Times of Change: Transformations in pottery production and exchange at Early Bronze Age Kontopigado-Alimos, Attica.

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Abstract

Studies of the Early Bronze Age Aegean have often stressed the transition from Early Bronze I to II as a turning point in terms of technology, the organisation of craft production, and the ways in which people socialised and interacted in a material world. While many recent studies have traced such changes back in time, some to the Final Neolithic, the transformations of scale in EB II posited by Renfrew and others still seem significant, especially in the pyrotechnical crafts.

Attention has concentrated on processes of craft specialisation, developments in pyrotechnology (primarily metallurgy) and in ceramic terms, an increase in exchange of pottery, both for itself and its contents and its increased use in more formalised settings of commensality. Indeed, pottery offers the possibility of investigating technological and organisational changes through examining production, such as standardisation, specialisation and scale, developments in firing technology, and its imitation of other materials, primarily metal vessels. The recent excavations at the prehistoric settlement of Kontopigado-Alimos in Attica present the rare opportunity to examine such early development in pottery production and consumption over two key phases at a confirmed production site.

Thin section petrography, microstructural and chemical analysis by scanning electron microscopy, and mineralogical analysis by X-ray diffractometry are combined to characterise, group and suggest the provenance of pottery from Early Helladic I and II deposits at the site. Emphasis is given to the detailed reconstruction of production at Kontopigado-Alimos from the selection, acquisition and combination of raw materials, through forming, surface modification and firing of pottery local to the site.

Radical changes in production processes are discussed, many of which have the aim of imitating metal serving and consumption vessels. Firing practices show clear transformations from open, fast firing episodes to ones which features consistently high temperatures and the close control of firing atmosphere. These changes are argued to elucidate social and organisational changes in the trends of production, as well as new patterns of consumption and exchange. The distinctive ceramic products of Kontopigado-Alimos can be traced across the Aegean in the Cyclades and as far as Early Minoan II Crete.

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‘Dream, hope it to be there with you at your creation and at the end of your life’

Agust D

List of abbreviations

Afs	Alkali feldspar
Amp	Amphibole
BGS	Bluish grey to white slipped
BSE	Backscattered electron image
Cal	Calcite
CV	Continuous Vitrification
DS	Black slipped
EB/EBA	Early Bronze Age
EC	Early Cycladic
EFT	equivalent firing temperature
EH	Early Helladic
EM	Early Minoan
FG	Fabric group
FN	Final Neolithic
Gh	Gehlenite
Hem	Hematite
Ilt	Illite-muscovite
IV	Initial Vitrification
Kon	Kontopigado sample
LBA	Late Bronze Age
LH	Late Helladic
LN	Late Neolithic
MG	Macroscopic group
Mnt	Montmorillonite
Mul	Mullite
NV	No Vitrification
O-R	Oxidation-Reduction
O-R-O	Oxidation-Reduction-Oxidation
Pl	Plagioclase feldspar
PPL	Plane polarized light

PS	Pink slipped
Px	Pyroxene
Qz	Quartz
RS	Red to brown slipped
RSB	Red to brown slipped and burnished
SEI	Secondary Electron Image
SEM	Scanning Electron Microscopy
SEM-EDX	Scanning electron microscopy with energy dispersive X-ray spectrometry
Spl	Spinel
Tcfs	textural concentration features
V	Extensive Vitrification
V+	Advanced Vitrification
Vc	Extensive Vitrification (calcareous body)
WS	White slipped
Wus	Wuestite
XP	crossed polars
XRD	X-ray diffraction

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Chapter 1 Introduction

1.1 The legacy of Renfrew and responses to internationalism in the EBA Aegean

Much of the study of Bronze Age Greece has been devoted to understanding social change and the development of state-level palatial society. One of the most influential works, Renfrew's (1972) *The Emergence of Civilisation* attributes the changes in Bronze Age society to internal processes which resulted in major transformation to a more complex socio-political organisation. His contribution began with an important synthesis of the origins of civilisation which employed systems theory focusing on internal cultural processes, especially those associated with the Early Bronze Age, during the third millennium BC. In contrast to the diffusionist viewpoint, he modelled the processes of cultural change via a 'multiplier effect' as 'positive feedback' which affected the interrelationship of the subsystems and thus motivate further changes in a comprehensive 'culture system'. In other words, the emergence of Aegean civilisation was argued to be fundamentally autonomous, in which Renfrew emphasises two major areas: epitomised respectively by the development of metallurgy, and transformations in subsistence from changes in vine and olive cultivation. Renfrew (1972: 265, 280) argues that the increase and diversification in agricultural productivity result in the accumulation of surplus, from which elites obtained power though social practices related to an increased consumption of specific commodities. He related this also to the development of metallurgy, which created new forms of wealth and argued that extensive exchange networks reached a peak in the transition to the second phase of the Early Bronze Age.

Renfrew (1972) states that during the EB II period, a new demand for specific commodities, primarily metals, as well as other types of raw materials and finished objects, such as midrib daggers, tweezers, figurines and vessels (especially sauceboats) stimulated the more pronounced interregional contacts and long-distance trade. Subsequently, the homogenous material culture widely distributed over the different cultural regions of the Aegean and the suggested conformity of social practice and lifestyle were argued to show a phenomenon of 'international spirit' (Renfrew 1972). He further argued that such demand is accompanied by craft specialisation and standardisation, as well as an increase in the scale of production, all of which was related to the development of socio-economic organisation and contributed to the accumulation of wealth and increased complexity seen in the later Bronze Age Aegean (Renfrew 1972; Whitelaw 2004). It is Renfrew's interest in craft specialisation, the development of technology and the increased exchange and consumption of material goods that is addressed by this thesis. While Renfrew's viewpoint was based on his contention that distinct transformations in metallurgy happened during the transition to EB II, this thesis examines the manufacture and movement of pottery as a proxy for such transformations in the material world.

Much of subsequent research has been in reaction to Renfrew's contention (e.g. *The Emergence of Civilisation Revisited* 2004). Indeed, recent studies have challenged the established view that the emergence of craft specialisation and intensified mobility of people, goods and ideology took place in EB II, arguing that the features Renfrew identified were certainly present in EB I, or even as early as the FN period (e.g. Day *et al*. 1997; Tomkins and Day 2001; Papadatos and Tomkins 2014; Wilson *et al*. 2008). Furthermore, Papadatos and Tomkins (2014) suggest the contact between Kephala Petras on the northwest coast of Crete and the Attica-Kephala Culture region in the FN period for obtaining metal resources of Lavrion in Attica and metal and obsidian in the western Cyclades. Such long-distance exchange has been taken place much earlier instead of EB II as conventionally held. Moreover, Day and Wilson (2016) identified the key production areas of the collared jar, the first amphora in the Aegean, and argued for the movement of liquid commodities in the transport jars along with the ubiquitous pouring vessels (primarily sauceboats) across the Aegean through the late EB II period (Kastri/Lefkandi I Culture). Such research importantly requires us to re-examine the crucial transformation in craft production and production organisation and the movement of goods during this transitional period.

As both Renfrew's original focus on metals, and the emerging consensus of the perhaps regular movement of goods to Crete from the Cyclades, and perhaps even from the Attic peninsula and metal-rich Lavrion, fifty years after his influential work, it is an opportune time to revisit Renfrew's broad idea of EB I-II transition in the Aegean through a diachronic study of pottery production in one site in Attica. Thus, this thesis presents the contextual study of EB I-II pottery production, exchange and consumption at Kontopigado-Alimos and the FN-EB II of West Attica, an area clearly linked with manufacturing activities in the landscape, especially in metals, and, as will be shown with the manufacture of some of the very EB II amphora and sauceboats found through the island and as far as Crete. The ceramic analysis looks both at transformation in production and at the consumption of drink and drinking paraphernalia, to the broad exchange networks through the western Cyclades to Crete. The thesis seeks to produce a ceramic study which contributes to the general pictures of EB I-II Aegean and to understand what goods were moving and when these movements occurred, whether other materials are being important besides metals, and how all the evidence reflects the new social practices of drinking and hypothesised feasting and to invite a re-examination of the crucial role of metallurgy in early trade and social transformation during EB I-II.

1.2 Pottery production, consumption and exchange

In order to understand the fundamental causes of the transition to social complexity, scholars have focused on analysing certain important social developments, including the performance of new scales and the organisation of collective activities, as well as the appearance of new symbolism in material culture. This requires an analytical perspective that illuminates aspects of social continuity and profound changes, in terms of both production capacity and the exchange and consumption of material goods, in order to integrate simultaneous evidence into a comprehensive understanding of social behaviour and relations changes in organisation and social relations. Therefore, the examination of pottery production, consumption and exchange of pottery have become the basis of this field of analysis provide marked potential in this respect.

Indeed, even prior to the widespread introduction of chemical and mineralogical analyses of archaeological ceramics, archaeologists devoted substantial effort to the investigation of craft specialisation, trade and exchange system and prehistoric economy, in order to characterise the social and economic organisation in the context of the prehistoric Aegean. Most early research on Early Helladic pottery was based on a typological approach (vessel shape and surface treatment) (e.g. Wace and Blegen 1916-18; Blegen 1921, 1928; Goldman 1931). Although such an approach allows the determination of whether there is a larger regional cultural zone and establish the relative regional chronological sequence, it is unable to characterise the technological tradition of production nor determine confidently evidence of the circulation of pottery. Vitelli (1993: 250) admits that the exchange of early pottery in Peloponnese can be much more complex and extensive than conventionally expected. For example, Michael Attas and his colleagues conducted neutron activation analysis (NAA) on EH I, II and III ceramics and reveal a higher level of regional exchange in the Corinthia and Argolid during the EH I period and additionally, the presence of specialist workshops for certain special wares, such as the sauceboat and shallow bowl which located in the immediate geographic vicinity of its distributed sites, suggests the short-distance trade during the EH II (Attas 1982; Attas *et al.* 1987). Wilson (1999) combined fabrics with ware types in his system of classification of ceramic assemblage at Ayia Irini on Kea. In this system, the potential circulation of pottery and the origin of its manufacture are better defined. In addition, recent works reveal the complex picture in production and consumption of EBA ceramics through the study of manufacturing processes (e.g. Burke *et al.* 2017;

Day *et al*. 1999; Hilditch *et al*. 2008; Nodarou 2011; Whitelaw 2014; Whitelaw *et al*. 1997; Wilson and Day 1994).

Through highlighting the potential of ceramic analysis, it is possible to identify and characterise changes in ceramic technology and thus to discuss transformation in production and organisation. Many scholars have been focused on the concept of craft specialisation and how it can be examined as well as its relation to the complexity (e.g. Cherry 1983; Clark and Parry 1990; Costin 1991; Rice 1991; Roux and Matarasso 1999). The examination of specialisation has focused on specific aspects such as standardisation, increasing scale, intensity and investment, mode and organisation of production, etc. In this thesis, the key issues of craft specialisation will be discussed and key elements are adopted to examine the changes in organisation of pottery manufacture, and subsequently, to discuss the organisational changes in relation to the consumption and exchange of pottery at Kontopigado and its associated communities.

1.3 History of research in Attica

The advantageous geographical location of Attica can reach different regions through overland and maritime routes, east to the Euboean Gulf and to the western Cyclades through the island of Kea, and the west coast directly looks across the Saronic Gulf, and further to the Argolid and Corinthia. Attica therefore played an intermediary role between the Helladic Mainland and the Cycladic islands. In particular, Lavrion with its metal ores, in particular silver-rich lead and arsenical copper, played a particular important role in the prehistoric trading systems.

The Western String model as proposed by Davis (1979; see also Schofield 1982), refers to the long-distance island chain from Attica to Kea, Kythnos, Seriphos, Siphnos, Melos, Paros, Naxos, Ios, Thera to Crete (Mountjoy and Ponting 2000: 179). Davis (1979) presumed this is the regular route of the Minoan traders travelling northwards to Lavrion in the southeast Attica for the procurement of metal sources during the Middle and Late Bronze Age. In addition, Schofield (1982: 22) argues the ‘special relationship’ between Crete and the western Cyclades which determined the available access to the Lavrion metal mines (Davis 1979; Nuttall 2014: 28). Phylakopi on Melos, Akrotiri on Thera and Ayia Irini on Kea, as the stepping stones for Cretan voyages to Attica, appear with strong Minoan influences, incorporating the Minoan elements into their local strategies of elites as markers of social differentiation in the Late Bronze Age (Nuttall 2014: 28).

It seems that this Western String exchange route for the demand of metal ores existed in the Early Bronze Age (Wilson 1987). The recent work by Day and Wilson (2016) argue this route was in use also during the EB II period through their examination of the distribution of the transport jars. They suggest the metal ores, transport jars along with their contents may be the same cargoes in the high-risk, long-distanced trade and exchange between interregional centres. Therefore, the critical role of Attica is emphasised.

Figure 1.1: Map of the key EBA sites mentioned in this thesis.

However, the research on EBA Attica is fundamentally influenced by the chronological and cultural framework of the Greek mainland and the Cyclades. The previous research basically defined two prominent culture horizons, from the burial contexts in the Cyclades and settlement contexts from the mainland. Such a research bias has led to the identification of the mixture of the Helladic and Cycladic characters in the Attic communities. In cultural-geographical terms, Attica always has been assigned with ‘Helladic’ but has been suffered from being considered a peripheral region with a passive role in the Aegean network. Most of the chronology of the southern mainland has been dominated by sites in the Argolo-Korinthia (Lerna, Tiryns, Talioti, Korakou, Tsoungiza) and Eutresis in Boeotia, though sometimes their detailed relevance to Attica is not proven.

On the west coast, a settlement and cemetery at Ayios Kosmas contains considerable information in terms of house complexes, organisation of cemetery, and material culture from the Early Helladic period (Mylonas 1959). Mylonas identified a Cycladic character in the grave types and burial offerings in cemeteries, while the objects in settlement were thought to bear a Helladic element. Such dichotomy in material culture categorisation makes the characterisation of Attic communities more complicated.

Such dual Helladic-Cycladic nature also presents at Ayia Irini on Kea. Wilson (1987: 35) states that:

> *it is clear that neither the term 'Helladic' nor 'Cycladic' is adequate as a cultural designation for Ayia Eirini in the EBA. ... Although the recognition of Ayia Eirini's dual Helladic-Cycladic nature is fundamental to the question, of far greater importance is how and why this came about. Furthermore, Ayia Eirini's apparent cultural ambiguity at this period is not unique, since a similar situation can be shown for East Attike. … shall argue for not just a Keian-East Attic pottery style in EB II, but for a regional group which form a cultural and economic bridge between the mainland and the islands. This definition of a Keian-East Attic group shows that a sharp division between the 'Helladic' mainland and the 'Cycladic' islands did not exist either ceramically or in cultural-geographical terms.*

Recent study of EH Attic ceramic assemblages (e.g. Douni 2015, 2020; Nazou 2020; Pantelidou-Gofa 2008; Pomonis 2020) also highlight the distinct pottery repertoire within Attica. Therefore, it requires us to reconsider the typology, nomenclature and regionalism in Attica.

Another obstacle possibly comes from the ill-defined stratigraphy and chronology. Many sites in Attica exhibit evidence of occupation from the Final Neolithic (abbreviated FN) onwards and continued to the late Early Helladic II (abbreviated EH II) period. Due to the lack of a clear stratigraphic sequence and limited changes in material culture, it has been problematic to construct a relative chronology to separate Early Helladic I (abbreviated EH I) level from its preceding FN phase. In contrast, the different settlement pattern and the marked changes in material culture make EH II more easy to recognise as a distinct period.

This was changed mainly by the recent excavations under the projects of the 2004 Olympic Games directed by the Greek Archaeological Service. These resulted in the discovery of many FN and EH sites throughout Attica and adds much new information. Along with the recent volume *Athens and Attica in Prehistory* (Papadimitriou *et al*. 2020), it requires our attention and substantial opportunities for analytical approaches to the production and consumption of the early materials so central to our understanding of the transformations of the late 4th and 3rd millennia BC.

The extensive rescue excavations conducted by Konstantina Kaza-Papageorgiou and her colleagues under the auspices of the 2nd and later 26th Ephorate for Prehistoric and Classical Antiquities have examined an ancient city road which overlapped substantially with the modern Vouliagmenis Avenue. The fieldwork has produced rich archaeological evidence from Prehistoric, Classical to Early Christian periods on the west coast of Attica (Kaza-Papageorgiou 2016). It is to this work that the excavations at Kontopigado-Alimos, the focus of this thesis, belong.

Along with resumed investigations at the well-known EH II site of Ayios Kosmas, there are several sites along the western slopes of Hymettus at Kontopigado and Pani hill in Alimos and Asteria in Glyfada, which range in date from Late/Final Neolithic to the Early Helladic period (Kaza-Papageorgiou 2012, 2016). These are now joined by the recent excavations at the peninsula of Laimos dated to LN/FN and surface collection to the EH period (Giamalidi *et al*. 2020) and demonstrate that West Attica is densely inhabited and the intensive human activities have been taken place during the FN-EH period. Amongst of these sites, the EH settlement and Mycenaean complexes at Kontopigado stand out, situated slightly inland in the area of Alimos, northeast of Ayios Kosmas.

The prehistoric settlement of Kontopigado, Alimos was occupied from the end of the Neolithic to Early Helladic and again in the Late Helladic period. Rescue excavations conducted by Kaza-Papageorgiou between 1986 and 1999 identified two Mycenaean complexes with Early Helladic houses on the top of the hill. Not only does it have the remains of metallurgical activity (silver and copper alloys) and obsidian working, it also has clear evidence for pottery production during EH II (large amounts of EH II wasters in this site which is also a major production centre in the Mycenaean period). The two main pottery phases of the EH period at Kontopigado lie in contrast to each other. The transformation from red slipped and burnished pottery in the EH I levels of the site to light coloured, thin-walled, pale slipped type skeuomorphic metal drinking and pouring vessels is striking and seems to involve radical changes in fabric recipes and firing technology.

The evidence for craft activity, at least in terms of metallurgy is also present at the nearby Pani hill, at Asteria and also at Ayios Kosmas. This clearly shows an intensely settled landscape on or near the west coast of Attica that has clear, repeated evidence for metallurgical activities and obsidian working associated with settlement during FN to EH II periods. As Kontopigado hosts well-dated, very large fill deposits of both the EH I and EH II periods, it offers the potential to examine changes in the production and consumption of ceramic material culture at a single site, to provide a window on transformations which took place from EH I to EH II. Its evidence of large-scale pottery production offers an almost unique opportunity to illuminate the place of West Attica as an important centre in this early period of change, to further examine key issues such as technological development, transformation and intensification of production and the connectivity between sites in Attica and through the Cyclades to Crete. As such the examination of pottery production and consumption at Kontopigado allows us once again to assess the very transformations which Renfrew posited in his model of social and economic changes in this critical period.

1.4 Research approach and research aims

The introduction of fine tableware with the metallic appearance in the EB II period and the marked stylistic and technological changes in pottery production, in particular the use of calcareous clays and the development of firing technology, reflects changes in production organisation, exchange and consumption. Such a phenomenon is closely related to the socio-cultural changes in the EB II Aegean which have been often been discussed in the context of the development of metallurgy, the emergence of extensive trade networks and social behaviours such as drinking and feasting.

These radical changes in production, consumption and exchange also exist in Kontopigado ceramic assemblage. Therefore, in order to study specific manufacturing processes, in particular, the radically changed choices of raw materials, paste manipulation, and the control of temperature and atmosphere in firing to examine the technological changes in ceramic production, this thesis utilises an integrated analytical programme consisting of typological, macroscopic fabric, petrographic, microstructural (SEM) and X-ray diffraction (XRD) analyses to investigate the stylistic, technological and organisational change in pottery manufacture. By using these techniques, it allows:

1) A detailed understanding of ceramic change at the Kontopigado production site and how technological change is related to changes in production organisation;

2) The characterisation of consumption patterns at Kontopigado and ceramic exchange where possible;

3) The comparison between changes in ceramics at Kontopigado, the broader region of Attica and surrounding areas

4) The examination of aspects of technological and cultural transmission in ceramics in late EB I-early EB II in the Aegean

The results will be interpreted within a theoretical framework of technology, habitus and tradition, key components of chaîne opératoire and craft specialisation. It will therefore illuminate the role of human choice and technological practices in ceramic production and organisation of production. The results will then be contextualised within published or available comparative materials in other areas of the Helladic world, the Cyclades and Crete to understand the scale of production, consumption and exchange at local, regional and interregional levels. Ultimately, it will be discussed under the main themes such as intensification, standardisation, specialisation, organisation, social identity and new social practices in the wider Aegean during the transition to EB II period.

1.5 Thesis structure

This thesis is based on theoretical and methodological approaches to the study the pottery production and consumption in the west Attic communities. It is organised into seven chapters, starting with a brief introduction of history of research in Attica to give a background of the research purpose and set up the scope and terms of this present work. Chapter 1, 2 and 3 are introductory chapters. Chapters 4 to Chapter 5 comprise the body of the thesis field and laboratory analyses. Chapter 6 contains the main discussion. Chapter 7 concludes the overall conclusions and avenues for further research.

Chapter 2 reviews the theoretical framework of material culture studies, social theory of technology and its relations to social and technological changes. The chapter also focuses on specific themes such as skeuomorphism, craft specialisation, and how the role of consumption and exchange has an effect on the process of production.

Chapter 3 addresses the detailed geographical and social background of EBA Greece and in particular, the EH I-II transition in Attica which generated from previous and recent excavations as well as contextualises the study and initial analysis of the sociocultural environment of EH I-II Alimos in west Attica and underlines the significance of Kontopigado at the core of this thesis.

Chapter 4 explains the analytical scheme to investigate the technological changes in pottery production and identifies the potential issues in studying firing technology of ancient ceramics and how the gap between ethnographic and archaeological world can be bridged by the scientific analysis and experimental data.

Chapter 5 is dedicated to the analytical results through the integrated methodological approaches of macroscopic, petrographic, chemical mineralogical and microstructural to look at the choices and manipulation of clay-rich material and its changes in firing practice. It will reveal the technological and stylistic changes in the two phases.

Chapter 6 combines the typological and analytical results of Kontopigado pottery, providing a discussion on the technological, social and economic aspects of pottery production, exchange and consumption and place them explicitly within the theoretical framework developed and the set background in the preceding chapters to characterise the critical role of Kontopigado. The chapter also compares with the available archaeological data from different regions, including the central Attica, Corinthia and southern Argolid, west Cyclades and Crete, to discuss the pottery production and consumption in the EH communities and the general EB I-II Aegean societies.

Chapter 7 then concludes the key interpretation and implications of this research, portraying a clear picture of how technological changes are interrelated with broader social and organisational changes and consequently result in the pan-Aegean phenomenon during the transition to EB II.

In summary, this thesis uses an integrated analytical approach to characterise the EH ceramic assemblage at Kontopigado in terms of changes in technological choice and practice, vessel types and surface finish, linking to consumption pattern and exchange within and between Attic communities and wider Aegean in diachronic period. The discussion of these results provides a new insight into EH pottery production, consumption and exchange.

Chapter 2 Theoretical approaches

> *Likewise, the essence of technology is by no means anything technological … We ask the question concerning technology when we ask what it is. Everyone knows the two statements that answer our question. One says: Technology is a means to an end. The other says: Technology is a human activity. The two definitions of technology belong together. For to posit ends and procure and utilize the means to them is a human activity. The manufacture and utilization of equipment, tools, and machines, the manufactured and used things themselves, and the needs and ends that they serve, all belong to what technology is. The whole complex of these contrivances is technology. Technology itself is a contrivance*. (Heidegger 1977: 4).

Technology has long been considered socially embedded. Archaeological and anthropological studies address the relationship between the technological and the social spheres by looking at material culture and explore how society influences technology or what sort of information is conveyed through material objects. The archaeological interpretations of material culture promote the in-depth appreciation of technological development and how technological changes are frequently in tandem with social changes. Many different theoretical trends have developed to explore how things are produced and explain the use of different artefacts and materials. Therefore, production, consumption and exchange offer three different analytical perspectives of how human beings interact with their world both consciously and unconsciously through materials.

It is important to note that these three categories are not separate, but three interconnected fields of activity. Human interaction with material objects in the process of making, usage, exchange and disposal reflects culturally and socially specific contexts and the perception of its inhabitants in a spatial and temporal background. An object is produced, exchanged and consumed in particular manners, places and times that suggest its participation in constructing social realities and social order. Therefore, a finished object and how it is used is the cultural product of its makers and users. Consequently, material culture constructs, consolidates and maintains multiple identities of individuals and social relations in the complex organisational networks.

Through the different levels of reactive strategies, the subjective perception of identity and the corresponding choices and actions constantly reshape the nature of social structure and organisation (Hahn 2012: 9).

In this way, this chapter reviews important ideas behind a consideration of technology and material culture, as well as issues relating to craft specialisation, scale, consumption, exchange, the active role of material culture in social life including skeuomorphism. The aim is to establish how pottery analysis can be used to illuminate production, exchange and consumption in prehistoric societies.

2.1 Material culture and social theory of technology

Technology is a means linking people and material, joining the intangible minds to tangible substances. The influential research on material culture based on Bourdieu's (1977) concept of habitus enables the entanglement between people and their perceptions of the environment to be explained through movement. According to such a perspective, technology is where symbolically organised interactions among social actors are embedded in the process of fabrication, execution and use. For Bourdieu (1977), the concept of habitus resolves the binary division of technology and society, seeing habitus as the socially organised form of movement. He considers how the social system is shaped by the behaviours of individuals. Basically, the substantively continuous social interactions between individuals generate rules and norms which continuously reshape the social system. In the process of socialisation, individuals learn, internalise, and strengthen the recognition of identity in the system. The social rules and norms are internalised in mind and behaviours of individuals and in turn consciously and subconsciously affect the surrounding environment. In other words, ideas and behaviours constantly interact with the environment, which Bourdieu termed as 'habitus'. As a consequence, the constructed habits in thought and behaviour of an individual cultured in the process of socialisation result in the performance of certain practices by collective individuals which contribute by the underlying mechanisms of 'socialised subjectivity' (Bourdieu and Wacquant 1992: 126). Consequently, the human agency continues to make changes to the social environment and aspects of the material world, organisation and ideology of human beings are reproduced by the changing environment. Therefore, it is understood that human actions are the rational results of the socially constructed mind (Bourdieu and Wacquant 1992: 129).

Furthermore, in the process of learning and internalisation, the individual has his/her own understandings and social experience, which leads to variability in decision-making and actions in shaping social relations. The variables of social dynamics in the learning process and the development of social process may lead to technological innovation. The variables integrate into the social system as the new variants are appreciated and accepted. Therefore, this suggests that the social system is a fluid-structure, constantly reshaped by the new components introduced by human agents (Bourdieu 1977; Sterne 2003).

Ultimately, 'technology is a mode of revealing'; it is a way of understanding the world (Heidegger 1977: 4). The nature of technology can be understood as a system constructed by ideology, traditions, cultural values, knowledge and organisation, at conscious and unconscious levels of horizontal and vertical social relationships within and between societies (Lemonnier 1993). As a consequence, material culture studies help us to observe the longue durée understanding of change and continuity in technology and its relation to social processes. Dobres and Hoffman (1994: 212-3, 226) suggest that the choices and actions of individuals as active social actors or agents related to social groups in manufacturing and use of objects are to convey and reproduce social meaning and value and related materiality, constructing social structure and interactions, and to negotiate social relations in the continuity and change of social organisation. In other words, these choices and associated actions in the process of adoption and innovation are made on the basis of social strategies and meanings, as Lemonnier (1993: 5) and Mahias (1993: 169) have pointed out. Therefore, it can be said that technology is the embodiment and expression of social relations, social meaning and social construction in reality through the lens of material culture (Dobres 1991; Dobres and Hoffman 1994: 227; Edmonds 1990: 56; Hoffman 1991; van der Leeuw *et al*. 1991).

The manipulation of material culture is a crucial part of identity construction and the creation of communities and cultural groups (see Frieman 2010: 35, 2013; Insoll 2007; O'Brien 2008; Shennan 1989). Therefore, the field of material studies is a key to understand structure at different scales in individuals, communities and societies. Consequently, material culture intrinsically represents archaeological evidence for cultural groups or ethnic identities to reflect the technological and social continuity and change in the spatial and temporal perspectives (Tilley *et al*. 2006: 2-3). By exploring the relationship between technology and the social system, it reveals the choices and actions in the spheres of manufacture, exchange and consumption of objects that are essentially social products and, subsequently, this highlights continuity, transformation and transmission of technological knowledge in ceramic studies.

2.2 Technological tradition, change and transmission in ceramic studies

> *Basically, to deal with technological choices is to deal with the conditions of change and continuity in material culture, whether these results from the autogenous invention by a group of a new element aimed at acting on matter or from some external borrowing*. (Lemonnier 2002: 21).

The pioneering works by Lemonnier (1986, 1993, 2002) note the importance of technological 'choices' resulting from cultural behaviours and representations. Technological choices suggest that there are several options for manufacturing operations available to people and the result of the particular way of making. These choices are 'active social strategies' to differentiate from other technological practices held by other social groups (Dobres and Hoffman 1994: 221; Lemonnier 1986). Therefore, the concept of technological choices suggests the significance of individuals as social actors or agents in production organisation and the technological choices and the resultant 'technical traditions' or 'technological tradition' can be used to distinguish the different characteristics of social groups or identity (Lemonnier 1993; Rye 1981: 5).

To understand the interactions between potters separated in space or time involves the transmission and acceptance of knowledge and techniques at vertical and horizontal levels. It is crucial to understand how knowledge and information are transmitted from one group to another and from generation to generation. Roux (2017: 102-4) further stresses that in the production process from raw materials selection, manipulation, forming and finishing, the 'inherited ways of doing' or 'technical traditions' are transmitted through the process of the individual (vertical) and collective (horizontal) learning. At the individual level, the choices and decisions potters made are based on their long-term learning and practice in pottery production. Therefore, the study of pottery technological processes can reveal different aspects of social relations in the transmission of knowledge within a single society. The establishment of potting tradition is involved in the vertical transmission of knowledge and skills from one generation to the next within a group of potter(s). As Santacreu (2014: 207) summarises, the long-term apprenticeship consists of the technical skills, ideas and information of composition and location in the learning process which integrates moral and social values as part of building cultural identity (see Wallaert 2012: 38). Therefore, a pottery style is the result of technological choices in the manufacturing process and forms the specific technological tradition that is indicative of the social identity of communities of practice. The intergenerational inheritance of technical traditions and technological knowledge exchange defines the social boundary and group identity (Roux 2017: 104). In other words, a particular pottery manufacturing process not only produces the particular style of final products but also reflects the potting tradition developed and followed consciously and subconsciously. The same potting tradition reflects the long history of interactions and the similarities in craft techniques reflect the strong social ties (Roux 2019). Therefore, pottery tradition is comprised of the technical traditions which are followed by the specific group(s) of potters underlying the habitus of a single community.

At the collective level, the horizontal transmission of technology occurs in a group of individuals connected by social ties that define the social boundary of a certain way of doing which examines the spatial distribution of knowledge and technical traditions and networks of technical dissemination and human interactions both within and outside communities of practice – interrelated communities under a social learning system (Wenger 1998) – (Roux 2017: 103). The same production localities – a locus for communal practice and knowledge exchange – allow the horizontal transmission of technological know-how between local potters (based on kinship) (Bevan and Bloxam 2016; Gosselain 2016: 201; Wenger 1998).

Furthermore, the technological choices of potters reveal the change and continuity in pottery technology (Lemonnier 1993: 21). Consistency in manufacturing techniques expresses the passing on of the cultural background and traditions between individuals and generations, defining social identity and the social relations of potters in the communities. It is a part of the process of accepting new technology which is related to the establishment and maintenance of identity when encounters with different social groups (Frieman 2010: 33-4). To maintain technological traditions is to maintain the reputation of the production group(s) and thus to obtain social and economic benefits for the communities. As a consequence, it is important to maintain integrity in the system of tradition and knowledge transfer in the fluid context of society through practices.

The variability within technological practices, on one hand, as Clarke (2005: 81-2) suggests, reflects cultural variations which are the result of random errors, selection and discrimination as well as imitation. On the other hand, the pre-existing cultural and technological elements are eliminated, transformed or added with the new elements contribute to the changing habitus (Santacreu 2014: 199). Therefore, both the aesthetic changes driven by the social domain and the technological changes in which potters accepted, adopted or innovated to achieve compatibility in material culture are the results of social mechanisms manifest in the organisation of pottery production. The variability introduced in the technological transmission essentially transforms the technical traditions and reflects changes in cultural history and social identity (Shennan 2013; Roux 2017: 104).

Moreover, in the long-term learning system, there are more than mere observation and imitation. The reinterpretation of technological traditions and the technical skills specific to each potter lead to the various choices and practices in the manufacturing process, which ultimately generate adoption and innovation in pottery technology (Arnold 1999; Santacreu 2014: 214). The adoption of new techniques requires long-term apprenticeship and participation in practice (Gosselain 2016: 205). It is important to note the individuality of potters gradually developed into the collective habitus after acceptance into the wider potter community. The technical elements in the process of adoption and/or innovation are chosen on the basis of social strategies and meanings (Lemonnier 1993: 5). These previously unknown elements are not immediately accepted, the social meanings embedded in these new features are ‘deciphered’ and reinterpreted according to the local context in order to select the best fit into the local social context (Lemonnier 1993: 14-15, 2002: 14). Hence, Lemonnier (1993: 26, 2002: 22) proposes that it is the sets of representations and social relations which determined slow or rapid technical changes.

Nevertheless, the social background, the potter’s status and role in the social group, the demand of markets and the organisation of production are all factors that constrain the acceptance or rejection of new technical elements by potters, which is subsequently able to shape the social environment around them. The cultural cognition conveyed by the ceramic products transmitted between producers and consumers, or vice versa, has an effect on the technological choices of the potters. The acceptance or rejection of certain technological choices in pottery production reflects both the mind and thinking of producers and consumers, in short, a complete picture of society (Santacreu 2014: 210) as discussed in the later sections of this chapter.

As Gosselain (2000: 170, 189-92) categorises the different parts of manufacturing stages, some techniques are highly visible and open to being influenced by others. He further points out (2000: 192) that there is communal technological knowledge shared amongst potters which can be useful to distinguish the strong bonding between different potting communities and the development of specific technical practices. Furthermore, the technological transfer occurs through the movement of craftspeople (Gosselain 2016: 195). The movement of artisans such as exogamy, itinerants, etc. involves the process of resocialisation to adapt the local habitus and re-define their social identity (Wallaert 2012). During the process of resocialisation of the potters, the new elements or new techniques are amalgamated into the pre-existing traditions and ultimately lead to the successful transmission of knowledge and techniques. The cultural transmission of knowledge and perception may explain the slow adoption and innovation in technology. The introduction of the new ideology, practices, techniques or objects is not a pure adoption, it is, however, to reshape the new elements or objects to integrate into the existing social environment (Aspiotis 2003: 9; Kopytoff 1986: 67-68). As Lemonnier (1993: 25) suggests, the new sharing of knowledge and techniques may affect a small part of the technological sequence at the beginning, yet leads to greater changes in the process and eventually leads to innovation. As a consequence, the definition of identity is subsequently reoriented through resistance, slow or rapid change. Different attitudes (accept, reject or tolerate) towards novelty and their accorded actions in the transmission and appropriation processes of potting practices are the strategies that form solutions in response to social changes such as new demands or interests or fluctuating circumstances.

In addition, the acceptance or adoption of these chosen technical elements also indicates the social relations between potters who are aware of the existence of these techniques or have close interactions with each other (Lemonnier 1993: 3, 9). Besides, the co-existence of acceptance and rejection of technological changes and social practices contribute to variability or heterogeneity in pottery production. Choleva (2018), Courty and Roux (1995), Kiriatzi (1997), Knappett (2016) demonstrate that the emergence of a new technology – in this case the potter's wheel - may only be partially accepted and show varying degrees of adoption. A limited range of vessel shapes are wheel-made and it is only gradually adopted in the production of other shapes (see Choleva 2018). It emphasises that the process of technology adoption and innovation requires time and operates gradually, not readily took place, yet also affects by consumption patterns. Kotsonas (2014: 8) elucidates that variation is the degree of heterogeneity in materials and artefacts while variability is defined as 'the liability of these attributes to change and become more varied or standardized'. Variability in production expresses its social context rather than merely economic organisation (Costin 1991: 34-5). It is derived from individual skills (consciously and/or unconsciously), generational traditions of technical practices, subtle differences in technology, different origins of raw materials, and social aesthetic fashions in style (Costin 1991: 35). The presence of variability in production may illuminate its nature for adapting to different social contexts. In this way, the dimension of variability is particularly useful to elucidate the different extents of specific stylistic and technological development and transmission in pottery production and consumption. These occur simultaneously in the EB I to EB II Aegean and are evidence in the Kontopigado assemblage, which testifies to radical stylistic and technological change in successive periods.

Pottery, therefore, can provide insights into chronological, cultural and geographical issues, allowing more comprehensive studies at local, regional and wider scales. It comprises an indirect way to reveal the lives of the prehistoric individuals and groups and aids understanding of how material culture acts as a medium for interaction with the world around them. Ultimately, this work focuses on how the technological traditions of individual potters or group of potters as the 'smallest interaction group' contribute and are affected by developments in society such as craft specialisation, the organisation of production, modes of distribution and social complexity.

2.3 Craft specialisation and social complexity

Renfrew (1972) has argued that one of the aspects of development in his technological subsystem – craft specialisation – is a major factor in relation to the emergence of social complexity in the Aegean. Consequently, here, it is critical to review how this important concept has been considered and measured through the examination of specialisation, and to establish criteria for the assessment of specialisation, through standardisation and scale in ceramic production and the organisation of production.

Although the pioneering work of Childe (1951) established the significance of craft specialisation in the development of social complexity, the often remained a lack of the explicit definition, and arguments over the definition of craft specialisation have attracted much attention (e.g. Brumfiel and Earle 1987; Cherry 1983; Clark and Parry 1990; Costin 1991, 2007). The core concept developed from Childe's understanding of specialisation is the division of labours which the differentiated productive activities involved within a community (Clark 1995: 270-271; Costin 1991: 4). In 1972, Flannery proposed systems theory to analyse the development of social complexity through human agency and its intertwined with social relations and structures. The system is the result of a series of social and cultural factors that affect the environment which contributes to the development of social organisation; the development of social organisation ultimately leads to the concept of complexity. Therefore, it defines social complexity as a form of complex organisational structures in which the fundamental premise derives from the multitude of social interactions between individual members of a group in many different contexts.

Clark and Parry (1990) re-evaluated and re-stressed the close relationship between craft specialisation and complexity and point out that owing to the difficulty of identification of the organisation in craft production in the archaeological context, most archaeologists turn to the degree of craft specialisation to identify an important part of the facet of social complexity (Clark and Parry 1990: 292; Rice 1996: 177). However, Day *et al*. (1997: 287) pointed out that it is problematic for some context (e.g. the Neolithic of Peloponnese) to explain specialisation. As Kerner (2010: 180) notes, the relationship between the level of craft specialisation and social complexity is so far not explicit:

> *it is not clear whether social complexity is a precondition for specialisation or specialisation furthers the development of social and political complexity, or if their relationship is dialectical.*

Feinman (2012: 36) states that social complexity can be defined as 'the extent of functional differentiation among social units, [which] may be vertical or horizontal; vertical complexity is hierarchical governance with a degree of concentration in decision making and power, [whereas] horizontal complexity is the differentiation of a population into various roles or subgroups'. 'Attached specialisation' proposed by Earle (1981) or 'hyper-specialisation' by Clark and Parry (1990: 293-7) define the specialised products attached to craft specialisation that serve the purpose of ideological legitimisation for the patrons of high status who are in control of and redistribution of goods and therefore participate in the process of the development of society and the economic and functional demands (Brumfiel and Earle 1987; Costin 1991: 7). The elaborate specialised products made by specialists deliver objects of higher value and are consumed on the conspicuous occasions to materialise social or political relationships of the participants (Clark and Parry 1990: 293-4; Costin 2007: 274). Therefore, it is suggested that craft specialisation is closely tied to social hierarchy.

The control over production links to the control of redistribution and thus restricts the power and prestige exclusively to the high status and prevents competition of peers or the lower status (Costin 1991: 11-2). Nevertheless, Day *et al*. (2010) point out the issue of linking specialisation to centralisation in the mode of political economy which undermines the complexity of social structures. For example, kinship relations as the main component of social structure or the ambiguity of obligations and alliances in prehistoric societies (Day *et al*. 2010: 207). Therefore, how to evaluate social complexity through the examination of ceramic production and its link to the concepts of specialisation are vital in the work. The study of ceramic production, standardisation and specialisation focuses on the assessments by Costin (1991) and Rice (1981, 1991).

Many scholars agree that the characteristics of specialisation are the improvement of skills, reducing manufacture time, standardised products and increased output, ultimately to enhance the efficiency for market demand and pursuit of quality at the same time (Clark and Parry 1990: 292-3). In order to measure the mode of organisation of production, it depends on four parameters: *context, concentration, scale and intensity* (Costin 1991: 8). In brief, the nature of the organisation (*context*), the degree of regional *concentration* of facilities, size and structure of the production units (*scale*). The 'production group(s)' signify the identity of the potter group(s) who practice the same tradition under the same ideology (Costin 1991: 33). The same potter community will display consistency in ceramic repertoire and techniques of manufacture. Last but not the least, the degree of involvement of the production group(s) (*intensity*), traditionally considered as the presence of full-time specialists (Costin 1991: 8). As a result, the mode of production can be assessed through the distribution of raw materials, the nature of technology, the skill and training of the specialists (Costin 1991: 2). In addition, raw materials, debris and facilities as the most direct evidence to identify the production locus (Costin 1991: 18-9). While the indirect evidence is the standardised products, manufacturing competence, efficiency and regional attributes in artefacts (Costin 1991: 32). Therefore, standardisation is frequently linked to specialisation for which the degree of standardisation has been considered as an index of craft specialisation, expressing through the standardised products which manufactured by one or a small number of production group(s) that consciously followed the same manufacturing routine and/or using a wider range of raw materials to achieve a higher degree of homogeneity of artefacts (Blackman *et al*. 1993; Costin 1991: 33; Kotsonas 2014: 8; Tite 1999: 192; see also Arnold 2000; Roux 2003).

Rice (1991) specifically proposes four categories to analyse the correlations of specialisation and standardisation in ceramic production: 1) resource specialisation, which using specific raw materials to produce different types of pottery, 2) product specialisation, that is, a concentration on a specific ware type, 3) site specialisation, 4) producer specialisation, which parallel to Costin's (1991) parameter of intensity, the presence of full-time specialists and increased level of skills. Furthermore, the competence of techniques and skills and the investment in permanent facilities and the wide distribution of specific products from the production centre are also included as key elements of the assessment. The specialised mass production is reflected by a high degree of standardisation and high productivity.

Costin (1991: 4) suggests specialisation as 'a differentiation, regularized, permanent and perhaps institutionalised production system'. Rice's definition (1981: 220) of specialisation is a process of regularised 'behavioural and material variety in extractive and productive activities' which elucidates the link between specialisation and standardisation and in contrast to variability in materials and artefacts (Costin 1991: 4; Rice 1981). Previous literature summarises the factors which have an influence on the standardisation in pottery production, consisting of the variety and availability of raw materials, potters' skills and the potting traditions, the accessibility in the employment of tools and facilities, the demand of cost-effectiveness, the consumers' taste and preference and the capacity of conveying social implications (Kotsonas 2014: 12). Thus, the intensity and the degree of standardisation and variability are determined by the social contexts and interactions with other potter groups as well as groups with different tasks and positions in the social structure.

To conclude, the scale of the organisation can be assessed by specialisation in ceramic production through the degree of standardisation, the labour requirement, the level of skills, technology and facilities, the high productivity and ranges of final products and the pattern of distribution (Tite 1999: 191). Increasing production complexity is an indicator of social complexity.

	Criteria
1	Resources specialisation
2	Concentration on the specific ware type(s) by specific potter group(s)
3	Degree of standardisation
4	Local workshop for most of the pottery
5	High level of craftsmanship
6	Nature of organisation – related to a high level of consumption
7	Investment in permanent facilities – e.g. kiln
8	A wide distribution of specific products

Table 2.1: The criteria for the assessment of specialisation (after Costin 1991; Rice 1981, 1991; Tite 1999).

2.4 Skeuomorphism and specialised products

Section 2.2 and 2.3 argued that pottery can provide insight on a symbolic level, that objects and materials are integrated into a broader material world and become part of the society with the way it changed such as the development of specialisation. In the context of this research, it demonstrates the important impact of the introduction of metallurgy in the EBA Aegean (Renfrew 1972). There are perhaps two ways in which the lives of ceramics and metals are entwined; one of the most obvious ways is the pivotal role of metallurgical ceramics in metal production, and another more intriguing is the way in which ceramic objects often imitate metal objects, a process known as 'skeuomorphism'.

'Skeuomorphism' is an interpretative term, which in ceramic terms means an intentional imitation to produce a vessel which bears the characteristics usually made from another physical material (Frieman 2013; Vickers and Gill 1994). Its study is usually associated with imitation as a sign of technological advancement according to an evolutionary view (e.g. Childe 1956), or closely related to cultural emulation – suggesting that imitation products are inferior to the originals from an economic perspective (Vickers 1999). Traditionally, skeuomorphs are considered the substitute for the value prototypes (Vickers and Gill 1994). Nevertheless, as de Freitas (1997: 4) argues, 'when potters later skeuomorphed the rare and valuable new material, metal, their products referenced up the relative value scale'. Furthermore, Andrew Sherratt (2002; Sherratt and Taylor 1997) and Susan Sherratt (1999, 2010) apply the concept of added-value goods to ceramic skeuomorphs; the cognitive association with the originals argued to give extra value and significance of the skeuomorphic products.

Clay is easily manipulated by a variety of techniques and procedures to produce a broad array of shapes and almost endless repertoire of details. Therefore, pottery is an ideal medium for assigning new meanings and reinterpretation of any new ideology through pre-existing and socially important objects, in this case, ceramic vessels (Antoniadou 2007). Since pottery production is a series of cultural behaviours, there is no fixed way to produce a vessel unless the potters are trained in the same learning system. Therefore, the making of ceramic skeuomorphs indicates the transformation of identities through the inter-materiality of the objects. In doing so, it creates a new shared identity. The ceramic skeuomorphs can have many purposes from visual reminiscences to the substitution of valued objects (metal vessels) and furthermore, representatives of luxury or symbolically charged items. However, the skeuomorphic products have their own material, their very own attached meanings and references to their original world. Therefore, the skeuomorphs are not only a way to access new ideology and obtain new meanings, but also to retain the pre-existing cultural and social values.

As a consequence, the skeuomorphs functioned as objects that stand across the two social worlds by applying novelty to the pre-existing culturally valued artefacts. Star and Griesemer's (1989) concept of 'boundary objects' states that the integration of ideologies from the intersecting social worlds makes a greater influence on the skeuomorphic products and its cultural value. Therefore, skeuomorphism is the manifestation of cultural and technological transmission which facilitates the process of acceptance of cultural appreciation and innovations through the transfer of cultural attributes and social memories, along with the creation of greater value from the familiar prototypes to the skeuomorphs (Blitz 2015). Archaeological studies of skeuomorphism show that the presence of skeuomorphism often existed in transitional periods – the material syncretism is the interaction between human and material and derived from a mixture of social desires, incorporating the influx of new ideologies and values into the local traditions and creating and maintaining the idiosyncratic group identity (Frieman 2010: 38). To incorporate the exogenous technology or objects into an existing social system can cause a significant transformation in the system and the exogenous value expressed through traditional means may be preferred. Skeuomorphism is possibly an intentional strategy in the process of acceptance when change is accommodated, the familiarity of the value of the skeuomorphs associated with the prototypes can either lessen the threat of unfamiliar innovations or attract those who are interested in the associations and connotations (Blitz 2015). Therefore, the production of skeuomorphs is closely linked to technological innovation.

Skeuomorphic artefacts are produced and consumed by a group of people who shared the same ideology which aesthetically or socially influenced by the image of the prototype. It may not be the same group of people who produced and used the original prototypes, yet the producers and consumers of the ceramic skeuomorphs are familiar with the social meanings and the characteristics of two different materials (metal prototypes and ceramic skeuomorphs). As a result, the producers are aware of which desirable features of the prototypes should be selected or imitated, while consumers are able to differentiate the two categories and recognise the social significance of the traits chosen by the potters to associate with the prototypes. The tacit knowledge between prototypes and skeuomorphic objects attests to the social distances of production group(s) and consumers and how cultural cognition is expressed through material culture. As a consequence, a new shared identity is created on the basis of sharing a common acknowledgement of the interplay of values in the discrete contexts of these groups through the consumption of the skeuomorphic objects (Blitz 2015). Knappett (2002) suggests the origin of ceramic skeuomorphs is indicative of the intention of the lower status to gain power from the elite consuming the prestige goods. Moreover, with respect to the EBA Aegean, Broodbank (1993, 2000) and Nakou (1995) identified the restricted acquisition of specific resources such as obsidian and metals ores and consumption of exotic goods which are related to social differentiation and power. Nakou (1995) argued for the intentional choices of metal processing sites for their remoteness and general inaccessibility of these sites. She further explained the skeuomorphism of EB II reflects a change in social strategies and allowed social mobility in a hierarchical system by creating a new social identity of the skeuomorphs-using groups (Nakou 1995, 1999).

Additionally, the increasing demand for skeuomorphic objects that carry very specific characters suggests social change, and thus such specific characters became very important and has to considered as indispensable to people in this specific temporal and spatial context (Frieman 2010: 35; Hurcombe 2008). For instance, this work focuses on the emergence and omnipresent ceramic skeuomorphs to reflect the significance of metal in the Aegean during the Early Bronze Age. Not only that, it considers a site which produces a range of innovative pottery in the later phase considered which heavily imitates metal drinking and other vessels. In Attica and the Aegean, the resemblance between ceramic skeuomorphs and metal referents is not the result of manufacture in an analogous process. The different manufacturing processes suggest the purpose of skeuomorphic pottery is to demonstrate the power and ability of potters to transform the material world through the manipulation of materials and technologies with relevant social symbols and to alter the attributed value of the ceramics which ultimately envision another material, metal. At the same time, the skeuomorphic vessels functioned as a communicating tool that transmits the information related to value, identity, status or communities of the producer and consumers of metals. Hence, due to the specialised production skills and the social reference of metal value in ceramic skeuomorphs, it becomes an important category of specialised products.

2.5 Consumption, exchange and economy

Based on the discussions in the previous sections, it should be clear from now that the production system undergoes a distinct transformation, not only in the way that things are made, but also in their use, which have impact on production. Things are changed rapidly in terms of scale and specialisation, not only in terms of the production process but also consumption. Therefore, the understanding of consumption and the way objects move are desired and understood after their production has an effect in every domain. In this section, not only is consumer choice stressed, but also biographies, the active role of objects in materialisation and social worlds, as well as changes in the movement of goods. All these are important to issues of consumption, exchange, the emergence of commodities, ideas of branding (Bevan 2010; Wengrow 2008) and perhaps shed light on the economic system on the basis of ceramics in such an early period of Early Bronze Age Aegean.

2.5.1 Consumption

First and foremost, it is important to consider the significant role of consumption in the process of production. From the traditional economic viewpoint, the relationship between production and consumption is based on supply and demand (Costin 1991: 3). However, it is not only the consumers' preferences that influence the choices of producers, but also the cultural reinterpretation of the products. Consumers' taste and preference is the result of the whole package of social relations, identity and ideology. The tendency of taste and preference is embodied in the experience of living in social status and within the belonged habitus, which further reinforces the power and social relations (Bourdieu 1984, 1990). Owing to the movement of goods meanings are constantly changing and renegotiated amongst different networks, at different stages of the biography of objects, and the embedded social value can subsequently be recontextualised according to the objects' new contexts (Knappett 2002: 101).

Furthermore, Gell (1986: 115) suggests that the cycle of social reproduction operates through the process of production, exchange and consumption where the ambiguity of a product enables it to be more easily transformed and transmitted. Consequently, understanding of the value of the commodities can be constantly changed through the course of production, distribution and consumption (Bevan 2010). It indicates how the value of an object has been transformed and reinterpreted in the process of consumption. Consumption is a social process in which people recontextualised the material world in their social life and reshape their habitus. The pattern of consumption is considered as a proxy symbolic activity that constitutes social behaviours and cultural concepts deeply rooted in social relations and specific cultural phenomenon in a particular time and space (Dietler 2010: 217).

Kopytoff (1986) explores the recontextualisation of social roles and meaning in the biography of objects, when objects become commodities through the process of commoditisation. The exchangeable nature of commodities results from the characteristics of alienation and singularisation (Appadurai 1986; Kopytoff 1986). When an object bearing specific cultural identities enters the market as a single commodity, it is physically detached from the original context of the suppliers (or producers) and becomes part of the properties of the consumers. Hence, the social role and meaning are redefined according to the context of the consumers and re-enter society as 'a culturally constructed entity' (Kopytoff 1986: 68). Therefore, the physical and cultural alienation of commodities between producers, distributors and consumers allows the commodities to become the practical substance of cultural products which play a significant role in the dissemination of symbols and ideology (Aspiotis 2003; Bevan 2010, 2014: 387).

Commoditisation is a process of generating demand through 'the creation of products embodying added value' (Sherratt 2004: 96-7; Wengrow 2008: 19). The different modes of consumption suggest that consumers have a common perception of regimes of value and thus intentionally select specific commodities for imports (Sherratt and Sherratt 1991, 2001: 21). The imported commodities are not only the mobilisation of materials but also the transmission of lifestyle and ideology of values (Sherratt and Sherratt 1991, 2001: 20). Through consuming commodities in everyday cultural practices, the social order and symbolism are constructed in social perceptions (Aspiotis 2003: 10; Glennie 1995: 178; Shanks and Tilley 1987: 155). The expansion of influences in culture and ideology from one centre to another in the network of interactions stimulates the demand for high-value commodities and substitutes to express the changing consumption pattern, cultural identity and social status and to generate technological innovation (Sherratt and Sherratt 2001). The way in which commodities are consumed, in particular social and cultural contexts, reflects the consistent manners of consumers which provide interpretations of complex social connotations and cognitions intrinsically linked in the organised social structure. In this regard, the performance of consumption is closely related to the construction and maintenance of social relations and social order (Dietler 2010: 224). Therefore, the commodity is the synthesis of symbol, consumption, ideology, distance and power (Aspiotis 2003: 11).

Appadurai (1986: 38-40) defines luxury goods with the restricted possession, the complicated process of acquisition, the ability to express complex social meanings, specialised knowledge for a specific way of consumption and the close relationship to body, individual and personality. The use of these specialised products evokes the 'indexical signs' of implicit associations from a fundamental social value in its wider context (Aspiotis 2003; Knappett 2002). It is more than commodities; with the active use of these products, these become symbols in the system of symbol to express the social status (Baudrillard 1981). The acquisition of luxury commodities not only shows economic strength but also resulted in social impact. The possession of such expensive commodities provides a sense of exclusiveness (Appadurai 1986: 44).

Costin (1991: 14) has stressed the distance and transportation that add to the economic value of the products. In prehistoric times, it was difficult to move goods in a large quantity in inter-regional trade (Bevan 2004; Sherratt and Sherratt 1991). Therefore, the exogenous material and style of the object, the final quantity of the same object arrived at the destination and the labour investment throughout the distance, all pile up to show the capability to obtain the object from distant places, manifest the high value of the object and therefore demonstrate the prestige status of the owner (Appadurai 1986: 44).

In addition, the ability to obtain knowledge in spite of the geographical/physical distance infers power, prestige and status (Aspiotis 2003: 10). Furthermore, the size and quality of products are affected under the consideration of transportation cost (Costin 1991: 14). The differentiation in the capacity of goods shows the differentiation of wealth and social position (Glennie 1995: 178). With the concept of 'commodity branding', Wengrow (2008) suggests the standardisation in packaging and marking practice (e.g. sealing) have transformed the objects into commodities which are regularised in their content, quantity and quality. The purpose of branding is to make origin, authenticity and value recognisable and being recognised in the shifting contexts of storage, distribution and consumption (Winter in Wengrow 2008: 26).

Bevan (2010) compares the modern concept of branding and stresses the personalisation of branded objects and the concept of 'brand community'. The concept of branding is a techno-economic reason and a solution to the problems due to the fear of deception and desire for trust-based upon the asymmetric information which Bevan

(2010) suggests is ultimately attributed to the social relationships in a given social environment. Hence, the consumers trust the brand which has a reputation for providing a guarantee of the quality of the products. Furthermore, branded products function through the transmission of symbols which are easy to transmit and memorise. Moreover, the specialised packaging adds additional value to the commodities (Bevan 2014; Sherratt 2004: 96; Wengrow 2008). Regardless of the interest in production, standardised commodities are also the product of the demand of consumers which deliver information about social status and group membership (Costin 1991: 33; Hodder 1983).

In addition, as Wengrow (2008: 8) suggested that the brand commodity implies the new forms of identities is settled between mass consumption and capitalist production. It allows space for creating a new social identity through the process of consumption. It attests to the significance of exchange and trade in creating a new form of constructing the relationship between each individual and different group (villages or settlements) and the expansion of social identity – from kinship to non-kin-based individuals – bonded by the material culture. For example, Renfrew (1975) suggests that there were mobile traders or merchants, 'freelance' or 'middleman' as the specialised agents in the economic activities who connect areas beyond the regular centres/zones of market exchange (Bevan 2007:23-29; Sherratt and Sherratt 1991; Stark and Garraty 2010: 40-41).

Material culture and its pattern of consumption construct and display social status and social identity (Dietler 2006: 231–232, 2010: 224). The choices of consumers are intended to maintain the stability of social life and the recontextualisation of the social order; at the same time, the selection reflects the discriminations of certain things further strengthen the constructed social system (Douglas *et al.* 1996). Such social and cultural aspects of consumption can be reflected by its significance in cross-cultural connectivity (Dietler 2010). Connectivity simply denotes the circulation of things, ideas and people (Gosselain 2016). The demand characterised from the pattern of consumption indicates the socioeconomic role of its consumers and the level of circulation and distribution (Costin 1991: 3).

The reinforcement of social order is accomplished in the process of cross-cultural consumption through reproduce, assimilation or rejection of exogenous commodities and practices (Dietler 2010). Commodities are the result of consumers' selection and discrimination due to their role in the social system. The selection and discrimination of exogenous goods, as well as the reinterpretation and localisation, contribute to the transformation and reproduction of culture (Dietler 2010). The higher connectivity may reflect more homogeneous social norms and material culture.

2.5.2 Exchange

An understanding of the choices and pattern of consumption requires an appreciation of how objects were exchanged and how the exchange network operated and was organised. This section reviews the previous use of theoretical concepts and their manifestations in the archaeological literature on exchange and economic activities to suggest how we can investigate the complexity of exchange and economic activities through the ceramic exchange in this thesis.

Exchange is at the core of models of the ancient economy and socio-economic activities in prehistoric societies. The different forms of prehistoric exchange including barter, transactions, trade, and other economic activities as well as reciprocal exchanges from localised to interregional interactions (Stark and Garraty 2010: 33). These forms of exchange may occur between individuals, households and groups alongside the sponsored events under the control of the higher status (Hirth 2010). Such socio-economic interactions and mechanisms operated simultaneously at multiple scales and indicate a complex economic structure in which social relationships are embedded (Feinman and Nicholas 2010; Hirth 2010).

Archaeologists have proposed several methods to identify market exchange in archaeological contexts. They pay attention to the physical evidence of the marketplace, the logical inference of market system to support the urban centre(s), the distributional scale in the primary units such as household and the relationship between regional production and distribution (Hirth 1998, 2009; Stark and Garraty 2010). Hirth's (1998: 453-454) 'contextual approach' has linked the marketing and the development of the market system to urban centres and extensive craft specialisation, which responded to the higher demands of urban provision (cf. Stark and Garraty 2010). The diversity of demands is stimulated by the heterogeneous groups and thus the variability in the products is able to meet the different expectations in the larger market and suits the more complex exchange mechanisms (Carr and Case 2005; Stark and Garraty 2010).

On the basis of Hirth's approach, Stark and Garraty (2010) combine the provenance information and the distribution pattern of goods at the regional level and underscore the importance of the diachronic assessment of the variability of commodities, changes in organisational and economic activities.

Returning to the context of EB I-II Aegean, certainly, there is no evidence of marketplaces and this thesis is not suggesting an implication for market exchange nor central redistribution. These approaches of exchange are generally discussed in the context of more complex societies. However, as more attention is devoted to EBA Aegean societies, there are aspects that are similar to supposedly 'more complex' societies: long-distances and an increasing movement of goods and increasing evidence of urbanisation in EB II. Thus, these characteristics allow us to legitimately ask these questions and recognise these useful concepts in the context of early societies. Such approaches to exchange are useful to evoke the discussions of the different forms of exchange in various scales (local, regional and interregional level) and mechanisms, the relationships between craft specialisation, the variability in products, urbanisation, demands and consumer choices, and the social relations within exchange network, all of which set up a theoretical basis for this thesis to discuss further in Chapter 6.

In the specific framework of archaeological studies on the Bronze Age Mediterranean societies, different models to explain the movement of materials and objects have been proposed, for instance, down-the-line exchange (Renfrew 1975) and gift exchange (Feldman 2006: 13-4; Kuhrt 1995; Renfrew 1972: 468-72). However, in our period of study, even though one might imagine a 'down-the-line' exchange, some artefacts such as obsidian, metal, and ceramics such as sauceboats and collared jars appear to be already involved in the long-distance exchange in the early period of the Early Bronze Age Aegean through different forms of maritime activity (e.g. Betancourt 2003; Broodbank 1993, 2000; Carter 2008; Day and Wilson 2016; Marthari 2008; McGeehan-Liritzis 1990; Nakou 1995; Whitelaw 2004). As suggested by the case of obsidian (cf. Carter 2008; Torrence 1986), there are different modes of procurement including direct access, specialist intermediaries ('middlemen') and redistribution by specific groups. Likewise, one might easily envisage the different manners to obtain ceramic products in such an early period. For example, there is evidence of the regional exchange of pottery in the Early Helladic Peloponnese (e.g. Attas *et al.* 1987; Burke 2017; Burke *et al.* 2017; Burke *et al.* 2018; Rutter 1993a). Therefore, it suggests there are various forms of multiple scales of exchange in the EBA Aegean which benefits the study of pottery exchange in this thesis.

Furthermore, the status and value of commodities are obtained through transfer and mobility in the context of exchange (Appadurai 1986). Regularised bartering and long-standing exchange contribute to the concept of value and the basis of equivalencies (Stark and Garraty 2010: 35; cf. Halperin 1994: 134-135; Polanyi 1957: 269). There are many choices involved in the exchange, in which the same types of goods have alternatives from different origins. For instance, there are various types of sauceboat which manufactured by several production centres (Wiencke 2000: 590). The sauceboats at Ayia Irini on Kea are imported from different production centres in eastern Attica and the Cyclades (Wilson 1988: 39, 42). Additionally, the recent study by Day and Wilson (2016) shows there are different production places manufacturing various types of transport jars. Therefore, the concept of the 'supply zone' (Renfrew 1975: 46) as Carter (2008) suggested is a relative term that requires us to conceptualise, qualify and manifest the exchange of ceramic products. Consequently, the proportion of imported pottery in the ceramic assemblage and the proportion of different ware types in the imported pottery repertoire have great potential to examine the ceramic exchange in this thesis.

More importantly, the value of objects is determined by their nature of inalienability to society (Miller 2008: 1123). Carter (2008) stresses the importance of noting the procurement of materials and objects being embedded in different contexts (cf. Bintliff 1977: 117-22, 538-43). As in the case of obsidian suggested by Carter (1998, 1999), it requires us to consider the different ways in which the variety of ceramic products have been moved, conceptualised/commoditised. It is possible to envisage the exchange of pottery in important social events or in more mundane everyday settings. One of the most obvious cases in the context-specific of this research is the different consumption assumptions towards sauceboats and transport jars (e.g. Day and Wilson 2002, 2004, 2016). In addition, the *in situ* deposition/destruction of pottery at Tsepi, Koropi and Nea Kephissia in Attica represents a remarkable accumulation of pottery and the ritual practice in which such significant consumption behaviours remain to be fully comprehended. As a consequence, the consideration of ceramic exchange requires us to consider not only the ceramics themselves but their context of exchange and consumption.

Moreover, it is suggested that exchange is operated through the different degree of social ties which reinforced affiliation and alliance between groups as well as social solidarity (Mauss 1990; Morris 1986). A range of Cycladic materials were flowing from the islands to numerous coastal communities in Attica, Euboea, southern Argolid, Boeotia and Crete in late EB I and during EB II (e.g. Day *et al*. 1998; Karantzali 2008; Kossyva 2009; Kouka 2008; Mylonas 1959; Sampson 1988; Tankosić 2017; Tzavella-Evjen 1985; Wilson *et al*. 2008), including a significant quantity of the obsidian and other artefacts moving around the Aegean through longboats between the Cycladic 'trader sites' (Broodbank 2000; Carter 2008). Such a prevailing mode of consumption shows well-connected communities between the mainland, Crete and the Cyclades. Carter (2008: 235) suggests the further redistribution of obsidian from major sites to minor ones through down-the-line exchange or local networks of exchange formed by kinship or trade-partnership. However, there are idiosyncratic patterns of consumption through engaging in different sets of exchange networks in relation to other communities to forge the regional identity in the broader Aegean context (e.g. Day *et al*. 1998; Carter 2004). As a result, the asymmetric demands, choices and knowledge amongst the participants in exchange create a space for specific human agents to obtain social prestige or political benefits (A. Sherratt 1993: 4; S. Sherratt 2010: 88, 96) which Appadurai (1986) terms as the 'regimes of value'. Broodbank (1989, 1993, 2000) argued some of the Cycladic traders have restricted access to certain prestige goods for the purpose of power via manipulation of access to the maritime voyage in the interregional communication network.

In summary, it shows that there are different ways for accessing the different types of products and different patterns of consumption. The various wares in the ceramic assemblage represent the 'social and cultural logic of the desire for them and the social, economic, and political roles that their consumption played' (Dietler 2010: 227). Keeping these different case studies and explanatory frameworks in mind, this research intends to delineate the consumption, exchange of pottery in the western Attic communities in the Early Bronze Age Aegean.

2.6 Summary

To summarise Chapter 2, the social embeddedness of technology is explored through the investigation of different aspects of material culture. The three interconnected perspectives – production, consumption and exchange – allow the manifestation of social influences on the technology in production, how and what goods are being exchanged and used in the different contexts. As Renfrew (1972, 1975) argued, the organised and intensified interregional exchange is one of the major factors that contribute to social development and ultimately the emergence of civilisations. The picture of EB II is clearly complex, such as the movement of goods with increasing scale, production and organisation of production is changing in tandem with a change in specialisation, and various goods being produced are imitating metal and show the sophistication of demand and social role of objects which pose different requirement on the production system and in particular on technology. The approaches presented in this chapter set the theoretical ground to examine the different aspects of the complex picture of EBA Aegean through ceramic studies and specifically the different ceramic assemblage in the EH I and EH II phases of Kontopigado, which raises a whole new range of perspectives with its local production of radically new, skeuomorphic pottery forms at the start of EH II, in a settlement to so clearly linked to the Cycladic islands and beyond.

Chapter 3 Early Bronze Age Attica

In order to explore technological and social transformation and their manifestation in ceramic production, this chapter is divided into three main parts. The first part outlines the issue of chronology, together with key changes in the environment and landscape of human occupation in Attica during the late EH I to early EH II period. The second focuses on diachronic change in ceramics related to these phases in Attica. Finally, the last part presents aspects of the ceramic assemblage at Kontopigado, especially its major stylistic and morphological changes.

3.1 Chronology

The EB I period extends back into the late fourth millennium BC and the EB II starts in the first half of the third millennium BC. According to Manning (1995), for most of the Aegean, two phases of EB I have been identified. On the mainland – which refers to Early Helladic (EH) – the important comparative assemblages are from Eutresis and Lithares in Boeotia and Perachora in northern Corinthia.

The knowledge of the two periodisations of EB I was mainly based on the Cyclades. Renfrew (1972: 152-3) designated the Grotto-Pelos culture to the early phase and the Kampos Group to the late phase in the EC I Cyclades. Broodbank (2000) remarks on the different patterns of living between two phases and the commencement of long-range trade from the late EC I Kampos group. Subsequently, the characteristic Kampos Group material culture provides a chronological relationship for analogies in other areas. Nevertheless, due to the issues of dating towards the end of the Neolithic to the beginning of the EBA, as well as the lack of well-defined stratigraphy alongside the regional variation of ceramic sequences in the mainland, the chronology for EH I Attica is even more problematic.

The EB II period, designated as the Keros-Syros culture by Renfrew (1972: 170), represents a new phenomenon from the preceding phase. The tripartite scheme of EH II proposed by Maran (1998) has been overviewed and further developed by many archaeologists with their associated ceramic sequences and radiocarbon dates at different sites. Wiencke's (2000) fourfold division of EH II Lerna (Lerna IIIA-D) is one of the most prominent comparisons for chronological reference. The phases A and B belong to the earlier phase of EH II while the phases C and D correspond to the advanced EH II and late EH II respectively (Wiencke 2000).

In the Argolid, the recent study of the Talioti pottery by Burke *et al*. (2020) revisits the chronological references of the Talioti 'phase' in the EH I period (Maran 1998: 8f; Pullen 1995: 41) and subsequently argues that the Talioti pottery belongs to the products of a single production area rather than a chronological terminology. This case suggests that it requires us to take the context and provenance of pottery into account when it comes to the chronological reference framework.

3.1.1 The issue of absolute chronology

The absolute chronology of the Early Bronze Age is problematic and the dates in different regions of Greece vary. The main issue is caused by the large gap in the last stage of Neolithic period. The uncertain length of the Final Neolithic (FN) means about 700 to 1000 years (ca. 4000-3300/3000 cal. BC) in the transition from FN to EBA in Greece (Maniatis *et al*. 2014; Manning 1995: 168). Consequently, it leaves a question at the beginning of EBA which falls between 3300 and 3000 cal. BC (Poulaki-Pantermali *et al*. 2004). This 300 years span has been expressed by the plateau in the calibration curve that make it problematic to distinguish events dating close to 3300 BC from events close to 3000 BC (Boyadziev 1995; Johnson 1999; Maniatis and Papadopoulos 2011; Maniatis *et al*. 2014). Furthermore, the beginning of EBA is not very fixed due to the little evidence of continuous stratigraphy and it varies according to different settlement types and locations. The recent Balkans 4000 Project focused on the transition from FN to EBA, giving a new label of 'FN-EB/EH I' through the integration of 25 radiocarbon dates from different sites in Greece, placing the beginning of EBA around 3300/3000 cal BC (Tsirtsoni 2016). Maniatis *et al*. (2014) suggest that the fully developed EB I period dates between 3350 and 2600 cal. BC which is further subdivided into the early and late phase. Such subdivision accords well with the associated material culture. Maniatis *et al*. (2014) believe that the earlier phase of EB I is closer to 3100 BC, begins after around 3200 cal. BC.

On the mainland, the radiocarbon dates of Eutresis III-IV and Tsoungiza suggest the EH I begins after 3300 BC (Manning 1995: 175, 185f, 191f; Pullen 2011: 15-6). According to Manning (1995: 171-3; Rutter 1993b: 756, table 2), EH II early (Lerna IIIA and IIIB) is assigned to ca. 2650-2450/2350 BC and EH II late (Lerna IIIC/D) to ca. 2450/2350-2250/2150 BC. Three dates from Tsoungiza propose the EH II Developed which is equivalent to late Lerna IIIB or early Lerna IIIC, dated to 2566-2364 BC (Pullen 2011: 15-6). Furthermore, the five dates from Kouphovouno suggest three partitions of this period: EH II Early (3126-2778 BC), EH II Middle (2830-2566 BC) and lastly, EH II Late (2586-2376 BC) (Cavanagh *et al*. 2016) (see Figure 3.1).

This Early Helladic absolute chronology is supported by the Cycladic chronology. Renfrew *et al*. (2011) include Markiani Phase II to the late EC I/II period (Kampos group) and Cavanagh *et al*. (2016) have equated the Zas III with Eutresis and Tsoungiza (see Figure 3.1). Therefore, Cavanagh *et al*. (2016) suggest the late EH I/II in the range of 3238-2905 BC. However, it consequently indicates an overlap with early EH II. The developed EC II phase (the Keros-Syros culture) consists of Dhaskalio A and Markiani III (2897-2635 BC) which are coherent with Lerna III B-C (Cavanagh *et al*. 2016). Wilson (2013: 413-4) has recently refined the early phase of Ayia Irini Period II to match with Lerna late IIIA-IIIB and the Ayia Irini late Period II to Lerna IIIC.

Cultural horizon/period	Sites included	Suggested Lerna equivalent	95% p range for start of phase
EH1	Eutresis Tsoungiza		3579–2935 BC
EC1/Lakkoudhes/Zas III	Zas		4449–2931 BC
Kampos Group/EC1–2	Markiani Phase II	EH1 late–EH2 Early	3238–2905 BC
EH2 Early	Kouphovouno	Lerna IIIA–mid B	3126–2778 BC
Keros–Syros, Ayia Irini II, Markiani III	Dhaskalio Phase A	Lerna IIIB late–IIIC	2897–2635 BC
EH2 Middle	Kouphovouno Tsoungiza	Lerna IIIB late–IIIC	2830–2566 BC
Kastri/EC2 late–EC3/ Ayia Irini III	Dhaskalio Phase B	Lerna III C late–IIID	2634–2481 BC
EH2 Late	Lerna, Geraki	Lerna IIIC late–IIID	2586–2376 BC

Figure 3.1: Comparison of the EH/EC chronology (Cavanagh *et al*. 2016: 46, table 5).

Regarding Attica, Tsirtsoni (2020) has redefined the chronology based on new evidence from stratigraphy, material culture and radiocarbon dates at the Kitsos Cave, Leontari, Marathon, Merenda, Schisto and Thorikos. The settlement at Merenda suggests the site is occupied during the transitional FN-EH I period and continued into the EH I period (Kakavogianni *et al*. 2016) (see Table 3.1). Subterranean chamber 5 at Merenda may provide the dates for the transitional period between ca. 3500-3340 cal BC and this transitional 'FN-EH I' phase is placed between the FN Attica-Kephala Culture phase and the proper EH I period. Two chambers at the site (2 and 7) may belong to a later phase, corresponding to EH I, dated between ca. 3360-3100 cal BC and ca. 3110-2910 cal BC respectively (Kakavogianni *et al*. 2016; Tsirtsoni 2020). In addition, the radiocarbon dates from 12 human bones in the cemeteries at Tsepi, Marathon provide ca. 3600-3000 cal BC date for the EH I phase based on the pottery typology (Prevedorou 2020). However, these results remain controversial due to the lack of well-defined contexts and satisfactory calibrated dates, and thus, these given dates are uncertain for extending to the whole Attica.

Date (ca.)	Central and southern Greece	Cycladic islands	Crete
Transitional FN/EB I 3500 – 3300 BC	Tsepi cemetery (early) Merenda (Transitional FN-EH I)	Final Neolithic Attica-Kephala Culture	FN III
Early Bronze (EB) I 3300/3000 – 2650 BC	Early Helladic (EH) I Eutresis Group III–V Perachora Vouliagmeni Talioti-Kephalari Tsepi cemetery (late) Merenda (EH I)	Early Cycladic (EC) I early Grotta-Pelos Culture	FN IV
		Early Cycladic (EC) I late Kampos Group	EM I
Early Bronze (EB) II early 2650 – 2450/2350 BC	Early Helladic (EH) II early Lerna IIIA–B Tsoungiza EH II Initial & Developed	Early Cycladic (EC) II early Keros-Syros Culture Ayia Irini Period II	EM IIA
Early Bronze (EB) II middle 2550/2500 BC	Lerna IIIC	Ayia Irini Period II	
Early Bronze (EB) II late 2450/2350 – 2150 BC	Early Helladic (EH) II late Lerna IIID Lefkandi I	Early Cycladic (EC) II late Kastri Group Ayia Irini Period III	EM IIB

Table 3.1: The Aegean EB relative and absolute chronology (based on Maran 1998: Taf. 80-81; Pullen 2011; Tsirtsoni 2020; Wilson 2007, 2013, modified by author).

3.1.2 The Early Helladic I period (c. 3300/3000-2650 BC)

The relative chronology of Early Helladic I has been designated to the Eutresis culture in central and southern Greece (Caskey and Caskey 1960; Goldman 1931), Lake Vouliagmeni, Perachora in northern Corinthia (Fossey 1969) and Lithares in Boeotia (Tzavella-Evjen 1985) on the basis of their ceramic typology from stratigraphically secured deposits. Additionally, the present knowledge of the EH I ceramic repertoire also comes from Tsoungiza and materials in the Talioti region in the Argolid (Pullen 2011; Burke 2017; Burke *et al.* 2020). Besides these, the sparse materials from Tsepi and Merenda in Attica are considered in this thesis (Caskey and Caskey 1960; Goldman 1931; Kakavogianni *et al.* 2009a; Pantelidou-Gofa 2005, 2008).

The pottery repertoire of EH I, equivalent to the Eutresis Group III to V, is characterised by red-brown to grey-black slipped and burnished bowls with incurving or carinated rim and mottled surfaces, plain ware – sometimes burnished – in various shapes, and coarse micaceous bowls or basins with fragments of ring-bases and pedestals (Caskey and Caskey 1960: 144-8). Renfrew (1972: 163) has suggested that the red slipped and burnished ware is possibly developed from the heavy burnished pottery in the Final Neolithic period.

The recently published pottery studies from Tsoungiza provide an important scenario for the end of the EH I period and the transitional EH I-II period (Pullen 2011). The appearance of fruitstands, shallow to hemispherical bowls on a flat base or pedestal, and some with incised shallow slashes on the lip, as well as large basins with vertical strap handles, jars with handles on the shoulder, askoi and cooking pots with plastic ridges as well as the varying surface treatments (smoothing, polishing and burnishing) are the main characteristics of the EH I period (Pullen 2011: 59-95) (Figure 3.2). Ceramic materials at Talioti and Kephalari Magoula in the Argolid present comparable fabrics and surface treatments to Tsoungiza in the late EH I period and the everted-rimmed, incised or impressed bowls and dishes are the dominant shapes along with collared-necked jar with handle on the shoulder (Dousougli 1987; Johnson 1999: 331; Pullen 2011: 57). In Lerna, there are only 20 sherds that appear to belong to EH I. The overall representation is similar to Tsoungiza with the composition of red to brown polished or burnished bowls and fruitstands with everted rim (Wiencke 2000: 632).

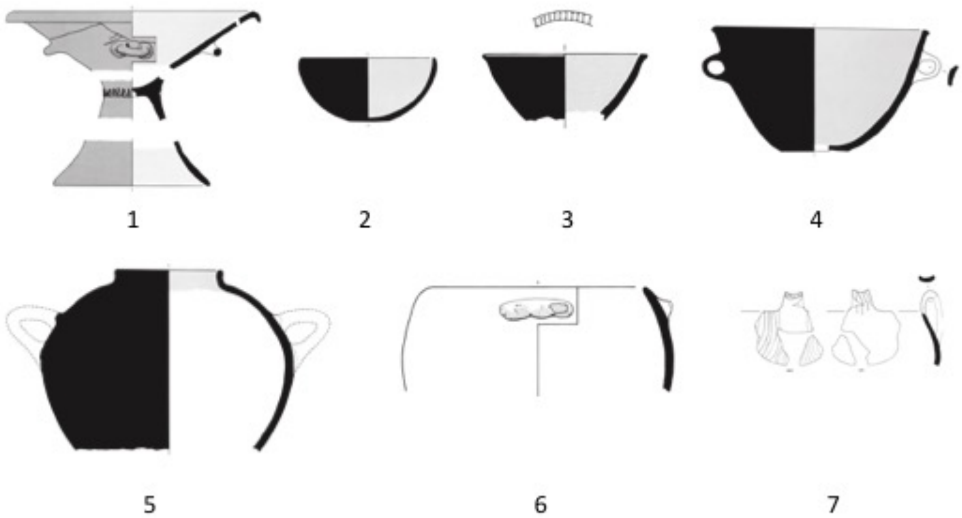


Figure 3.2: EH I vessel forms at Tsoungiza. Top row: 1. Fruitstand; 2. Shallow to hemispherical bowl; 3. Bowl with slashes on flat spreading lip; 4. Basin with two vertical strap handles; 5. Collared jar; 6. Incurving cooking pot; 7. Askos (Pullen 2011: 66, 75, fig. 3.7-8) (for shape, not-to-scale).

Moreover, the main classification of pottery from Merenda in Attica comprises brown to black burnished bowls, coarse yellow to brown vessels which are equivalent to Wilson's (1999: 13-4) category of pan, and such pan shape with perforated feature below the rim, so-called 'cheese-pots' (Kakavogianni *et al*. 2016) (Figure 3.3). The perforated pan is the characteristic shape in the Final Neolithic throughout the Aegean and has been continued to be considerably present in many sites during the EH I period. However, the function of these pots has not yet been clarified. Additionally, the EH I cemetery at Tsepi provides the fundamental repertoire consisting of jars and pithoid jars, bowls, basins, and fruitstands, from plain to heavy burnished (Pomonis 2020). The red polished wares with flat base are the main type at Palaia Kokkinia, and there are two examples from Ayios Kosmas and Askitario in Attica (Wiencke 2000: 632).

Figure 3.3: EH I pan (or 'cheese-pot') from Merenda in Attica (Kakavogianni *et al*. 2016: fig.13) (for shape, not-to-scale).

The comparable Early Cycladic I ceramic sequence is divided into the early phase (Grotto-Pelos culture) and later phase (the Kampos Group) (Renfrew 1972: 152-3, 373). The characteristic Kampos Group includes pear-shaped bottles and its variant of miniature bottles and aryballos with incised and stamped decoration, frying pans with incised spirals and spherical pyxides sometimes with conical shapes (Stampolidis and Sotirakopoulou 2011; Zapheiropoulou 1984: 31) (Figure 3.4). Such analogies with the Kampos Group are found at Palaia Kokkinia, Ayios Kosmas and Tsepi in Attica, suggesting dates in the late phase of EH I (Mylonas 1959; Pantelidou-Gofa 2005; Warren and Hankey 1989: 33f).

Figure 3.4: Photographs of spherical pyxis with incised decoration from grave 84 at Pyrgos on Paros displayed at Museum of Cycladic Art, Athens (photographed by the author).

In this thesis, two main deposits excavated from the Early Helladic settlement at Kontopigado in Alimos yielded a considerable of pottery. The first deposit, from the fill of a winter torrent, presents a large quantity of red to brown burnished or polished shallow bowls and bowls as the main characteristics of the EH I period, together with the incision on the lip of bowls, red to brown coarse ware and other shapes comparable to many EH I ceramic repertoire. Supported also by the presence of incised and stamped pottery and other finds which have elements of a Cycladic character of the Kampos Group phase, this relatively homogeneous ceramic fill assemblage can be dated to the late EH I period.

3.1.3 The Early Helladic II period (c. 2650-2250/2150 BC)

The typical Early Helladic II pottery repertoire is well-defined based on the Lerna III ceramic sequences (Wiencke 2000). There are common classes in general: the light-painted polished fine ware, dark painted urfirnis dark-painted fine ware and the coarse storage and cooking vessels (Wiencke 2000). Furthermore, Lerna III can be divided into four main phases (A-D) with further subdivisions (Wiencke 2000: table 3). Phases A and B are characterised by the presence of dark-painted vessels with various shapes (pedestaled sauceboat, saucer, jar and basin), polished or burnished light-painted saucers, cooking pots and pithoi, while Phase B displays a decrease of dark-painted saucers and basins, accompanied with the appearance of unpainted miniature saucers (Wiencke 2000). The later phases of Lerna IIIC and D are distinguished by dark-painted, light-painted and unpainted vessels in existing shapes, together with the new shapes of flasks and collared bowls (Wiencke 2000).

Apart from the late EH I phase, Tsoungiza allows division of the earlier phase of EH II in the northeast Peloponnese. Pullen (2011) further developed the early EH II to EH II Initial and EH II Developed phases. The former phase is equivalent to Lerna IIIA and the latter is equivalent to the last stage of Lerna IIIA to IIIB/IIIC early (Pullen 2011: 52-3). To conclude, both the EH II Initial and Developed periods at Tsoungiza broadly correspond to EH IIA or EH II early in mainland terms.

In the Cycladic terms, the site of Ayia Irini, Kea provides several links in its ceramic repertoire consisting of sauceboats, dishes, deep saucers, collared jars with a two-stage neck profile and transport jars with a flaring collar neck and broad strap handles, which are commonly found in the earlier Period II (Wilson 2013: 399-401) (Figure 3.5).

Figure 3.5: Pottery from early Period II deposits at Ayia Irini on Kea. Top row: a jar with two-stage neck (II-197). Bottom row: strap handles (II-229, II-231) from transport jars (Wilson 1999: pls. 9, 50, 51, 53).

Returning to Kontopigado, the second deposit from the rectangular buildings yields many sauceboats, comprising sauceboat type 1 – that marks the beginning of the Lerna IIIA late to IIIB – and sauceboat type 2 – which is common in Lerna IIIC (yet few examples also presented in phases A and B) (Wiencke 2000: 585-7, fig. II:92) (Figure 3.6). Both sauceboat types 1 and 2 are comparable to the sauceboats in the EHII Developed at Tsoungiza (Pullen 2011: 348-51, fig.5.70). The sauceboats with high-rising spout and pointed ears of type 3 and the shorter spout of type 4 belong to Lerna IIIC and IIID (Wiencke 2000: 587, fig. II:92) (Figure 3.6) and both types appear together at Kontopigado. However, sauceboats of Kontopigado contains more many variants and have no apparent development in shapes. Additionally, although there is similar body profile and high-rising spout, there is a notable absence of the vertical handles seen in Lerna type 3. Consequently, it seems a variety of sauceboat shapes are the regional characteristics of local production. In the meantime, several comparable vessel forms of EH II Initial and Developed periods at Tsoungiza are well-represented at Kontopigado including shallows bowls, T-rim bowls, jars with flaring neck and evenly smoothed jars with rim thickened out to triangle (Pullen 2011: fig.4.17: Forms

5, 6, 10, 15-17) (Figure 3.7). At Kontopigado, apart from the typical shapes of sauceboats from Lerna, many close parallels of sauceboats with low pedestals or ring-bases are found at Ayia Irini on Kea (Wilson 1999: 72-5, pl.67: II-642-3, II-646, II-649-50) (Figure 3.8).

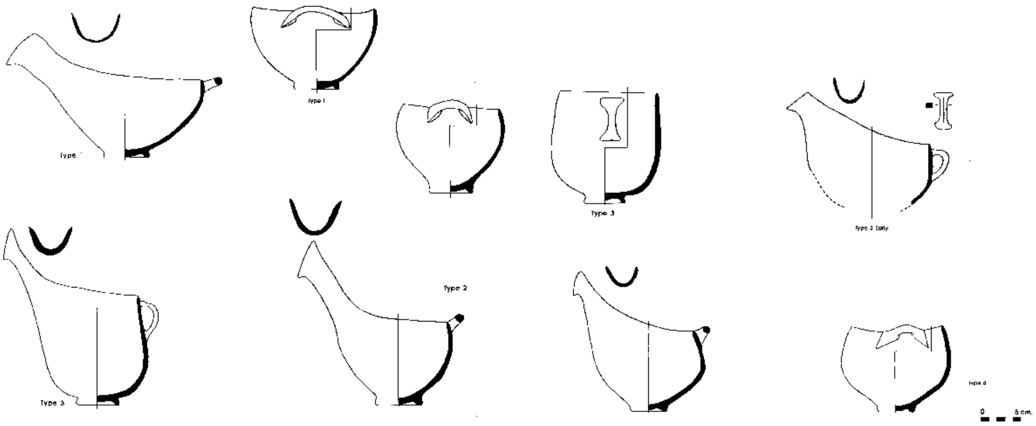


Figure 3.6: Sauceboat type 1-4 from Lerna (Wiencke 2000: 586, fig. II:92).

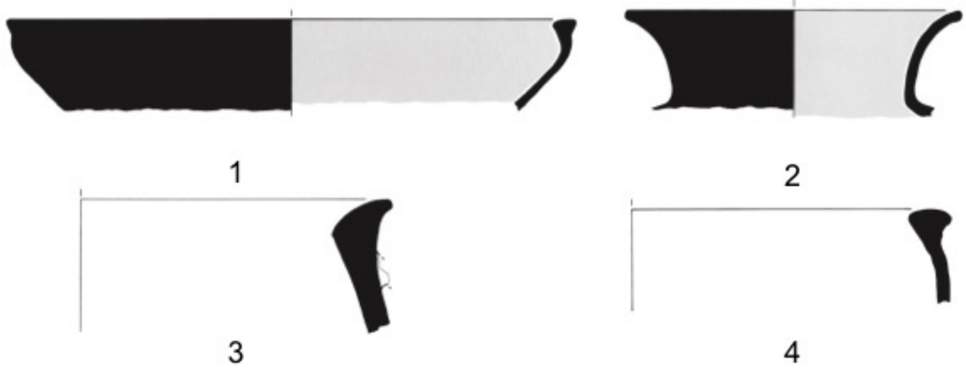


Figure 3.7: 1. T-rim bowl; 2. Jar with flaring neck; 3-4. Jar with thickened rim (Pullen 2011: 217-8, 384, 407, figs. 4.33:275, 5.79: 393, 5.98: 497-8) (for shape, not-to-scale).

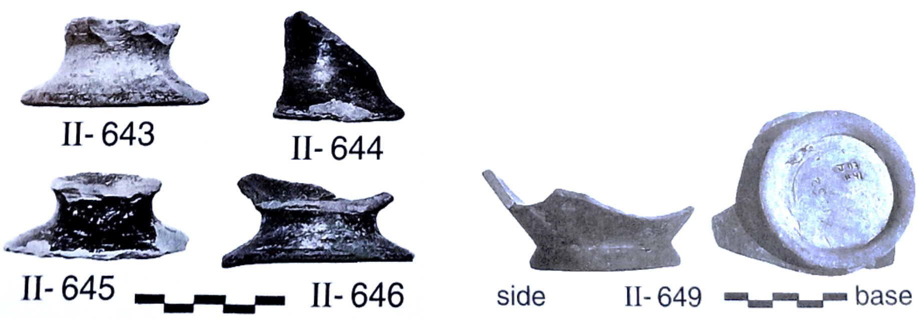


Figure 3.8: Sauceboats from Ayia Irini on Kea (Wilson 1999: 72-5, pl.67: II-643-6, II-649).

As a result, to put the house deposits of Kontopigado in the context of Greek EB/EH chronology on the basis of the pottery typology, the considerable ceramic linkages – predominantly the characteristic sauceboat types and the common presence of the saucer and basins – between Tsoungiza, Lerna and Ayia Irini and Kontopigado suggest that pottery from the houses at Kontopigado is broadly contemporary with the Lerna IIIA and IIIB phases, in parallel with both EH II Initial and EH II Developed periods at Tsoungiza, equivalent of Ayia Irini Period II in the west Cyclades. Such ceramic synchronisms in shapes and stylistic features with the mainland Helladic and the Cyclades allow us to secure the pottery assemblage from the EH II building remains at Kontopigado in EH II early.

3.1.4 Summary

By comparison with well-defined ceramic sequences, the Kontopigado EBA contexts studied here are dated to the late EH I and early EH II period respectively.

In the base of the EH I deposits, the fragmentary nature of potsherds and its mixed with other small finds comprise fills of winter torrents associated with the late EH I phase.

Although there are also large fills of the EH II period at Kontopigado, the pottery of this phase in the present study is mainly from a domestic context of the EH II period. It must be stressed that the two contexts here distinguished are found in a stratigraphic relationship one with another. As a consequence, the rich ceramic contents of Kontopigado fills are highly significant. It provides valuable evidence for the diachronic ceramic study from the late EH I period to the early EH II period. While there is a strong continuity of some ceramic styles, it shows a radical ceramic transition in shapes and stylistic features remarking the new beginning of ceramic development in the early EH II.

3.2 General overview of the Early Helladic culture

The earliest phase of the Early Helladic period, EH I, has been traditionally considered as the continuation of the Final Neolithic based on the evidence of settlement pattern and material culture (Renfrew 1972: 107; Cherry 1986: 31). The growth in the number of sites and the expansion of settlement size during FN-EH I are evident in the southern Argolid, Nemea Valley, central Laconia, Methana peninsula and coastal Messenia and Boeotia, suggesting an increase in population (Cherry *et al.* 2013: 336; Pullen 1985, 2003, 2008, 2011; Weiberg and Finné 2013). The increasing exploitation of the coastal regions and low hills may indicate a shifting pattern of land use from pastoralism to agriculture and the importance of seafaring activities (Pullen 2008: 22). Evidence of metallurgical activities, obsidian working and pottery production is attested sporadically. Tomb finds include frying pans, pyxides and marble figurines with prominent Cycladic features, particularly the Kampos Group, are considerably presented at coastal sites in Attica (e.g. Ayios Kosmas: Mylonas 1959), southern Argolid (e.g. Delpriza: Kossyva 2009) and Euboea (e.g. Karystos: Mavridis and Tanković 2016), indicating the importance of maritime activities at these sites.

In the second phase of the Early Bronze Age (the mid-3rd millennium BC), new settlements continue to emerge on hills adjacent to the water resources, suggesting the further importance of agricultural activities. Furthermore, together with the existing settlements, these display a completely new layout with the construction of building complexes. Many settlements are planned with clusters of building structures, sometimes with courtyards for public use, the arrangement of stone-paved roads and watercourses, houses with special functions (e.g. workshops) and some major sites have early traces of fortification walls. Such evidence of town planning suggests a sign of urbanisation and demographic expansion (Pullen 2010: 28). Moreover, the differentiation of settlement size, in which large centres are surrounded by several smaller subsidiary sites, is attested in the Argolid, in Boeotia and more recently through important evidence in Attica. This, together with the appearance of seals has been argued by some to reflect emerging differences in wealth and even a redistribution system within 'the larger society' in each topographically distinct region, with the beginning of settlement hierarchy associated with the complex social organisation (Driessen 2001; Forsén 1996; Jameson *et al*. 1994; Konsola 1984, 1986; Pullen 2003: 29-35, 2011; Runnels *et al*. 1995: 141-2; van Andel and Runnels 1988; Weiberg 2007, 2017: 482; Wiencke 1989: 497-9, 507). In addition, Pullen (1985, 2003: 22; 2010: 22-3, 2011: 904) considers the number of sites, which falls into a slow-down in growth and the abandonment of some sites, may indicate the shift towards nucleation and consolidation of settlements (see also Weiberg and Finné 2013). Later in EB II, the emergence of fortification walls in some locations, mostly in coastal settlements, at Lerna in the Argolid, Manika in Euboea, Thebes in Boeotia and Kolona on Aegina may suggest an increasing social tension (Pullen 2010: 31).

In ceramic terms, many publications have detailed the EH I pottery repertoire including shallow to hemispherical bowls, fruitstands or pedestalled bowls, basins, jars, jugs, cooking pots and pithoi (see Figure 3.2). Most of bowls and fruitstands are burnished with or without red slips on the surfaces, and other shapes in relatively coarser fabrics with burnished surfaces and in addition to plain coarse ware (see Burke 2017; Caskey and Caskey 1960; Goldman 1931; Pullen 2011; Tzavella-Evjen 1985). The characteristic fruitstands (a wide spreading bowl on a cylindrical stand) or pedestalled bowls, mostly burnished with red slips on surfaces, or alternatively with incised, impressed or plastic decorations, are common in the region of Talioti Valley and Argive Plain and similar shapes are found across the EB I Aegean (Pullen 2011: 71; see also Day and Wilson 2004: 55; Karantzali 1996: 114-6, fig. 22e, 73; Wilson and Day 2000: 50-56; Zapheiropoulou 1984: fig. 3c for the popularity of chalices and the pedestaled bowls in the EC I Kampos Group and EM I Crete). It is suggested that fruitstands as well as the similar pedestalled bowls may be associated with a display of food and communal sharing in the EH I period (Pullen 2011: 897). The small bowls may be used as individual serving vessels that contain food taken from fruitstands (Pullen 2011: 897).

Alongside these vessels, there are common frying pans with stamped or incised decorative motifs, and askoi with incised curving grooves or lines on bodies, bottles and pyxides with incised or stamped spirals and circles, all elements of the EC I Kampos Group in the Cyclades (Figure 3.4). The different patterns and the barred handles of frying pans are present both in the mainland (e.g. Tsoungiza and Asea) and in the Cyclades, but are rare in Attica, reflecting the different patterns of contact between Attica and the Cyclades (Pullen 2011: 897).

Some imports have been identified by a characteristic 'gold mica' volcanic fabric in Aegina (c.f. Gauss and Kiriatzi 2011). The millstones with this volcanic material are widely used in the northeastern Peloponnese and Saronic Gulf regions (Runnels 1985: 36; Pullen 2011: 88). Vessels with gold mica fabric such as shallow bowls, bowls, deep bowls, incurving bowls and large jars are well-represented in some coastal EH I mainland assemblages especially those bordering the Saronic Gulf (see Burke 2017: 234-7; Pullen 1995:10-12, nos. 161, 165, 2011: 88; see Gauss and Kiriatzi 2011 for pottery assemblages in Aegina). This highlights the significant production centre in Aegina within the regional network of Saronic Gulf.

A range of radical changes occurs in the stylistic and technological nature of pottery assemblages from EH I to EH II. Most prominently, this is marked by the appearance of very fine tablewares with metallic surface finishes. The pouring vessel, sauceboat, is the most prominent novel vessel form in the EH II ceramic assemblages and has been found not only in the mainland but also in the Cyclades, the northern Aegean and Crete. These new shapes of very fine tableware for special use such as communal drinking practices and structured hosting, are exchanged over large distances and some have been argued to be special products from their source areas (Burke *et al*. 2017, 2018 in Corinth; other production areas such as Melos see Wilson 1999: 82 and Day and Wilson

2016) and argued to have been socially valuable. For example, the presence of ladles for serving the contents in large bowls or basins has been widely found in Argolid-Corinthia in the early phase of EH II (Wiencke 2000: 573-4) (Figure 3.9). The studies by Attas (1982: 39), Pullen (1985: 341) and recently by Burke (2017) show sauceboats and small bowls, yellow-blue mottled wares are produced by specialist workshops - as 'specialist' suppliers and thus provide a picture for the movement of vessels in the neighbouring areas with an increased long-distance contact in the EH II. The Corinthian sauceboats and ladles found at Koropi attest to the long-distance contact between the mainland and Attica (Burke 2017: 168; Burke *et al*. 2017: 111).

Figure 3.9: EH II vessels from Midea in the Argolid. 1. Pedestal base of a sauceboat; 2. Horizontal handle of an askos or jug; 3. Ladle (Alram-Stern 2018: 165, 177, figs. 3, 18) (for shape, not-to-scale).

Equally important, collared jars, which are the first amphora in the Aegean for transporting specialised products such as wine, join the pouring vessels such as sauceboats in the common EH II drinking set (Day and Wilson 2016: 23, fig. 3) (Figure 3.5). The increase in the variety in shapes and the introduction of new shapes leads to the increased diversification in the ceramic assemblage, reflecting the changes in consumption (Pullen 2011: 199). The appearance of more specialised shapes (e.g. sauceboat for pouring, ladle for scooping) accompanied with increased quantity of small bowls reflect more emphasis on the sharing of food and drinking consumption and new patterns of consumption in commensality (Pullen 2011: 254; Wiencke 1989: 503). It is suggested that the replacement of fruitstands by large basins which have been made in the fine tableware fabrics may be associated with new practice and context of drinking (Pullen 2011: 199; Wiencke 1989: 503). Likewise, in Crete, Day and Wilson (2004) propose that the change in practice, from large communal vessel forms in EM I to more individual vessels in EM II indicates changes in practice which reflect increased social competition and commensal activities which facilitate the negotiation of identity. In addition, the increased elaborate decoration in early EM IIA tableware (e.g. stemmed and footed goblets, dark-on-light jugs, and spouted basins) is related to object display and viewer perspectives (Day and Wilson 2004: 54-6).

The new, very fine, hard fabrics and yellow mottled or black urfirnis coatings produce metallic surfaces on these specialised vessels, suggesting the imitation of metals, so-called 'skeuomorphism' in archaeological interpretation. Such imitation of metal prototypes involved radical changes in ceramic technology in the production processes, as seen in vessels produced in Corinth (Burke *et al.* 2017, 2018), consumed at Midea (Alram-Stern 2018) through to Crete (Day and Wilson 2004), showing an Aegean-wide phenomenon, relating to the increasing importance of metallurgy and major social and technological innovations in the EB/EH II period.

Moreover, it is suggested that the finds of seals and sealings are indicative of changes in sociopolitical organisation and the perception of ownership (e.g. Pullen 2003). Wiencke (1969, 2011) considers over 70 sealings on boxes, jars and baskets at Lerna as personal seals for labelling, relating to storage of goods brought from the participants of the feast (see also Peperaki 2007: 97). Pullen (1994) proposed that a lead seal from Tsoungiza may indicate a re-introduction of sealing from the Near East for more elaborate uses during EH II. Moreover, a large cache of sealings in a small Early Helladic house at Petri near Nemea suggests a system of elaborate storage and recording (Kostoula 2000). Most recently, Weingarten *et al.* (2011) re-emphasised the use of the seal through the sealing impressions in the storage room from the fortified EH II inland settlement at Geraki in Laconia. As a result, the current evidence suggests that the seals and sealings are associated with the storage, recording and labelling, perhaps in a system of redistribution, or at least the control of commodities and have a strong association with communal consumption.

Overall, this period shows economic prosperity which has been argued to be resultant from the growth of agricultural surplus, the creation of the new forms of food and beverages, the development of craftsmanship and craft specialisation, together with the expansion of trade and exchange (Renfrew 1972: 339; Sherratt 1993: 14-24). All the abovementioned changes have a direct impact on the development of social organisation, pointing to the emergence of wealth and hierarchy, an increased emphasis on display, redistribution and the resultant economic and social stresses that may contribute to the commencement of warfare and hostility.

3.2.1 Landscapes of Attica and neighbouring areas in the EH I - EH II period

Due to chronological issues, the FN and the earliest phase of EH I are conventionally bracketed together; indeed the occupation of many sites in Attica frequently show continuity between the two periods. A large number of FN sites have been recognised in Attica, suggesting an intense habitation of the Attic landscape from the Final Neolithic onwards. Recent excavations and surface surveys in Attica demonstrate it was inhabited by small groups scattered sporadically in flat areas and from the Final Neolithic onwards, small settlements are situated on hills, sometimes with evidence of enclosures as well as the intensified occupation of caves (Andrikou 2020; Palaiologos and Stefanopoulou 2020). It appears that the proximity to streams and torrents and the dense vegetation hinterland is preferred for inhabited settlements (Palaiologos and Stefanopoulou 2020; Treuil *et al*. 1996: 136). Larger settlements begin to emerge in the EH period (Palaiologos and Stefanopoulou 2020). The site of Zagani is particularly important with an internally organised settlement with a fortification wall, situated on the flat top of a hill overlooking the access to the Mesogeia plain. In contrast to this hilltop settlement, that of EH II is situated on the lower part of the same hill (Andrikou 2020: 5). The FN/EH defensive wall at Zagani was strengthened in EH II, perhaps suggesting increased social tension and control over the inland regions (Andrikou 2020: 5). Similarly, an unexcavated settlement on Etosi hill overlooks the route to Athens (Andrikou 2020: 5; Apostolopoulou and Kakavogianni 2002: 19-20). Together with several FN sites (e.g. Marathon, Merenda, Zagani), there are many new sites that appear in EH I and continue to be occupied until the last stage of EH II. These new settlements were founded on the plains of Mesogeia and Marathon, indicating a shift in land exploitation for agriculture and animal husbandry (Andrikou 2020). In addition, there appears to be a differentiation of settlement size which distinguishes the new major settlements (e.g. Koropi, Magoula, Spata, Gerakas) from minor ones (e.g. Lambrika and Merenda) (Andrikou 2020). In addition, there are coastal settlements situated on promontories and hilltops close to the sea, indicating an economic orientation to the maritime activities during the FN-EH period. One might even envisage that sites slightly inland represented the exploitation of a hinterland, perhaps as subsidiary sites in supporting roles to the coastal settlements, which participated in the interaction networks of the Saronic Gulf, the passages to Euboea and northern Cyclades and the wider Aegean. For example, obsidian and other associated objects of Cycladic style found at coastal and inland sites may suggest direct or indirect contact with the islands, demonstrating the developing interrelationship between inland and coastal sites.

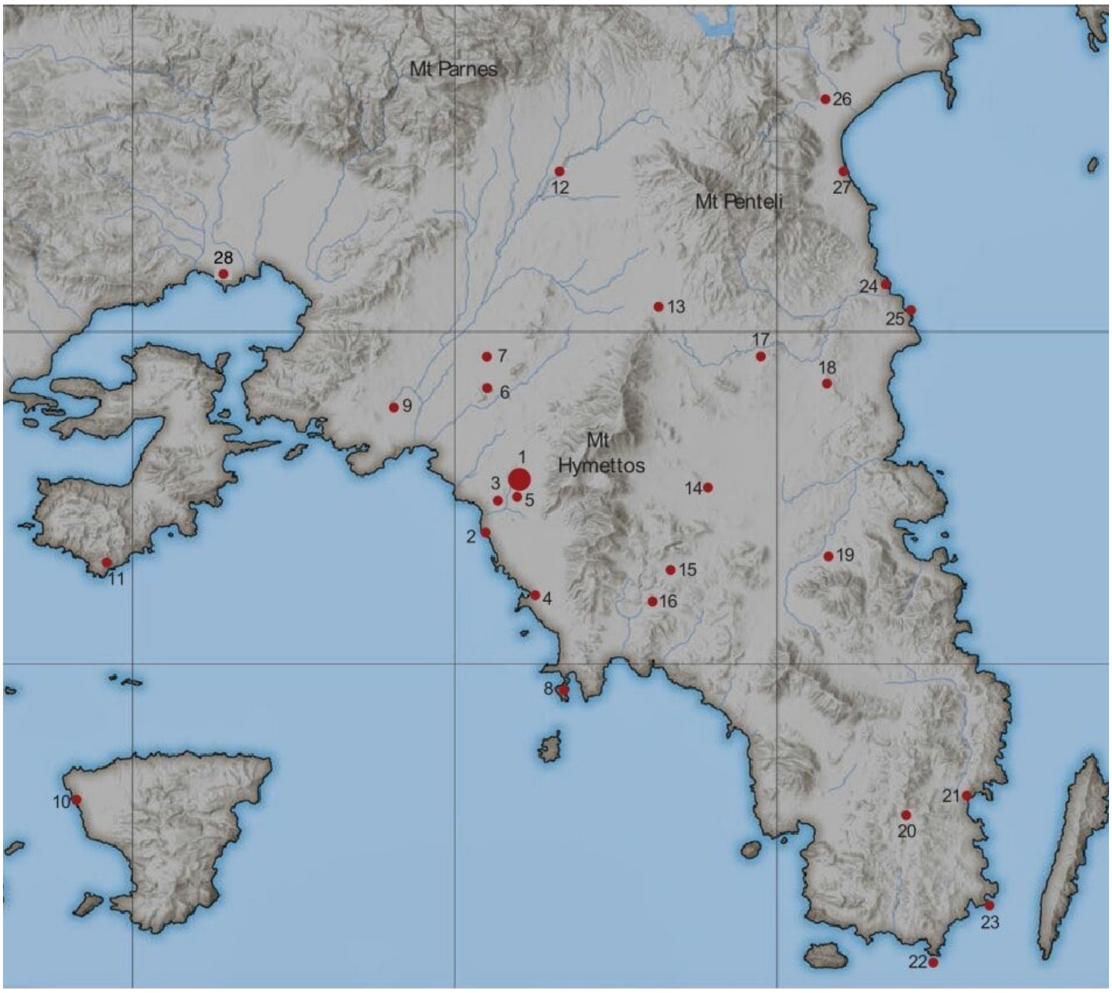


Figure 3.10: The EH sites in Attica peninsula mentioned in the text. 1. Kontopigado, Alimos; 2. Ayios Kosmas; 3. Pani hill, Alimos; 4. Asteria, Glyfada; 5. Trachones, Alimos; 6. Acropolis of Athens; 7. Agora of Athens; 8. Laimos, Vouliagmeni; 9. Palaia Kokkinia; 10. Kolonna, Aegina; 11. Euripides Cave, Salamis; 12. Nea Kephissia; 13. Gerakas; 14. Koropi; 15. Lambrika; 16. Kiapha Thiti (Kontra Gliate); 17. Gyalou, Spata; 18. Zagani, Spata; 19. Merenda; 20. Kitsos Cave; 21. Mine 3, Thorikos; 22. Sounion; 23. Lavrion; 24. Raphina; 25. Askitario; 26. Tsepi, Marathon; 27. Nea Makri; 28. Eleusis (after Fachard *et al*. 2020: Map II, xiii).

While several of these changes in settlement patterns are reflected in other areas of the Aegean, there are some distinctive features in the Attic inhabitation of the landscape. Most characteristically, the subterranean chambers at Marathon, Merenda and Koropi, possibly for storage or dwelling, comprise rather unique structures in Attica, which have been used in the transitional FN-EH I, EH I with some continuity into the EH II period (Kakavogianni 1986, 2020; Kakavogianni *et al*. 2009a, 2016). Merenda is situated at the edge of the Mesogeia plain, a smaller scale site (ca. 0.5 ha) compared to the organised settlements at Zagani, Koropi, Asteria and Raphina (Douni 2015: 28).

The two settlement areas at Merenda suggest two phases of occupation dated to EN/LN and FN-EH respectively (Kakavogianni *et al*. 2016: 437). In addition, six clusters of subterranean chambers cut into the natural bedrock; each chamber comprises three rooms with elliptical shape, interlinked with an open side as the doorway and the vertical, shaft entrances are covered with a rock-carved roof (Kakavogianni *et al*. 2016: 442) (Figure 3.11). On the southern part of the hill, two rectangular spaces with traces of stone foundation, both have an underground built storage room dated to EH I (Kakavogianni *et al*. 2016: 443). Five subterranean chambers are found at Koropi which is similar to those at Merenda (Kakavogianni *et al*. 2016; Kakavogianni 2020). The chambers are carved out of the natural bedrock and have the ellipsoidal floor with an entrance from the roof shaft (Kakavogianni 2020: 213). A low bench is built inside Chamber III (Kakavogianni 2020: 214). The findings from the chambers contain the debris from the EH settlement, including pottery sherds dated to the EH II period with some EH I pottery, metalworking residues, and litharge (Kakavogianni 2020: 214). Kakavogianni (2020) argues these chambers, possibly for storage, are used by several households or the community as a part of urban planning. Although there is no evidence of fortification, the site has enclosure walls and ditches (Douni 2015: 28).

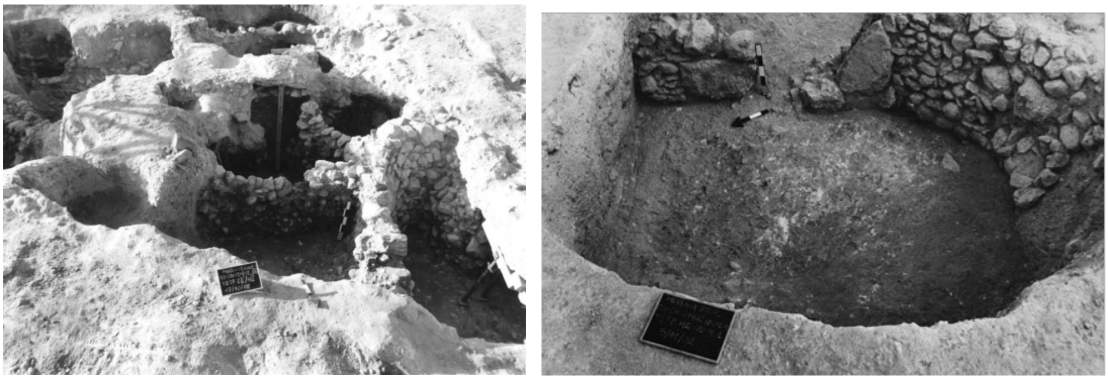


Figure 3.11: The subterranean chambers (Cluster B) at Merenda (left); Room 1 in Cluster B (right) (Kakavogianni 2020: fig.7; Kakavogianni *et al*. 2009a: fig.8).

Furthermore, the FN/EH I rock-cut pits often form a levelled circular area considered to have been used for industrial activities, based on the discovery of stone cairns, including pottery sherds, stone tools, litharge fragments, and traces of metallic remains at Asteria, Kontopigado, Lambrika, Merenda and Tsepi (Kaza-Papageorgiou 2013, 2014; Andrikou 2020; Stathi 2015: 136; Gkinalas *et al*. 2015: 342-6). Many sites are situated on low or high hills and have access to the water resources nearby, such as streams (Andrikou 2020). Traces of watercourses and their alteration have been identified at Kontopigado, Asteria and Lambrika (Kakavogianni *et al*. 2009b; Kaza-Papageorgiou 2013, 2016).

The layout of settlement changes fundamentally in EH II, with rectangular buildings of one or more rooms. This pattern is repeated in most Attic sites of this period. The important site of Koropi is situated on the edge of the fertile land Mesogeia plain next to Mt Hymettos. It is large, extending to around 20 hectares (Douni 2015: 28) and has a long history of careful excavation and publication (Kakavogianni 1986, 2020; see also Andrikou 2013a, 2013b). The main phase investigated is EH II and its rectilinear stone-walled buildings and the open-space terraces are arranged on either side of planned streets. This organised settlement consists of three buildings (A, B and C) of rectangular plan and Building C has at least two rooms (Douni 2015: 43-4). Two EH II rectangular buildings at Merenda comprise of a single room and double rooms respectively (Kakavogianni *et al*. 2016: 443). At the site of Moschato in the plain of Athens, the remains of rectangular buildings in the northern sector contain the antechamber with an entrance alongside the small rooms and corridors (Chryssoulaki *et al*. 2020) (Figure 3.12). Such organised arrangements of settlement together with the rectangular buildings are clearly presented at Ayios Kosmas (Mylonas 1959) and Kontopigado (see section 3.3.3 below).

Figure 3.12: The northern sector of the settlement at Moschato (Chryssoulaki *et al*. 2020: 302, fig.3).

Moreover, the strong affinity in the larger cemeteries can be observed in Attica. The cemeteries at Tsepi and Asteria are the first and second largest organised cemeteries in Attica. Apart from the major coastal cemeteries at Asteria, Ayios Kosmas and Tsepi, there are small clusters or isolated graves are reported throughout Attica (Andrikou 2020; Cavanagh and Mee 1998: 22; Pantelidou-Gofa 2005: 289-90). The two large cemeteries at Tsepi and Asteria show close affinities in tomb structure, burial offerings and funerary practices. A similar phenomenon is found at the cemetery at Ayios Kosmas.

The cemetery at Tsepi, Marathon is located on the Marathon plain on the northeastern coast of Attica. This FN-EH cemetery has the earliest organised arrangement of burials in Attica and the standardised tomb structures provide an indication of spatial and social organisation (Pantelidou-Gofa 2005: 342-3, 2020; Prevedorou 2020: 245). There are a variety of types of funerary structures that are frequently altered from the FN to EH phases of the cemetery (Pantelidou-Gofa 2005, 2020: 239). It suggests that the cemetery is used by groups with different burial customs in the two consecutive periods. Furthermore, some of the graves in the cemeteries at Asteria, Tsepi and Ayios Kosmas echo the cist and built graves in the Cyclades, in particular Chalandriani, Syros (Doumas 1977; Kaza-Papageorgiou 2012; Hekman 2003: 77; Mylonas 1959). On the other hand, certain tomb chambers are constructed with the three-sided stoned wall (*peribolos*) with an entrance which seems to be specific to the mainland communities (Kaza-Papageorgiou 2012, 2013; Mylonas 1959: 66; Pantelidou-Gofa 2005: 287-8, 2020; Weiberg 2007: 308-11). A peculiar custom is observed in the older burials, in which pebbles are intentionally thrown on the skeletons (Pantelidou-Gofa 2016: 221-6; 2020: 242-3, Tombs 43 and 68, fig.5). This occurrence of 'special pebbles' is also found in the cemeteries at Ayios Kosmas, Asteria and the pit deposit at Tsepi which pebbles and stones are found interspersed with pottery sherds (Kaza-Papageorgiou 2012; Mylonas 1959: 64; Pantelidou-Gofa 2008: 287-8). Such similar performance of deposition and the special usage of pebbles in Attica may suggest regionally specific ritual practices during the EH I period.

3.2.2 The development of metallurgy

The new discoveries of metallurgical evidence, especially regarding silver production, along with pottery and other craft activities such as obsidian working provide a new economic perspective on Attica from the mid-4th to 3rd millennium BC. Recent work reveals copper, silver and lead production at Lambrika, Koropi and Merenda in the plain of Mesogeia during the transitional FN/EH I to EH II period (Kakavogianni *et al*. 2008). In particular, the significant quantity of litharge fragments at Lambrika indicates an important workshop of silver and lead production.

Lambrika, situated 5 km south of Koropi, features a spacious rectangular house and a workshop with rich evidence for silver and lead production in EH I continuing into the EH II period (Andrikou 2020; Kakavogianni *et al*. 2008; Kakavogianni *et al*. 2009b). There are three medium-size circular pits and a large circular pit with a white lining which is related to silver-bearing metal (Kakavogianni *et al*. 2009b). The large pit found by the built wall is filled with hundreds of litharge fragments together with stone tools, mostly millstones, EH I potsherds and cooking pot supports, suggesting a workshop area of cupellation process (Kakavogianni *et al*. 2009b) (Figure 3.13). In the cupellation process, silver is extracted from argentiferous lead, leaving litharge as a by-product to be discarded (Georgakopoulou *et al*. 2020: 185). Most significantly, 160 kg with over 1500 litharge fragments are mostly bowl-shaped as the most common type in Attica with a standardised arrangement of depressions (ten depressions distributed in three rows of 3, 4, 3) exclusively in the southeastern Attica (Georgakopoulou *et al*. 2020: 186, 188-9; Kakavogianni *et al*. 2008) (Figure 3.14). The bowl-shaped litharge fragments are also found in Siphnos and Thassos (Georgakopoulou *et al*. 2020: 190; Papadopoulos 2008; Papadopoulou 2011, 2013). Lead isotope ratios of these litharge fragments are consistent with a Lavrion origin (Georgakopoulou *et al*. 2020: 190).

Figure 3.13: The layout of pits in the metallurgical workshop at Lambrika (Kakavogianni *et al*. 2009b: fig. 8).

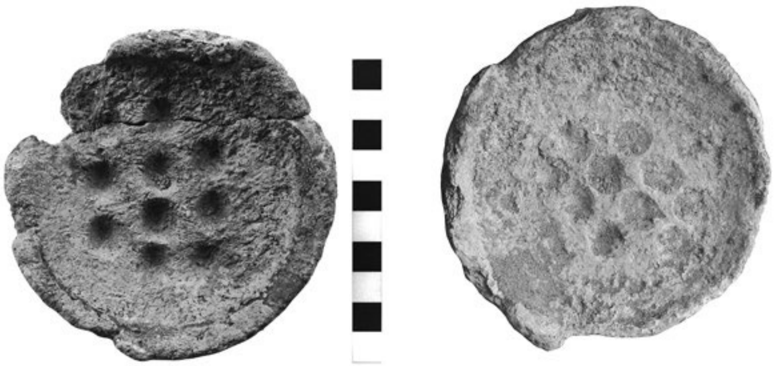


Figure 3.14: Bowl-shaped litharge with depressions from Lambrika (left) and Zapani (right) (Georgakopoulou *et al*. 2020: 188, fig.4).

Georgakopoulou *et al*. (2020) believe that smelting may have been carried out in depressions in the ground near mines in the region of Lavrion to avoid long-distance transportation of large quantities of metal. They assume that the beneficiation and smelting of argentiferous lead ores to produce argentiferous lead took place near the mines and argentiferous lead as the end product of smelting from which silver was then produced by cupellation, are being transported to other areas in Attica for further processing. The litharge ingots suggest the refuse material at the end of the cupellation process (Andrikou 2020: 6, 23). Other examples of the significant quantity of litharge fragments come from Zapani, Keratea and Gyalou, Spata (Georgakopoulou *et al*. 2020: 186; Gkinalas *et al*. 2015: 344ff, fig.23; Zgouleta 2020). Zapani is more comparable to the scale of Lambrika with 42kg of litharge while the depressions are not as regular as the bowl-shaped litharge from Lambrika (Georgakopoulou *et al*. 2020: 187-9) (Figure 3.14). One of the earliest known litharge fragments comes from Gyalou and Merenda, dated to the FN/EH I period, attesting to the early metallurgical activities in Attica (Georgakopoulou *et al*. 2020: 186; Kakavogianni *et al*. 2016: 446, note 59).

The large settlement at Gerakas, situated at the northern edge of the Mesogeia plain, reflects an increase in population density in this region of central Attica during the EH period (Plassara 2020: 331). The settlement is located on a low hill, close to a torrent bed flowing from Mt Penteli. It is suitable for agricultural exploitation and industrial activities, with stone tools and obsidian cores and, most importantly, 29 clay fragments of a metallurgical furnace wall, 15 of which have perforations and a clay fragment with agglomerated slag with the presence of copper and traces of lead, from a deposit date to early EH I and with features common in FN pottery of the area (Plassara 2020: 331-6).

Evidence of metallurgical activity from the EH II buildings at Merenda includes 80 fragments of litharge, mainly bowl-shaped, 8 pieces of copper slag, one mould for copper casting, a fragment of the small copper tool, a lead lump and one lead join (Kakavogianni *et al*. 2009a: 165, 171, 2016: 446). In a small isolated EH I building on the east to the settlement, one fragment of flat litharge was found accompanied with a small number of potsherds and many stone tools (obsidian blades and cores, grindstones and grinders) which Kakavogianni *et al*. (2016: 444) characterise as a workshop. Multiple places in Attica have identified traces of metallurgical activities during the EH II period. The presence of copper slags, moulds and small numbers of litharge fragments at Koropi attests to copper-based metallurgy and silver cupellation on the site during EH II (Alram-Stern 2014: 318; Kakavogianni *et al*. 2008; Georgakopoulou *et al*. 2020: 186-7). Theocharis (1952) considered a rock-cut pit as the remains of a copper smelting furnace at Raphina and lead isotope analyses of copper slags are consistent with the use of Lavrion ores (Gale *et al*. 2009). Therefore, it is suggested that the metallurgical finds may indicate the existence of EH II metal workshops at Raphina (Douni 2015; Theocharis 1952: 130-5).

Lead isotope analysis of metal artefacts of EBA Aegean demonstrates that there are two main sources of silver, Siphnos and Lavrion (McGeehan-Liritzis 1990: 151). In particular, the copper slags, litharge fragments, silver and copper artefacts from FN Kephala and EH Ayia Irini on Kea and the Alepotrypa Cave in Laconia as well as Kavos Dhaskalio on Keros attest to the exploitation of the Lavrion mines, stressing Attica's crucial role in the metal trade of the Aegean (Broodbank 2000: 159; Gale *et al*. 2009; Georgakopoulou 2018; Stos-Gale 1998). The overwhelming quantities of litharge fragments indicate significant silver production in Attica, with the earliest dates to at least FN/EH I phase (the mid-fourth millennium BC) and the increased amount of finds in the EH I and EH II periods (Georgakopoulou *et al*. 2020). Together with the copper slags from several sites, this suggests the copper-based metallurgical activities were taking place in Attica from a very early period.

3.2.3 The geological setting of Attica

The Attica peninsula contains interconnected plains of alluvium and Pleistocene sediments (Higgins and Higgins 1996: 26). The Central plain around Athens is encompassed by Mt Parnes on the north, Mt Penteli on north-east, Mt Hymettos on the south-east and Mt Aigaleos and Poikilo on the west, connecting Eleusis (the Thriasian plain) on the northwest, the Marathon plain on the northeast, and the Mesogeia plain on the south (Higgins and Higgins 1996: 26).

In order to suggest the provenance of ceramics, knowledge of the geological environment is required (see Figure 3.15). The geology of Attica is divided into two major zones with a series of nappes dominated by the Triassic limestones of the Pelagonian zone, in the northwest of Attica, and schists and marbles derived from the Attica-Cycladic high-pressure metamorphic belt (Higgins and Higgins 1996: 26; Krohe *et al*. 2010: 85-6) in the southern and eastern parts of the peninsula. The uppermost part of the series of nappes, the so-called 'Athens schist', contains clay-rich schists and phyllites, mica schists, sandstones, slightly metamorphosed marls and shales, cherts with intercalations of crystalline limestones and ophiolitic materials, and are covered with fossiliferous limestones on the eastern slope of Mt Aigaleos and Poikilo, the western slope of Mt Hymettos, and the hills of the southern Athens basin (Higgins and Higgins 1996: 26, 28; Krohe *et al*. 2010: 86; Papadopoulos and Marinos 1992: 111; Papavassiliou *et al*. 1982). The second series of nappes is formed of schist, chert and ophiolites, overlain by lightly metamorphosed and unmetamorphosed limestones and flysch sediments of the Cretaceous and Eocene age (Higgins and Higgins 1996: 26; Krohe *et al*. 2010: 86).

During the Neogene period, the mountainous formations ceased and basins were formed by erosion and faulting which were subsequently flooded by the sea and deposited with sandstone, shale, clay and limestone (Higgins and Higgins 1996: 26).

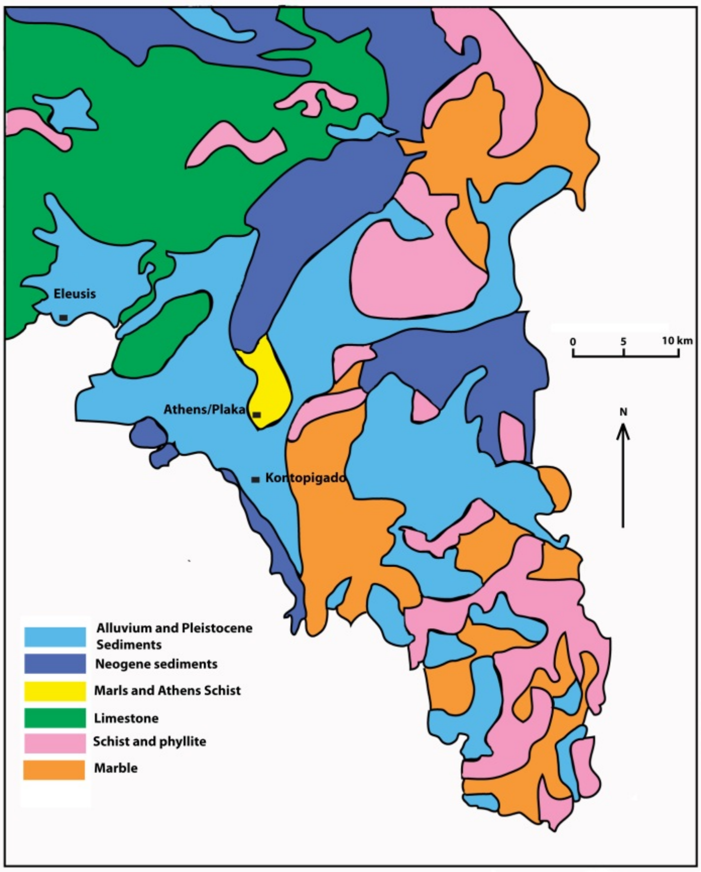


Figure 3.15: Geological map of Attica (Higgins and Higgins 1996; Gilstrap 2015).

The geological map shows that the site of Kontopigado is situated on the conjunction of a multitude of sources of clays and tempering materials suitable for pottery manufacture: Neogene sediment of marly limestones and sandstones, marine and coastal formation of alluvium clays and diluvial sand and clays, the Upper Miocene sand, the Athenian schist and limestones of the sub-Pelagonian zone in Alimos (Papavassiliou *et al*. 1982) (see Figure 3.16).

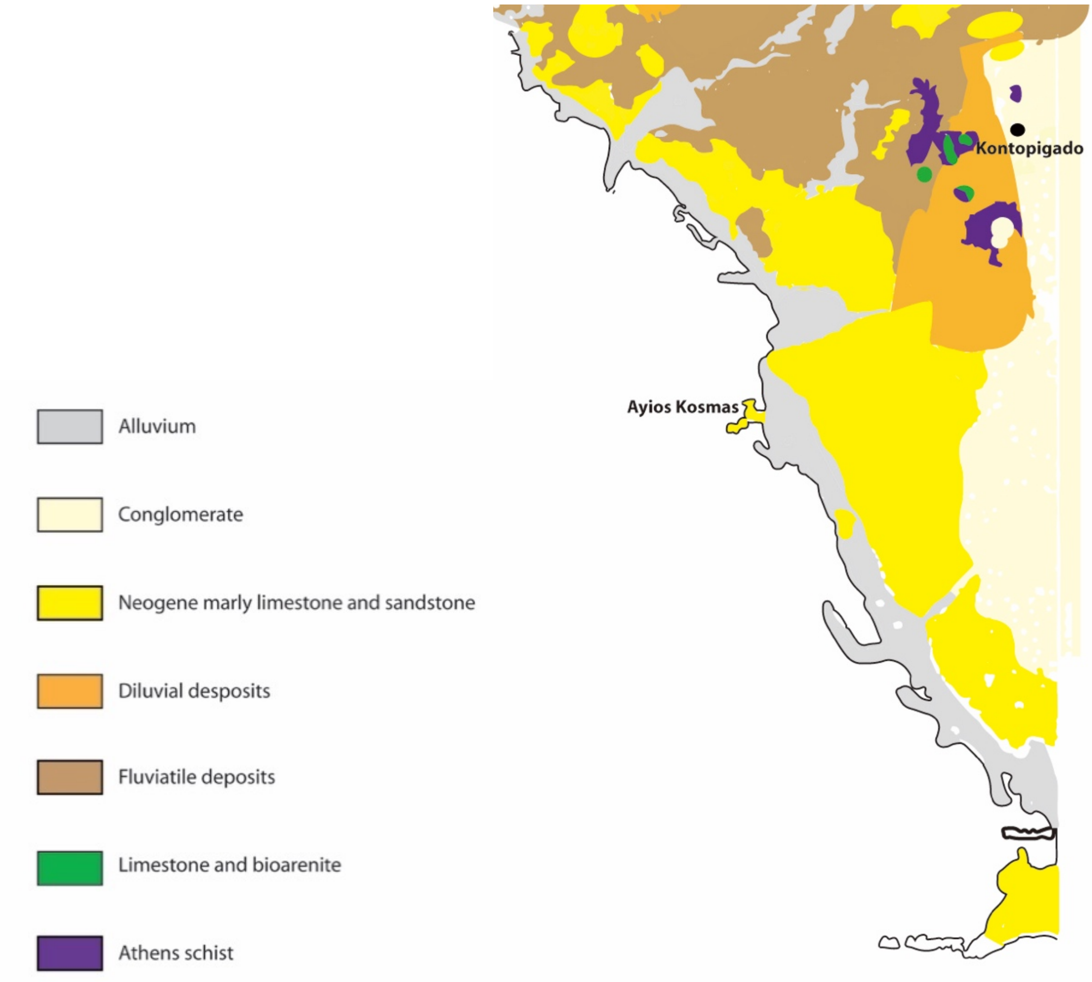


Figure 3.16: Simplified geological map of west coast of Attica (modified by the author, after Papavassiliou *et al*. 1982).

The natural boundary of mountains and hills roughly divides Attica into three main zones: western, central and eastern, with regional variation of ceramic assemblages. This following section 3.3 outlines the key sites and materials in each region to set up the background for the core site Kontopigado and the regional study of Alimos in the west Attica in this thesis.

3.3 Material culture in different parts of Attica

3.3.1 East Attica

The east part of Attica has been seen as particularly pivotal regarding the role of Attica in the EBA. This is mostly on account of the rich multi-metallic ore resources at Lavrion. A large number of coastal sites may attest to the critical and strategic position of east Attica in the trade and exchange network. In addition, the site of Thorikos is located on the southeastern coast of Attica, north of modern Lavrion. It is not only a well-known mining settlement but also a natural harbour which plays an important role in the network of ore circulation throughout the southern Aegean (Nazou 2020: 203). The early exploitation of mines can be traced back at least to EH II with toolmarks of mining activity (Nazou 2014: 36, 242). A macroscopic assessment of uncontexted FN-EH pottery from Mine 3 at Thorikos by Nazou (2014, 2020), has provided a more detailed ceramic repertoire of the east coast of Attica. The ceramic assemblages categorised as EH I are dominated by red-brown slipped or burnished wares alongside incised pottery, as well as relief bands and ribbed decoration, in contrast, the EH II pottery repertoire consists of cups, sauceboats and collared bowls with different colours of slip from grey-brown, red, red-brown, buff-yellow and orange (Nazou 2020). Nazou (2020) argues that some of the early vessel forms such as FN-EH I bowls are associated with ore processing. The imported pottery includes pyxides, frying pans, burnished bowls from Aegina as well as talc ware which considered to be associated with mining and metallurgy (Nazou 2020; Vaughan and Wilson 1993: 177-9) and/or obsidian distribution (Nazou 2020) linking eastern Attica with the western Cyclades along the western string of procurement of metal ore sources at Lavrion.

Raphina is located on the east coast of Attica, covering an area less than 4 ha (Konsola 1984: 98). The fortification walls encompass the western part of the settlement (Douni 2015: 51-4; Theocharis 1953). One of the six buildings comprises two rooms (Douni 2015: 51-2) with finds of pottery including painted ware and urfirnis fine ware which characterise the EH II period and some shapes which belong to the Kastri/Lefkandi I Group. Cycladic frying pans are also present (Theocharis 1953-4). Nearby, the coastal settlement at Askitario is located on a promontory, 2 km south of Raphina. It has three main occupation phases corresponding to EH I, EH II and the late EH II-III period, based on pottery typology (Douni 2015: 48-50; Theocharis 1955). The elements of Phase I are similar to most EH I pottery in Attica; Phase II is characterised by the sauceboat and urfirnis ware as well as light slipped jugs and askoi familiar from EH II; Phase III contains vessels of the Kastri/Lefkandi I Group (Douni 2015: 48-50; Theocharis 1955). The EH II ceramic assemblages from Raphina and Askitario have been studied by Douni (2015) as comparable materials to Koropi fine wares.

The site of Tsepi, Marathon, about 2.5 km from the sea, contains the largest and the earliest organised Early Helladic cemetery comprising more than 70 tombs in Attica. Together with the burial practices, the pit deposits manifest the performance of deposition and pottery consumption in the ritual perspective. Such similar mortuary and ritual practices are also found in the study region of this thesis. Ayios Kosmas and Asteria in west Attica during EH I reflect the cultural and social links in burial custom and ritual performance across Attica. In terms of ceramics, there are fruitstands, conical cups, and smoothed large basins made of fine clay alongside bowl shapes, jars, occasionally collared jars, large pithoi, and plain amphorae (Pantelidou-Gofa 2008). The characteristic EC I Kampos Group including amphoriskoi, pyxides and frying pans with incised triangles, or rectilinear and curvilinear impressions are also presented (Pantelidou-Gofa 2005).

3.3.2 Central Attica

The Mesogeia area is a fertile central plain to the east of Mt Hymettos and south of Mt Penteli in the southern part of Attica. It was occupied from the Early Neolithic onwards and flourished in the Early Helladic period when the major EH settlements such as Koropi, Gerakas and Zagani were established as the focus of the region, dominating the surrounding areas and smaller sites such as Lambrika (Andrikou 2020).

In terms of ceramics, the FN/EH I pottery from Merenda consists of red burnished conical and other bowls, while the EH I pottery is characterised by brown to black smoothed surface large bowls, coarse yellow-red pottery with impressed bases, cheese-pots, as well as some Cycladic-style pottery such as cylindrical pyxides and amphoriskos (Kakavogianni *et al*. 2016: 444) (see Figure 3.3, 3.17).

Figure 3.17: EH I deep bowl from Merenda (left) and the vessels of Cycladic character: cylindrical pyxides (centre) and amphoriskos (right) (Kakavogianni *et al*. 2016: figs. 11-2) (not-to-scale).

Most importantly, the recent study of chronology, provenance and technology of pottery, in particular the fine ware (e.g. sauceboats, saucers) at Koropi carried out by Douni (2015, 2020) suggests local pottery production in the region with the distribution of some of its ceramics into the Cycladic islands during the EH II period. Her technological study based on chaîne opératoire approach has suggested the Attic production with specific characteristics is different from production in the Cyclades, Peloponnese or Central Greece (Douni 2020). Furthermore, there are different ceramic traditions (e.g. forming techniques) in different parts of Attica, and thus reflect different social groups characterised by distinct production methods (Douni 2015, 2020). The fine ware classification according to surface finish includes yellow blue mottled (YMB/FJB), light slipped (LSL/FC), urfirnis pottery (UR/FU) and fine decorated painted pottery (FDP) (Douni 2015: 117, 2020) (Figure 3.18). Typologically, sauceboats and bowls are the dominant shapes with common pyxides or shallow bowls and fewer examples of cylindrical pyxides (Douni 2020). The semi-fine/semi-coarse pottery includes miniature bowls, bowls, plates, jars with slipped, polished or plain surfaces. A large group of pottery, mostly classified into the fine yellow blue mottled ware (FJB) and fine slipped ware (FC), is considered to be manufactured at Kontopigado (Douni 2015: 402). Douni's (2015) comprehensive study of pottery production in the region of Koropi has been used as the direct reference materials to the study of EH II ceramic assemblage at Kontopigado in this thesis.

Figure 3.18: EH II pottery from Koropi. 1. Yellow blue mottled sauceboat; 2. Light slipped bowl; 3. *Urfirnis* sauceboat; 4. Fine painted tankard (Douni 2020: 282-5, figs. 4, 5, 7, 8).

3.3.3 West Attica

The recent rescue excavations under the projects of the 2004 Olympic Games directed by the Greek Archaeological Service and the more recent surveys revealed many new sites along the west coast of Attica (Papadimitriou *et al*. 2020). This thesis focuses on the area of Alimos and the adjacent Glyfada.

i. Alimos and adjacent areas

Alimos or the ancient deme of Halimous, a municipality in the south of Athens on the west part of Attica peninsula, is situated between Mt Hymettos and the Saronic Gulf. The best-known prehistoric site on the southwest coast of Attica is the settlement and cemetery at Ayios Kosmas, excavated in the 1950s by George E. Mylonas. Recent excavations conducted by K. Kaza-Papageorgiou have extended our understanding of this area of Attica not only in terms of the number of sites, but also different phases of occupation from the FN to the EBA, revealing a rather intensive settlement which hosted a great range of activities, including craft production. Intense activity in EH II in the Alimos area builds on a strong presence during FN-EH I, as evidenced by large amounts of obsidian, pottery, the remaking of metallurgical activity and metal tools at Kontopigado and Pani Hill and further afield at Asteria, Glyfada (see Figures 3.10 and 3.19). Subsequently, EH II is characterised by the nucleation of the population in large settlements with the strong maritime influence of the coastal areas. Evidence of interregional contacts is represented by frying pans, marble figurines and other small finds from the Cyclades, obsidian from the island of Melos and andesite millstones from the island of Aegina.

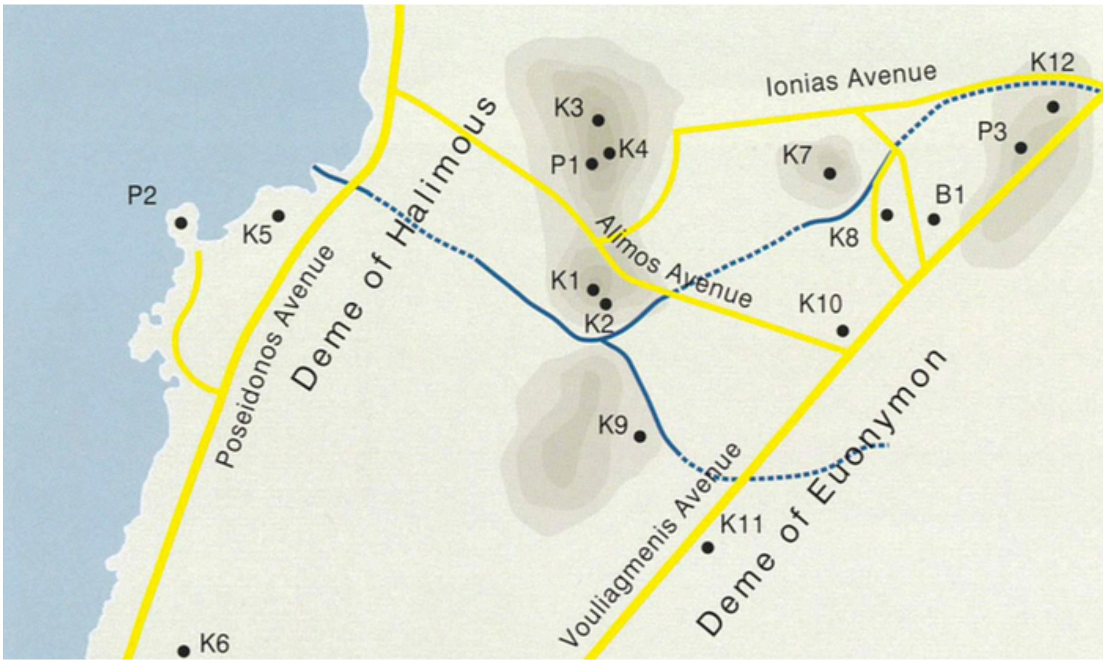


Figure 3.19: Prehistoric sites in Alimos. P1: Pani Hill; P2: Ayios Kosmas; P3: Kontopigado (Kaza-Papageorgiou 2016: 138, fig. 227).

ii. Ayios Kosmas

The main excavation at Ayios Kosmas is one of the most famous EB II coastal sites, on a headland with a view as far as the island of Aegina and as far as the Argolid on a clear day. The site is situated on a low promontory just into the sea, to the north lies Phaleron and Piraeus and to the south Glyfada. The architectural remains and *bothroi*, as well as the ceramic assemblage in both the settlement and the two major cemeteries, are mostly dated to the EH II period. The building remains show two phases of EH II occupation before an abandonment with traces of burned fill (Mylonas 1959: 9, 12). The pottery sherds from the building area consist of handmade and well-fired ‘yellow-mottled ware’ with grey to pale blue slip, urfirnis black lustrous ware, red slipped ware and very rare patterned ware (Mylonas 1959: 14-5). Five *bothroi* are filled with stones, obsidian chips, animal bones and pottery sherds, mostly belongs to sauceboats, spouted bowls and skyphoi with red or urfirnis slip and one frying pan (Mylonas 1959: 16-8). A serpentine seal found in Room 3 of House E is similar to the impression of the Asine seal (Mylonas 1959: 29-30, 157-9, fig. 166; Weiberg 2010). The making of the seals from Ayios Kosmas and Asine may suggest a Minoan creation and thus, as possible imports (Aruz 2008: 42f; Weiberg 2010: 198). Strikingly, the settlement contains almost no metal objects (only a fragment of a pair of tweezers) while a large number of obsidian blades and chips are found which possibly indicate the everyday use of obsidian (Mylonas 1959: 15, 29).

The cemetery contains two main grave types, cist graves and built graves, while the plans are varied from quadrilateral or trapezoidal to elliptical and semi-circular and very rare rectangular (Mylonas 1959: 64). Careful construction of entrance (*stomion*) blocked by a large slab and passage (*prothyron*) were observed in many graves (Mylonas 1959: 65). It seems that the tombs have been used for multiple burials, with skeletons pushed towards the door and the latest burials placed through the roof (Mylonas 1959: 66). Parallels for this can be found at Tsepi, Marathon on the east coast. In addition, the performance of second burial and the use of the tombs as ossuaries are similar to the characteristics of the Early Helladic mainland sites such as Eutresis, Korakou, Zygouries and Asine (Mylonas 1959: 121, 150-52; Weiberg 2007: 324-6). Some corbelled built tombs with roof slabs have the parallel arrangements as Cycladic graves, especially those at Chalandriani in Syros (Hekman 2003: 77; Mylonas 1959: 65; Tsountas 1899: 73-76). Furthermore, the construction of graves and funerary offerings including marble figurines, obsidian flakes and blades, incised and stamped wares, frying pans and pyxides were argued by Mylonas to reflect a strong connection to Cycladic culture (1959: 153-5).

The abundant amount of obsidians found at Ayios Kosmas indicates the material's social and economic significance, leading to Mylonas' considering Ayios Kosmas as an *emporium* for obsidian established by the Cycladic islanders (Mylonas 1959: 155). However, Carter (1999: 199) argued that although the funerary consumption of obsidian at Ayios Kosmas is largely due to Cycladic social practices, there are elements which completely different from the contemporary Cycladic funeral customs. He further suggested that certain coastal sites including Ayios Kosmas (also Manika, Dhaskalio-Kavos, Mochlos and Poros-Katsambas) act as nodal points in long-distance exchange networks which have privileged exploitation and technical knowledge of obsidian

(1999: 328). Such strong affinities to the material culture of the late EC I Kampos Group may suggest that Ayios Kosmas was occupied during the late EH I period and reflect the 'culturally elaborated interaction' between the Cyclades and other areas by the end of EB I suggested by Broodbank (2000: 300-301).

iii. Asteria

On the coast by Vouliagmeni Avenue and south of the Cape Ayios Kosmas, Asteria in Glyfada is situated on the northern half of the Pounta peninsula. Two sectors have been recorded. Sector 1A (also called Sector Δ) has unearthed a large rectangular *peribolos* wall and rock-cut pits (Kaza-Papageorgiou 2012, 2013, 2019: 94). The finds of pottery, obsidian, seashells, idols and figurines may suggest a character of ritual activity during the end of the third to early second millennium BC (Kaza-Papageorgiou 2012). In addition, finds of a whole range of stone tools and slag fragments indicate that this sector is associated with metallurgical activities and there is a sign of re-use in the pit area with early EH I sherds (Kaza-Papageorgiou 2006a: 47-51, 2013, 2019, 2020a: 309). Sector 1B is situated on a low hill and this area contains three parts, an EH cemetery, rock-cut pit deposits and four stone cairns (Figure 3.20) (Kaza-Papageorgiou 2012: 4–5; 2013: 5; 2019: 94). The extensive EH cemetery is enclosed by a long *peribolos* wall (Kaza-Papageorgiou 2012; 2019: 95). The built tombs are dug into the natural rock and each grave is outlined by the three-sided double-layered stone wall and an open entrance to the chamber and is covered with slabs (Kaza-Papageorgiou 2012, 2019: 95-7) (Figure 3.21). The similar design of tomb structure and similar practice has been observed at Ayios Kosmas and Tsepi. The practice of multiple burials is evident with the piles of skeletons being pushed towards the back of the chamber (Kaza-Papageorgiou 2012, 2019: 97). The grave goods include fine or medium ware and frying pans, pyxides, beads, bone palettes, Cycladic-type figurines, seashells and obsidian blades and small pebbles in front of the doorway as a part of the ritual (Kaza-Papageorgiou 2019: 97). Although the offerings appear to be closely related to the Cyclades, possibly Cycladic imports, Kaza-Papageorgiou (2019) argues that some of the popular figurine types may have been locally produced in Attica. In addition, Koufovasilis (2020: 257) argues that the bone palettes are Attic products as most were found in burial contexts in Attica, some dating back to FN and continued into the EH period. Marble palettes were perhaps imported from the Cyclades during the EC/EH I period onwards (Doumas 1977: 76; Pantelidou-Gofa 2005: 321).

Figure 3.20: Stone cairn at Asteria (Kaza-Papageorgiou 2012-4: 15, fig. 3).

A rubbish/storage pit has two phases of use: the finds in the earlier phase suggests a workshop nature of the pit for processing metals during FN/EH I, while the later phase is related to burial ceremonies, with a large quantity of potsherds and other materials in EH I-II (Kaza-Papageorgiou 2020a). The huge area of the pit deposit resembles that at Merenda and Tsepi (Kaza-Papageorgiou 2014). Most importantly, the 28 fragments of bowl-shaped litharge, five in the area of the tomb and two others in the pit-deposit, indicate the cupellation of silver on the site (Kaza-Papageorgiou 2006a: 49; 2020a). Together with traces of water courses and their alteration, it may indicate a FN/EH I workshop area of crushing, roasting and washing metal ores (Kaza-Papageorgiou 2012, 2020a: 313). Furthermore, a circular area to the east of the EH tomb features levelled ground and broken stone with traces of burning, suggesting a space related to the metallurgical activities on the site (Kaza-Papageorgiou 2013). Finally, there is a substantial stone cairn (see Figure 3.20) and the nearby trench consist of EH I potsherds, stone tools, pebbles, and grinding stones (volcanic andesite and sandstone) (Kaza-Papageorgiou 2012). The broken stones with the sign of use and traces of burning and EH potsherds, stone tools and shells from stone cairns suggests the cleaning of a nearby workshop, possibly the pit area (Kaza-Papageorgiou 2013, 2020a: 313-4, fig.8).

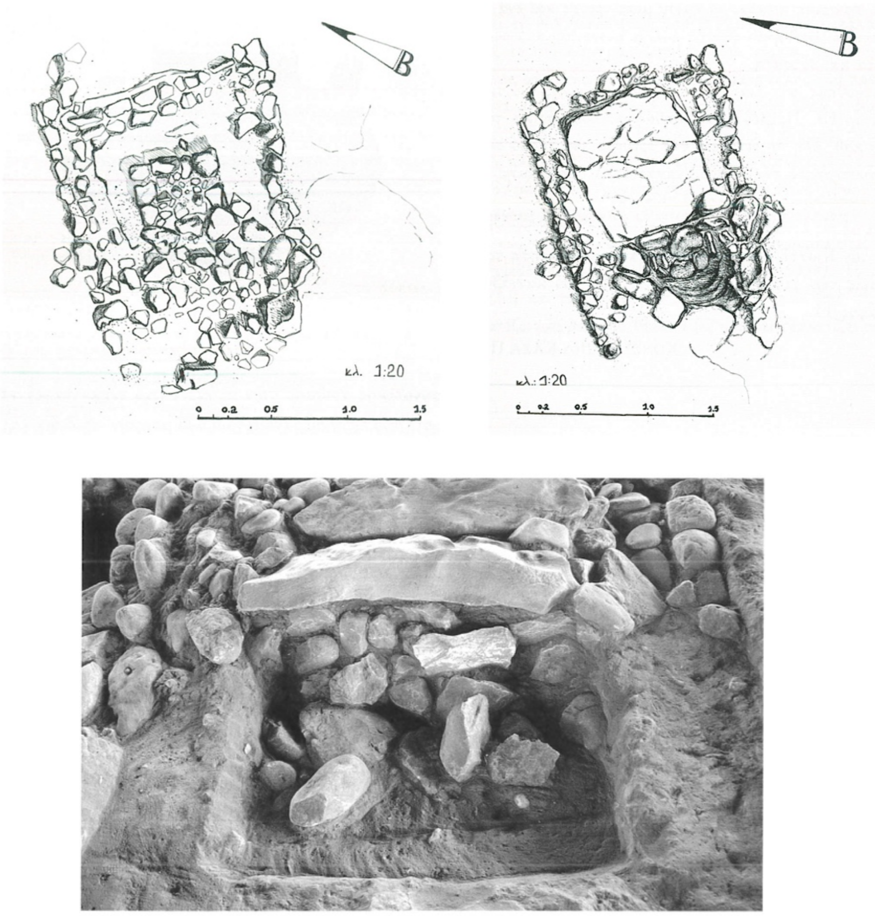


Figure 3.21: Tomb structures at Asteria (Kaza-Papageorgiou 2012: fig.3, 2013: table 3b).

iv. Pani Hill

In the central area of Alimos, the hill of Pani produced more than 4000 pieces of obsidian blades and production debris, along with stone tools and pottery sherds in an area encompassed by a circuit wall (Kaza-Papageorgiou 2006a: 26; Morgan *et al*. 2009: 13). The walls are part of the foundations of domestic houses and date to the later Neolithic to the Early Helladic period (Kaza-Papageorgiou 2006b: 24). The preliminary study of the pottery suggests occupation during the transitional Final Neolithic to Early Bronze Age, while layers with fragments of litharge attest to metallurgical activities (K. Kaza-Papageorgiou 2017 pers. comm.).

v. Kontopigado

Amongst of all rescue excavations along the Vouliagmeni Avenue, Kontopigado is most important for its nature of settlement and workshops in the Early Helladic and Mycenaean periods. The low hill of Kontopigado is located on the west side of Mt

Hymettos, east of Ayios Kosmas at a distance of 5 km. The area was occupied episodically from the late fourth millennium BC down to the end of the Mycenaean palatial period, transitional LHIIIB2/LHIIIC. Systematic excavations in 1987-2000 identified two Mycenaean complexes (I and II), built over EH remains (Kaza-Papageorgiou 2020b: 541). The Mycenaean complex appears to be used in the mid-14th century BC and intensely occupied during the 13th and the beginning of the 12th century BC and then abandoned (Kaza-Papageorgiou 2016: 94). Kontopigado is important for its preservation of an industrial installation with evidence of massive flax linen production from the Mycenaean palatial period (Kaza-Papageorgiou 2011: 266). A recent study of the LH ceramic assemblage by Gilstrap (2015) argues that Kontopigado is also important for pottery production attested by the misfired wasters and 'an axle housing from the base of a potter's wheel' (2015: 41).

The EH I deposit at Kontopigado is a one-period fill of a winter torrent (Figure 3.22) that runs through the site, consisting of a large amount of potsherds, stone and earth. These materials seem to have been transported and deposited to level the streambed for the construction of the EH II structures that lay above (Kaza-Papageorgiou 2006b). Clearly, then, the EH I fill testifies to an extension of the EH II settlement. Indeed, a strong retaining wall is built along the torrent, to prevent the EH II houses from flooding (Figure 3.23). The EH II buildings, built of herringbone masonry, are divided into small rooms and arranged on either side of a preserved narrow road (Kaza-Papageorgiou 2006b: 30). A clay seal (Figure 3.24) was found in one room and a built case for safekeeping of fragile vessels in the corner of another room (Kaza-Papageorgiou 2006b: 30). The rooms with a clay seal are named as 'House of Seal' (see Figure 3.22). On the northwest of the site, there was an underground pit, representing a hut with a roof built above ground, possibly used as a dwelling in the early phase of the settlement (Kaza-Papageorgiou 2006b: 28). At the top of the hill, two pits carved into the bedrock were both filled with EH I pottery sherds (Kaza-Papageorgiou 2020b: 543; Kaza-Papageorgiou *et al*. forthcoming).

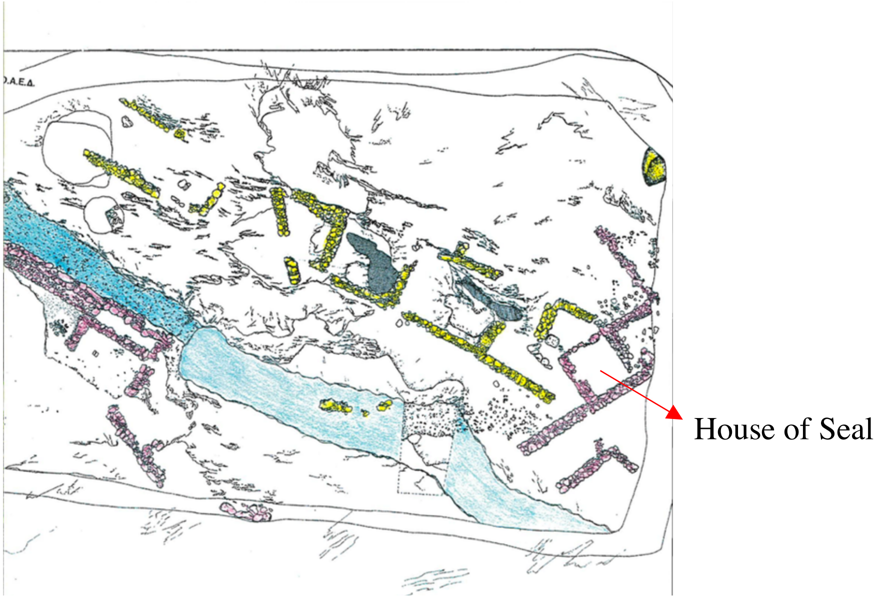


Figure 3.22: Plan of Kontopigado. The remains of EH II houses (pink) and winter torrent (blue) (modified by author after Kaza-Papageorgiou 2016: 26, figs. 34).

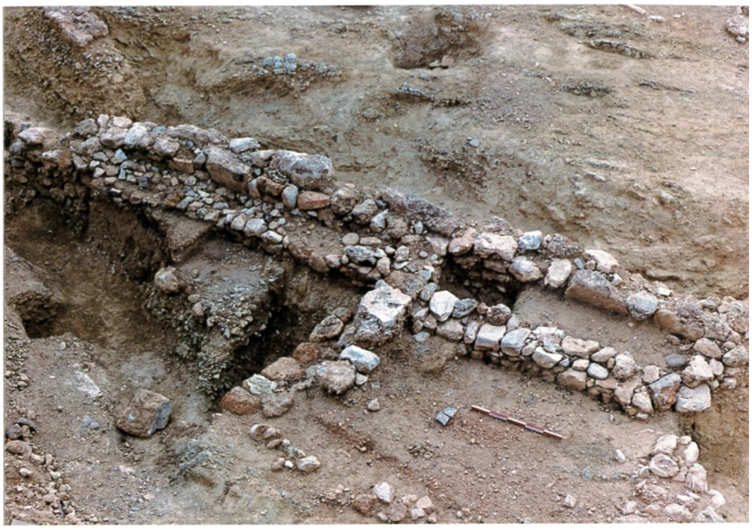


Figure 3.23: Remains of EH II houses next to the retaining wall of the winter torrent (Kaza-Papageorgiou 2006b: 27).

Figure 3. 24: Clay seal from EH II Kontopigado (Kaza-Papageorgiou 2006a: 34) (not-to-scale).

The EH I fills were discovered with fragments of moulds for bronze casting (Figure 3.25), and clay fragments with drips of molten copper (possibly from a crucible) suggest metalworking activities during the EH I phase of the site (Kaza-Papageorgiou 2006a: 30-33, 35, 2020b: 543). Moreover, the large number of obsidian blades and working debris also indicate obsidian working during the EH period (Kaza-Papageorgiou 2006a: 30; 2020b: 543).

Figure 3.25: Parts of moulds for casting of bronze tools found at Kontopigado (photographed by the author, not-to-scale).

The bulk of pottery sherds from the EH I winter torrent are mostly semi-fine burnished ware, frequently with red to brown slips and semi-coarse to coarse buff to brown pottery (Figure 3.26). Most of the burnished and/or slipped ware belongs to bowl shapes. The excavated units of EH II houses – including the room with seal – consist of pottery with innovative shapes of very fine to fine tableware, mostly slipped with distinct colours such as bluish grey, white and black, frequently with pedestalled base, alongside the semi-fine to semi-coarse ware, sometimes polished or slipped, with the shape of jars (Figure 3.27). Therefore, a comparison of both chronological pottery groups shows that pottery assemblages of the two phases stand in stark contrast to each other not only from morphology, but also the nature of fabrics and surface finishes. In addition, the huge quantities of pottery sherds in both phases and their increased standardisation and scale in the EH II period would seem to suggest that it was not only the expansion of the settlement itself with obvious planning, as seen elsewhere in Attica, but also the types and technology of ceramics that give an impression of marked transformations in the material world of Kontopigado between EH I and EH II.

Figure 3.26: EH I pottery sherds from Units 292 and 438 in the winter torrent at Kontopigado (photographed by the author, not-to-scale).

Figure 3.27: EH II pottery sherds from Units 182 and 321 in the houses at Kontopigado (photographed by the author, not-to-scale).

As will be discussed, this study has identified several misfired wasters from excavated units in the EH II houses as evidence of pottery production at the site at this early time. As a consequence, the torrent fills and construction of the EH II settlement, with their evidence for metallurgical activities, obsidian working and pottery production, and a clay seal, all indicate a developed, planned settlement with an extensive craft activity. Kontopigado is chosen as the research site for which to provide rare evidence of diachronic development of pottery production and consumption from the EH I to EH II period. Furthermore, the additional information that comes from the extensive discovery of EH sites in Alimos and the adjacent areas will reveal the nature of an industrial landscape with associated settlements in West Attica.

3.4 The ceramic assemblage at EH I-II Kontopigado

Since the typological study is not the focus of this thesis and the lack of an established system of terminology for Early Helladic pottery in this region, the terminology for typology used in this thesis is descriptive and the standardised terminology is adapted from published works, in particular, a series of synthetic studies at key sites such as Eutresis (Caskey and Caskey 1960), Lerna (Wiencke 2000), Tsoungiza (Pullen 2011), Kouphovouno (Cavanagh *et al*. 2004) and Lithares (Tzavella-Evjen 1985) in the central and southern Greece and Ayia Irini on Kea (Wilson 1999). The EH I material studied in this thesis is very closely related to the under published material from Pit 1 Kontopigado (Kaza-Papageorgiou *et al*. forthcoming) and thus the terminology used in this thesis is consistent with their work. For those shapes and features in this assemblage that are not present in Pit 1 material, the standardised terminology from the abovementioned sites is used. Similarly, there is no official publication of EH II material from Kontopigado. In general, EH II vessels in the Kontopigado assemblage are standard shapes that are well-known in EB II assemblages. The archaeological drawings of shapes and features will be published in due course by those who studied the typology of this assemblage.

3.4.1 Early Helladic I

Around 5000 potsherds from 58 excavated units in the winter torrent were investigated. Most are highly fragmentary, rarely featuring joins to other sherds. The assemblage presents a chronologically homogeneous pottery repertoire, dominated by coarse ware and characteristic red slipped and/or burnished shallow bowls and bowls. Occasionally, there are fragments of red to brown burnished ware sometimes with mottled surfaces as well as semi-coarse to coarse vessels.

i. <u>Shallow bowl</u>

This is the most common vessel shape in EH I Kontopigado and continues into the EH II period only in much smaller numbers. Most have an incurving rim, with some examples of a simple rim with flat lip, those slightly rolled towards the outer rim and a bevelled inner rim, thickened rim with slightly flattened lip, thickened rim with bevelled lip, outcurving rim with thin pointed lip on straight or convex walls. The features of incurving rims and the thin pointed lip seem to be the predecessor of the main rim type for the EH II tableware. Most examples are red slipped and burnished, occasionally brown slipped and burnished and very few are plain. The slips are homogenously applied to the surface, whereas sometimes, slip colour varies from red to brown on the same vessel. Very few examples show dark slips along the rim, with a red/brown slipped and burnished surface. Dark slipped and burnished, burnished and plain are present in a few cases. One small example with a simple rim with flat lip, and several of medium size with the incurving rim, all red slipped and burnished, are found with a rounded pellet just below the rim. While the deposits do not have complete vessel profiles, some base fragments with their remaining of lower body may be attributed to this vessel shape. These are mostly flat bases with a rounded edge and very few dimpled bases. Parallels for the shape of these shallow bowls are plentiful in EH I assemblages in Attica and the mainland (e.g. Ayios Kosmas, Palaia Kokkinia, Merenda in Attica, Lithares in Boeotia, less commonly at Kontra Gliate (Kiapha Thiti), Tsoungiza, and Eutresis) (Caskey and Caskey 1960: 134-5, fig.4; Kakavogianni *et al*. 2016; Mylonas 1959: 116; Nazou 2014: 135-6; Pullen 2011: 72-3, form 5 and 7; Theocharis 1951: fig. 14; Tzavella-Evjen 1985: 21, figure 7).

ii. Bowl

This vessel shape is an important component in the assemblage, slightly smaller than the shallow bowl, it is characterised by the similar ratio of diameter and height, the size ranges from small, medium and large. The incurving rim remains prominent in this vessel shape, following with the common occurrence of simple rim with flat lip, rim with a shallow groove on lip, thick rim with grooved lip, everted outer with slightly bevelled inner rim, thicken rim with slightly flatten lip, incurving rim with rounded lip on straight-walled open and convex-walled of both open and closed shapes. The profiles resemble Eutresis Group II (Caskey and Caskey 1960: 134-5, fig.4). Lugs and handles as well as bases exhibited in this form comprise flat and thickened strap-shaped, pieced lug, horizontal lug, dimpled and flat bases with a rounded edge, sometimes with impressions of straw marks on the underside. Even without complete profiles, a few fragments of pedestalled bases and raised bases may be assigned to this vessel form. The thick rim with grooved lip is commonly present on the sherds in the gold mica fabric, which is presumably an Aeginetan feature, and very few examples with local silver mica fabric. The variations of surface treatments are the same as with shallow bowls, apart from the fact that the burnished bowls and red/brown slipped and burnished bowls are equally common.

A few red/brown slipped and burnished bowls have additional decoration on the top of the lip with impressions (occasionally incisions) of one or two rows of circular, a row of obliques or parallel diagonal slashes, or a rounded pellet just below the rim (Figure 3.28). Such identical ornamentation on lip with two rows of circular impressions is from a pithos at Eutresis and similar cases at Lithares (Goldman 1931: 88, fig. 109; Tzavella-Evjen 1985: 22, fig. 8). It is worth noting that reserved lip with shallow slashes is also found in the Aeginetan gold mica fabric.

Figure 3.28: Incised dots or slashes on the lips of EH I red slipped and burnished bowls from Kontopigado (photographed by the author, not-to-scale).

iii. <u>Deep bowl or Basin</u>

The form commonly has a thick rim with a sharply flatten lip, or a slightly rounded inner rim on the straight-walled or globular shape. Several lug types are attributed to this vessel shape, including horizontal ledge lug, vertical horned lug, slightly projected lug. Only one base fragment is assigned to this form, the dimpled base. The surface is primarily red slipped and burnished with one preserved light brown to red slip. Few are burnished or plain. A very few body sherds, burnished with or without red slipped, have one horizontal applied ridge, one example showing two rows of circular impressions with a horizontal ridge appliqué in the centre and one example of three rows of horizontal ridges (Figure 3.29). Although without diagnostic features, five body sherds are assigned to this form due to the straight wall.

In addition, this vessel shape is present in the Aeginetan gold mica fabric, but dominated by the thickened rim with grooved lip and very few of rim with a shallow groove on lip and one rim with flat lip. It seems that a thick rim with grooved lip is one of the typical rim types for the Aeginetan ware and the very few examples of the local schist or silver mica fabrics may suggest a feature shared between the potters of Aegina and Kontopigado. A few examples exhibit vertically projected lugs stretched from the rim, which is considered a decorative element in Aegina (Kakavogianni *et al*. 2009a: 165, fig. 10: a) (Figure 3.29). The surface treatment varies from red to dark slipped and burnished, burnished, heavy polished/scored, plain orange or with a blackened surface.

1 2

Figure 3.29: Parts of EH I deep bowls/basins with decoration on the surfaces from Kontopigado. 1. Local fabric; 2. Gold mica fabric with a vertically projected lug (photographed by the author, not-to-scale).

iv. Jar

A small number of jars are found, mainly with two profiles, the collared jar and flaring jar, while small variations are also presented. A low collared jar with simple rim and flat lip has a plain, smoothed, reddish-orange surface. A few jars have a two-stage neck and a vertical strap handle (see Figure 3.30). The flaring jars feature an outcurving rim with pointed lip are also commonly presented. One jar is black burnished on the exterior and is considered to be an import.

Figure 3.30: Part of a jar with a horizontal strap handle from EH I Kontopigado (photographed by the author, not-to-scale).

v. Storage jar (pithos)

This form is characterised by thick-walled sherds in coarse ware. The assigned sherds are all plain with pink, orange to light grey surface colour. These vessels are frequently accompanied by the button lug of small to large size (Figure 3.31). One example has an outcurving rim. Pithoi with attached button lug have been found in EH I deposits at Ayios Kosmas, Eutresis and Tsoungiza (Goldman 1931: 88, fig. 110; Mylonas 1959: 26; Pullen 2011: 220, fig. 4.37:289).

Figure 3.31: Parts of EH I pithos with button lugs from Kontopigado (photographed by the author, not-to-scale).

vi. Pan

There is some confusion over these vessels in the literature. Most publications categorise these vessels as pans (Coleman 1977: 17; Immerwahr 1971: 15; Spitaels 1982: 31; Wilson 1999: 13-14). Some identified these pans with a series of perforations below the rim as 'cheese-pot', frequently considered as a feature of the Final Neolithic and continued to be common in the Early Helladic period (see Wiencke 2000: 535-6). The function of this shape remains unclear. Heidenreich (1935-1936: 139-41) firstly argued these vessels are associated with cheese-making while a recent study by Decavallas (2007) suggests the perforated vessels belong to part of the beehive (see also Liaros 2003: 240). The wide distribution of this shape on the mainland, the Cyclades and Crete may suggest their socio-economic significance across the Aegean (Alram-Stern 2014: 313-4).

At Kontopigado, a substantial amount of pan fragments is found, and sometimes the complete profile is occasionally preserved. The profile is shallow and usually has an opening of which the low wall sloping down to the base rim. In this thesis, the cheese-pot is categorised by a row of perforations beneath the rim and the base is roughly finished with imprints of crushed stone on the underside of the base (see Figure 3.32).

Figure 3.32: Parts of bases from pans (cheese-pots) with imprints of crushed stone on the bottom from Kontopigado (photographed by the author, not-to-scale).

The baking pan is distinguished by a shallow or flat profile and occasionally with one or two pierced holes and the base is rough without any imprints. Few base fragments join a part of the rim (Figure 3.33). The interior surface is smoothed or burnished and frequently has a grey or mottled exterior, possibly resulting from burning. The total number of cheese-pots is substantial comparing to baking pans which are relatively small in the EH I assemblage.

Figure 3.33: Parts of pans with sloping rims joining base part from Kontopigado (photographed by the author, not-to-scale).

vii. Pyxis

Three pottery sherds are tentatively attributed to this form. Three body sherds, with a globular profile, possibly with lugs which have broken off, and a dark surface. One has herringbone incisions and stamped concentric circles. Such forms are rare in this assemblage and have parallels in the early EC I pottery tradition of the Pelos group (Stampolidis and Sotirakopoulou 2011), suggesting that they may be imported.

Figure 3.34: Parts of pyxides from EH I fills at Kontopigado (photographed by the author, not-to-scale).

3.4.2 Early Helladic II

There are large EH II fills at Kontopigado with huge quantities of material which have a very consistent set of shapes that are characteristic of this period. These are yet to be fully mended and studied. This thesis concentrates on a small part of this sort of pottery, around 600 sherds from 11 excavated units in the EH II houses, including the units in the House of Seal. Strikingly different from the pottery dominated in the EH I torrent fill with the red slipped and burnished pottery, the EH II ceramic materials are characterised by higher fired bluish grey to white slipped vessels. The pottery sherds are not as fragmented as EH I, yet they have not been fully studied to find joins.

In general, the consistent EH II ceramic assemblage is divided into two parallel traditions (Figure 3.35).

1) A medium red slipped and/or burnished and plain coarse ware seems to be the continuation of the preceding phase. Nevertheless, the red slips are more homogeneous on the surface without mottling and the coarse ware frequently has a thick T-rim that distinguishes these vessels from their predecessors.

2) A striking new range of hard-fired, thin-walled vessels with white, bluish grey or black slips, some plain (mainly dish and cup) suggesting the various techniques and preferences in surface colours and finishes. The very well smoothed surface, if not burnished/polished, suggests then additional care for surface finishes. Moreover, the existence of wasters (Figure 3.36), the overfired production debris, testify to pottery manufacture at Kontopigado. The introduction of fine tableware with metallic appearance in the EB II period, and the marked stylistic and technological changes in pottery production existed not only at Kontopigado, but also throughout the wider Aegean area at the same time. Such specific technological developments particularly involved in the control of temperature and atmosphere in firing, but also in the radically changed choices of raw materials, happen simultaneously. However, the dominant bluish grey to white surface finish is a distinct feature at Kontopigado and the considerably larger number of them are presented mainly in Attica (e.g. Koropi, Ayios Kosmas, Raphina and Askitario, see Douni 2015).

Figure 3.35: Pottery sherds from EH II house deposits at Kontopigado. Top Row: red slipped and plain coarse ware which are similar to the preceding phase. Bottom row: new types of tradition with a variety of slip colours and new vessel shapes (photographed by the author, not-to-scale).

Figure 3.36: Wasters from EH II deposits at Kontopigado (photographed by the author, not-to-scale).

i. Sauceboat

A substantial number of thin-walled sherds are discovered in the EH II Kontopigado are attributed to this distinctive vessel type. Rim fragments are generally thin with a profile of mostly incurving, occasionally thin rounded rim, one rim with flat lip and one with slightly rounded inner rim. A variety of spouted profiles are present; both long and short, broad or narrow, all having a tendency to have a broad opening with smoothed or pointed edges. In some cases, the traces of pulling from the rim reveal the manufacturing technique. There are three types of horizontal handles below the rim opposite the spout: the lug handle, strap handle (round in section) and strap handle (flat in section). Base fragments attributed to this form are low pedestalled or ring-footed bases with small variations.

The sauceboats are mainly bluish grey to white slipped and frequently white to creamy white or silver white slipped, occasionally dark slipped rarely brown, with only one example simply burnished. The combination of surface treatments is not uncommon; A few fragments of sauceboats are slipped with bluish grey to white on the exterior/interior and with dark/red or highly burnished on the interior/exterior. The quality of the slip is usually good, while one spout fragment is covered with a slightly thicker matt dark slip and cracks observed. The sauceboats have very fine fabrics with or without very rare white, dark, orange or red inclusions. They are well-fired with grey or a grey core with light coloured margins.

Figure 3.37: Sauceboat fragment with horizontal handle (round in section) (left) and low pedestalled bases (centre and right) from EH II house deposits at Kontopigado (photographed by the author, not-to-scale).

In the literature, the bluish grey to white slipped ware are often termed ‘yellow-mottled ware’ and the black slipped ware as ‘urfirnis ware’ (Blegen 1928: 78-83, Class AII; Pullen 2011: 116, 337, 343-4; Wiencke 2000: 584-93; Wilson 1999: 71, 76). However, the bluish grey to white slips of the Kontopigado materials presents difficulty in finding their corresponding classifications to include those variations. For example, the well-studied yellow blue mottled fine pottery (YMB/FJB) at Koropi (Douni 2015, 2020) consists of a variety of slip colours in which some are similar to those at Kontopigado, while many others with yellow to orange are rarely presented at our site. As a result, this thesis intends to use descriptive terminology in terms of the slip colours to avoid any confusion. In terms of the urfirnis pottery categorised in the literature covers a range of different black slipped vessels produced in different centres in the mainland and Cyclades (see Burke *et al*. 2018 for urfirnis ware produced in Corinth; Wilson 1999:

71-5 for a range of urfirnis ware presented in Ayia Irini; Renfrew and Evans 2007: 148-9 for urfirnis pottery in Melos). At Kontopigado, the black slipped sauceboats seem to be dominantly local while at nearby Kontopigado, both Attic and Corinthian versions are present (Burke *et al*. 2017: 111).

Comparable shapes are commonly represented in Attica at Ayios Kosmas, Koropi, Merenda, Askitario and Raphina (Douni 2015: 307, K189-193, K195, K198, K227, K248) and a few examples can be found at Mine 3 Thorikos, Eutresis and Zygouries, Ayia Irini on Kea and Poros-Katsambas on Crete (Blegen 1928: 91, fig. 79:28; Caskey and Caskey 1960: 155, pl. 49: VIII.15; Nazou 2014: 226, MI94, MI97, MI103, MI112, MI114, MI115, MI268, MI274, MI294, MI387, MI388; Wiencke 2000: 584-92, Type I, II, IV; Wilson 1999: 73, pls. 66: II-612, 67: II-619; II-642-3, II-646, II-649; Wilson *et al*. 2008: 267, fig. 26.5).

ii. <u>Saucer</u>

The term 'saucer' was used by Caskey and Caskey (1960: 165, no.33) to differentiate from another common form, that is, the bowl (see below v and vi) in the EH II period. The saucer is essentially a footed-bowl. There are no complete EH II saucers preserved at Kontopigado and they are identified on the basis of the fragment of bases and lower body. The base fragments include mostly pedestalled bases or ring bases, or a few of raised and hollowed ring bases with rounded ends. The body profile is possibly similar to the bowl. Most saucers are plain and few of buff white to white, red and dark slipped. This vessel form with the same base features also appears at Ayios Kosmas, Askitario, Raphina and Mine 3 at Thorikos, Lerna III, Eutresis and Lithares in Boeotia (Caskey and Caskey 1960: 155, pl.50: VIII.14; Douni 2015: 239, 244, Type Ia, IV, fig. 7:K48, 8: K63, 9: K67-78, 10: K80-83, K88-90, 12: K98-102, 57: A8-10, 73:R15, 78:HK13-15; Nazou 2014: 224, MI1094; Tzavella-Evjen 1985: 33, fig. 21d; Wiencke 2000: 340 Saucer Early Type 2, fig. II.5:P82-85, 551-2, II.80; Wilson 1999: 28, pls. 6, 45: II-30).

Figure 3.38: Fragments of saucers from EH II house deposits at Kontopigado (photographed by the author, not-to-scale).

iii. <u>Dish</u>

There are a small number of dishes in the EH II houses. Another seven sherds are tentatively assigned to this form due to the preserved sherds from rim to base for the complete profile. Three sherds have incurving rims, two of the thin rounded rim, one incurved rounded rim and one thickened rim. One base fragment possibly related to this shape is flat. A dish with incurving profile has a carination to the body which has a comparable profile from Midea (Alram-Stern 2018: 175, fig. 15). Most dishes are small with a variety of surface treatments, mostly slipped. They range from bluish grey to white and pinkish white slipped, white slipped and burnished, red slipped and burnished, dark brown to dark slipped and plain. This vessel form corresponds to those at Period II Ayia Irini, and other sites in the Cyclades, but is only found at a few sites on the mainland such as Ayios Kosmas, Koropi, Raphina, Zygouries, Lerna and Eutresis in Boeotia (Blegen 1928: 87, fig.76:270; Caskey and Caskey 1960: 153-5, fig. 11:VIII.1, 3, 21, 23, pl. 50:VIII.1, 2, 21; Douni 2015: 215-6, fig. 1:K5, fig. 72: R6-9; Mylonas 1959: drawing 54: shape S-2, phiale; Theochares 1953: fig.8 right; Wilson 1999: 26, pl. 6, 45: II-18-26).

iv. <u>Cup and goblet</u>

Cups and goblets are two extremely rare vessel forms with only a few sherds tentatively identified. Both cups have incurving rims, one is plain with fine fabric and the vessel wall is uneven and irregular; the other one has traces of buff to white slip on the interior and is well-made with the medium fine fabric. The cup profile finds its analogy to Mylonas' one-handled cup, a cylindrical body with straight walls, with the exception of no handle presented in this case (Mylonas 1959: 25, fig. 144: 181, 149: 215-6, 151: 220, 153: 242-3, 154: 244, 155: 250). This similar shape also occurs at Koropi (Douni 2015: 281, Type V: K160, fig. 18).

At Kontopigado, three goblets are identified by the pedestal base fragments, covered with bluish grey or pink slip. Two are made of fine fabric and one with bluish grey finishes is semi-fine and porous. The closest parallel example also occurs at Ayia Irini on Kea as an import (Wilson 1999: 77, pl. 68: II-673).

v. <u>Shallow bowl</u>

The EH I incurving shallow bowl continued to appear with more variation in surface finishes and rim shapes alongside more shallow profile and the finer fabrics in the EH II context at Kontopigado. The profile occasionally has a slight carination, commonly with the incurving rim and three of the bevelled inner rim, thickened rim with slightly flattened lip, thicken rim with bevelled lip, few of EH II typical rims and the more elaborate T-rim types. The majority is covered with slips, from buff white to white, bluish grey, dark and red accompanying with/without burnished or polished. A slightly less percentage is polished, smoothed or plain. Additionally, it shows a tendency that the plain shallow bowls, most of them possibly individual-sized judging from the small fragments, are made by the finer fabric. A few shallow bowls in gold mica fabric have the characteristic Aeginetan thick rim with grooved lip. The surface is black burnished, red or brown slipped and burnished.

vi. Bowl and Basin

In EH II, bowls and basins usually have thickened rims, extending to a characteristic 'T' shape on the exterior and interior of rim. Few fragments of rim with flat lip, incurving, thickened rim with slightly flattened lip, everted and slightly offset rim, thick rim with sharply flatten lip, thicken rim with sloping lip and rolled inner rim on a slightly closed incurving or open spreading profile (Figure 3.39). Medium to large size bowls sometimes have attached lugs such as horizontal flaring lugs, horizontal crescent-shaped lugs or horizontal horned lugs. Some lugs seem to be larger in size than the preceding period, suggesting they have a more practical use in this period. The base profiles include flat bases or bases with a rounded bottom. One rounded bottom of pot found attached on a pedestalled base, possibly functions as a stand for the round bottom.

A great variety of surface treatments are used in this vessel form, mostly slipped and occasionally polished/burnished or plain. Several wasters from a large incurving bowl with bluish grey slips on both sides are made of fine fabric, confirming the local production of the fine bluish grey slipped ware at Kontopigado. The deep convex bowl seems to have been replaced by the large bowl with the spreading wall, whereas the straight-walled basin continued to exist and appeared with attached horizontal rectangular lug(s). The surfaces of basins are evenly treated with two red slipped and/or burnished, two dark slipped and/or polished, two white slipped and/or polished and two plain. The closest parallels come from bowls at Ayios Kosmas (Mylonas 1959: 23, fig. 116, 117). Other comparable lug types appear at Mine 3, Thorikos (Nazou 2014: 223-4, MI568, MI888), Lithares in Boeotia and further pointed to Eutresis, the Cyclades and Anatolia (Caskey and Caskey1960, pl.46: II/28, Lamb 1936: 77, fig. 27; Tzavella-Evjen 1985: 34, Pl. 21).

Figure 3.39: Parts of large bowls with T-rims and lugs from EH II house deposits at Kontopigado (photographed by the author, not-to-scale).

A few bowl fragments are made in the Aeginetan gold mica fabric and have rims with flat lip and convex walls with heavily polished/scored exterior and polished interior (Figure 3.40). They are generally coated in a thick red slip. Some body sherds in the gold mica fabric have a straight wall, possibly representing basins, most having heavy polish or scoring on the exterior.

Figure 3.40: Parts of bowls/basins in Aeginetan gold mica fabric with a variety of surface treatments (photographed by the author, not-to-scale).

vii. <u>Jar and Jug</u>

Without the complete profile, sherds attributed to these two vessel shapes are based on profiles from Ayia Irini on Kea (Wilson 1999) and Tsoungiza (Pullen 2011). Seven jugs are recognised on the basis of the flaring rim, vertical handles of the rounded section, thick strap handles, two-stage neck sherds (see Figure 3.41). Three jugs are covered with bluish grey to dark slipped, dark slipped and polished and brown slipped. Another four jugs are plain. A rounded handle with applied pellet (see Figure 3.41) is also found at EH II Midea, Ayia Irini on Kea and Knossos on Crete (Alram-Stern 2018: 177, fig. 18.d; Wilson 1999: 85, pl. 70: II-749; Wilson 2007: 53, fig. 2.3:3). Two jugs have high cylindrical necks splaying to a circular opening (see Figure 3.41) with an attached handle of the rounded section, and comparable examples occur at Ayios Kosmas, in

Mine 3 at Thorikos and at Ayia Irini on Kea (Mylonas 1959: 25, fig. 117: 14; Nazou 2014: 277, MI698; Wilson 1999: 83, pls.21, 69: II-726).

The collared jar/jug is frequent in a medium fabric, usually with a red to dark brown slip. Two profiles have been identified: a closed jar with a collar and incurving rim and an open-mouthed jar with a flaring shoulder and outcurving rim. There are many two-stage neck fragments with part of the shoulder, occasionally covered with bluish grey to dark slips. A few base fragments assigned to jars are a blushed grey slipped flat base with a convex wall, a white slipped and a plain flat base with a rounded edge and flat base with a round bottom with brown slipped and burnished exterior and smoothed interior. A larger strap handle usually found on the collared jar is present with a red slip. Wasters of rims, strap handles, neck and shoulder fragments from jars/jugs have been identified, indicating the local production of various shapes of jar/jug.

This shape finds correspondence at Ayia Irini and limited findings from Askitario, Aegina, Mt. Kynthos-Delos, Christiana and Poliochni-Lemnos in the Aegean (Wilson 1999: 37, pls. 9, 50: II-197). A unique vertical handle of sagged type finds close to parallel at Mine 3, Thorikos on a low collared jar as well as at Manika (Nazou 2014: 228, MI508-9; Sampson 1985: fig. 23). The closed jars with thickened rim find their close parallel at Tsoungiza (Pullen 2011: 186, 215-6, 227, fig. 4.19: form 16, fig. 4.32-33:270-2, fig. 4.41:318).

Figure 3.41: Parts of neck (left and centre) and handle (right) of jars/jugs from EH II house deposits at Kontopigado (photographed by the author, not-to-scale).

viii. Storage jar (pithos)

The existence of pithoi is represented by a rim sherd and a body sherd. The rim is thickened and rolled and has a thicker vessel wall when the surface remained untreated with a grey core diffused to buff to pink margins. Of the thick-walled body sherd which is made of medium coarse fabric, has a porous surface and is white slipped.

ix. Unidentified shape

Twelve potsherds possibly belong to two individual vessels and have a yellow to pink surface which is applied with a faded black slip or 'wash'. Due to the similar appearance presented at Koropi which is argued as imports (see Burke *et al*. 2017: 111), it is suggested that these fragments at Kontopigado belong to the imported vessels from Corinth.

Figure 3.42: Parts of vessels with black slips or 'wash' on yellow to pink surfaces (photographed by the author, not-to-scale).

3.5 Summary

In summary, this chapter outlines the many aspects of social transformation in Attica including site planning and material culture, accompanied by extensive crafting activities. It is important to point out the early development of metallurgy in Attica can be traced back to the Final Neolithic and the close contact with the Cyclades in the late EH I period. Together with the metallurgical finds and evidence for obsidian working, it appears that Kontopigado and West Attica are involved in many industrial activities that conform to the other regions in Attica. Therefore, it requires us to contextualise Kontopigado and Alimos in the western part with the rest of Attica to understand the relationship between Attic communities inland and along the coast of Attica.

More importantly, such changes show that ideas are changing rapidly, with extensive long-distance interaction. Kontopigado and areas of Attica are vital to this understanding and it seems clear that looking at this geographical area, through a ceramic approach will provide insight into many key theoretical concerns that underlie our interest in the Early Bronze Age Aegean.

Studies of the Early Bronze Age Aegean, since Renfrew (1972), have often stressed the transition from EB I to EB II as a turning point in terms of technology, the organisation of craft production, including craft specialisation, and the ways in which people socialised and interacted in a material world. Such discussions often build in the context of the development of metallurgy, the emergence of extensive trade networks and social behaviour such as drinking and feasting, all of which are closely related to the appearance of fine tableware.

A comparison of ceramic assemblages of two phases at Kontopigado shows radical changes between late EH I and early EH II, showing a touching point of change in pottery production and consumption. Not only do the new shapes and surface finishes epitomise the changes in society and the emergence of long-distance exchange, but also wasters and large-scale pottery show deep changes in pottery technology and organisation of production in west Attica which may link to the technological changes and emergence of specialisation in the wider Aegean. As a consequence, the study of pottery production and consumption will illuminate the socio-cultural and technological changes as well as the role of Kontopigado and its surrounding sites have played in the regional and interregional networks across the Aegean during this formative period.

Chapter 4 Analytical approaches and methodology

The preliminary study of Kontopigado ceramic assemblages outlined in Chapter 3 reveals very different pottery repertoires in the EH I and EH II phases, showing major transformations in stylistic and technological aspects of ceramic vessels at this great time of change. The innovation in style and technology of ceramics and in their production, as well as the variability within the ceramic assemblages, reflects both the flow of stylistic influences between regions of the Aegean and technological transmission over time. The presence of overfired wasters is evidence for locally produced pottery in the EH II period and the abundant potsherds of a rather uniform type in EH II presumably attest to the large-scale production. In order to investigate the source of pottery, the different ways or patterns of making pottery, the identification of production places/areas, the exchange of pottery between sites and the diachronic technological and organisational change in the local pottery production, with questions of how the pattern of consumption changes in mind, this thesis comprises a ceramic study within three basic frameworks: groupings, technological reconstruction and suggestion of provenance. These three frameworks are based on the theoretical standpoint that technology is essentially socially constructed, and pottery production are examined through technological aspects of the pottery manufacturing sequence. The interpretation of certain crucial components of a chaîne opératoire approach, in particular the choices and manipulation of raw materials, surface modification and firing strategies, involves the issues relating to the technological choices and practices in production, distribution and the pattern of exchange, and the organisation of production that taken the archaeological context into account in which the ceramics were produced, circulated and consumed within this study.

4.1 Material culture and a social approach to technology

Studies of material culture are fundamental to archaeological research. The link between the visible characterisation of the finished products and social implications has been generally accepted in archaeological studies (see Chapter 2). On the other hand, the relationship between the technical aspects of manufacturing processes and social dynamics was not widely emphasised in the Anglophone literature until Lemonnier

(1976, 1986) emphasised the way in which socio-cultural embeddedness in the manufacturing techniques by integrating the chaîne opératoire approach.

The term 'chaîne opératoire' refers to an operational sequence of the manufacturing processes, consisting of selections of raw materials, paste manipulation, shaping techniques, surface treatments and firing, involving a series of rational practices and technical gestures taken by the potters in which the potting tradition is shaped by and embedded on the social environment (Dobres and Hoffman 1994; Gosselain 2000; Lemonnier 1986, 1993; Mauss 1934; van der Leeuw 1993). Archaeological and ethnographic ceramic studies have benefited in particular from the chaîne opératoire approach (e.g. Livingstone Smith *et al.* 2005 for different aspects of pottery manufacturing processes).

Van der Leeuw (1993) stated that the potter's choices and actions are varied according to social circumstances, emphasising the social dynamic and social relations that construct technological behaviours. The social context of technological practice leads to characteristic, different 'technical behaviours' or 'technical gestures' (van der Leeuw 1993: 239). That is, it is the technical behaviours or technical gestures shaped by the social phenomenon that contributes to the particular style of the finished products that characterised a particular 'technological tradition' (Rye 1981: 5). This helps to pinpoint certain 'communities of practice', that is, as a social system in which individuals participate in the practices of social communities and produce materials that reflect the shared practices in a certain social learning process (Lave and Wenger 1991; Wenger 1998). Consequently, the configuration of technological traditions and changes is subject to the vertical and horizontal transmission of techniques which elucidate social boundaries and interaction between social groups (Roux 2017). Therefore, the concept of chaîne opératoire reveals a series of technical elements in a broader technological context built upon the cultural and social context of identity. As a result, identifying the possible origin of raw materials and similar technological traditions can allow the identification of centres of production and communities of practice, and offer insight into the study of social relations and social organisation.

As technology is socially constructed and technological change is tied with social change (Pfaffenberger 1988, 1992), thus technological changes offer a reflection on the social changes (Lemonnier 1993). As Franklin (1999) proposed, technology and production organisation are inseparable and that relationship enables the examination of craft specialisation at the individual and organisational level. Therefore, the chaîne opératoire approach offers an opportunity to reconstruct the technical and social aspects in the manufacturing sequences and thus allow archaeologists to understand the social and cultural identities, social relations and boundaries within the particular social phenomenon. The examinations of pottery manufacturing processes enable the archaeologists to identify the technological and its related stylistic changes which are extremely important to examine the close relationship between pottery development and changes in society in the critical transitional periods.

4.2 The manufacturing process in pottery production

With the socially contextualised aspects of chaîne opératoire approach in mind, the crucial stages in the manufacturing sequence of pottery production related to this work are best illuminated by ethnographic studies and their association with technological and social traits.

4.2.1 Obtaining raw materials

The potters' first step is to collect the raw materials. Some ethnographic studies confirm that raw materials are obtained from the known deposit(s) and the knowledge of the location of suitable clay may be shared within a certain group (Gosselain and Livingstone Smith 2005: 33; Rye 1981: 16). In addition, Rye (1981: 17) asserted that the selection of clay is limited by social and economic reasons, such as 'ownership or control of land, seasonal access, depth of overburden, and distance of transport'. Arnold (1985, 2006) and Gosselain (2002: 40-41; Gosselain and Livingstone Smith 2005: 35) suggest a 7 km and 3 km maximum radius respectively for the distance of clay collection, as a possible distance threshold for potters. As a result, it shows that selection of raw materials is a deliberate choice by potters and the distance threshold may pinpoint close proximity of possible clay deposits to the production centres. Shepard (1963) has recognised the usefulness of thin section petrography in the field of provenance suggestion through the identification of geological and/or geographical sources of raw materials.

4.2.2 Paste preparation

This manufacturing stage recognises the interactions between potters and their raw materials under natural and social constraints. There are many possible techniques involved to reach the appropriate state of a paste such as hand-sorting, levigation, crushing or grinding, mixing, adding temper, kneading and pounding (Gosselain and Livingstone Smith 2005: 37-41; Rye 1981: 36-40; Sall 2005: 60). The knowledge and the experience of potters are crucial to producing the most suitable paste recipe for making their pots. Gosselain and Livingstone Smith (2005: 40-41) stated that although there are many ways to manipulate the paste, potters follow 'tradition' and perceive their choices as the only method to reach the desired result (e.g. Day 2004). Therefore, paste manipulation is a crucial stage to explore the transmission of knowledge and technical skills in a single potting community or across a wider region. Thin section petrography has been considered as a useful method in ceramic studies to examine the potter's choice and practices in the manipulation of raw materials (Day 1989; Whitbread 1995).

4.2.3 Forming

In the stage of forming/shaping vessels, a wide range of forming techniques has been identified (Rye 1981: 62-82; Sall 2005: 60). Likewise, shaping techniques are varied in accordance with the knowledge and social identity of the potters (Sall 2005: 61). Shepard (1963: 393) pointed out that it is potters' decisions to use certain forming techniques to attain the certain shape of vessels which can be completed by many other techniques. Furthermore, the shapes and size of ware are determined by the intended function of the vessels, the natural limitation of the paste and the cultural perception of potters. The final shape of the vessel is the most visible characteristics towards consumers. Balfet (1984) suggested that the vessel shape is the result of techno-economic production, which demonstrate the demand of consumers and social concepts. As a result, the shaping techniques are substantially socially decisive. The different techniques of forming in the Bronze Age Aegean have been explored by several scholars through the detailed macroscopic observation of macrotraces on the vessels (e.g. Gorogianni *et al*. 2016; Burke 2017; Choleva 2018; Douni 2015; Knappett 2016; Mentesana 2016). A variety of analytical techniques can be employed to investigate the forming methods such as thin section petrography (e.g. Whitbread 1996; Woods 1985), X-ray radiography (e.g. Berg 2008, 2009) and recent developments with micro-CT scanning (e.g. Kozatsas *et al*. 2018). However, in this study, due to the fragmentation of vessels in the Kontopigado assemblage, forming methods can only be detected by the sherd break in some cases. As a result, forming techniques can be only partially reconstructed and, therefore, the forming method of vessel will not be the focus of this thesis.

4.2.4 Surface treatments

The surface treatments of vessels can be divided into two categories: the primary finishing of the surface such as polishing, wiping, slipping or burnishing and the secondary refinement by techniques such as painting, and the addition of appliqué (Rye 1981). This process can be based on both functional and/or decorative properties. In a fashion similar to vessel shape, the surface modification of the pot is closely tied to the aesthetic appreciation of the potters and consumers and, therefore, is explicitly linked to social values and ideology. In other words, the surface of the vessels may be treated with different techniques which sometimes create a similar surface effect. Furthermore, similarly to clay exploitation, the acquisition of colouring agents is restricted and strongly related to the social relations and interactions of the artisans (Bowser 2005).

In this thesis, the most striking differences encountered in the pottery are the result of the uses of slips, which in turn are dependent on raw material selection, processing and firing conditions. As a result, it is the technology of slips that comprises one of the main ways to assess technological and typological change in the Kontopigado ceramic assemblage.

4.2.5 Firing

In this stage, sufficient technological and social knowledge is essential to achieve a satisfying result. Potters are aware of the duration, temperature and atmosphere of the firing, which all contribute to the appearance of the final product (Nicholson and Patterson 1989; Rice 1987: 80-1; Rye 1981: 98). The potters have to be familiar with firing procedures to avoid any failure and must control the firing duration, fuel consumption, the time to reach the peak temperature and the colour variation during the cooling period (Nicholson and Patterson 1989: 80). The firing process is not merely a technological process; firing procedures can be varied according to the individual potters and the reasoning behind actions which can be unrelated to purely technical issues (Gosselain 1994; Nicholson and Patterson 1989). Due to the complexity of firing, specific firing behaviours may reflect the technological style of the potters and the social relations between different groups. Some firing sequences, such as those which involve a built structure (kiln), offer potters differential ease of control of the firing conditions. They require not only increased investment in building such structures, compared to open firing, but also more complex technological knowledge to control some kiln firing sequences (Rye 1981: 99-111).

4.3 A framework of analysis

It is clear that there are recognisable sequences in the manufacturing process which can be individually examined and understood in the final products, as a comprehensive manifestation of technical and social phenomenon. There is substantial variability of pottery production sequences, as shown ethnographically. From the choices and practices potters made based on the long-term learning and practices, to the establishment of potting traditions that potters developed and followed, influenced by their social environment, human interaction can be revealed at different levels. This includes the transmission and acceptance of knowledge and techniques both vertically (from one generation to the next) and horizontally (from one community to another).

Roux (2017) develops insights into variability in operational sequences through the concept of chaîne opératoire, which integrates different analytical techniques. Likewise, within the Aegean archaeology, several scholars have examined ceramic production from a perspective of chaîne opératoire (e.g. Burke 2017; Choleva 2018; Douni 2015; Hilditch 2008; Mentesana 2016; Mentesana *et al.* 2016a; Nodarou 2011). Although some may not be able to completely reconstruct all stages in chaîne opératoire approach, due to limitations and the nature of materials, their analysis and results rely on the principle that technology is socially embedded and reconstruction of technology is deeply relying on the chaîne opératoire approach. The social relations involved in the knowledge transmission system and discernment of the spatial distribution of knowledge and technological transmission network reveal human interactions on both intra- and extra-community levels. As a consequence, even though the full technological sequence of manufacturing processes is not completely reconstructed in this study, it is possible to select certain key components from it to signal similarities and differences reflecting that pottery technology is not simply technical choices but deeply socially embedded.

Moreover, this thesis aims to use the macroscopic study to group the ceramic materials and reconstruct different parts of technological sequences, concentrating on the choices of raw material and manipulation and firing procedures which are essential to the significant differences in the nature of pottery from EH I and EH II. The following sections outline the strategy of sampling based on this and how the reconstruction of the specific parts of technological sequences are investigated with the associated analytical techniques in this study.

4.3.1 Sampling strategy for the analyses

Preliminary information was provided by author's macroscopic examination of material from 61 excavated units. All pottery sherds were categorised by macroscopic fabric, surface treatment and details of forms of diagnostic sherds (rim, base, etc.). The choice of samples was based on technological variability observed in the pottery. Considering the great volume and the wide range of the sherds in fabrics, surface finishes and vessel forms, a total of 190 samples were selected for analysis, all of which were to be subjected to thin section petrography and a subsample of which were analysed by other techniques, such as SEM and XRD.

The EH I and EH II ceramic assemblages appear to be consistent according to their date across individual excavation contexts and thus samples were selected across well-dated units, in order to obtain a general picture of the assemblage. Ultimately, 90 samples were selected from 34 out of 50 units in the EH I winter torrent and a further 100 from 11 units in the EH II houses, both representative samples encompassed all macroscopic fabric classifications, with a variety of surface treatments and morphological properties of diagnostic sherds (rim, base, etc.). A selection of wasters, the overfired discarded by-products in the EH II deposits were also included, as certain indicators of locally produced pottery. A sub-sample of the 190 were selected for examination by scanning electron microscopy with energy dispersive X-ray spectrometry (SEM-EDX) and X-ray diffraction (XRD) analysis. Their choice was based on the petrographic groupings, the observation of surface treatments and questions regarding firing conditions, mainly observed by the colour in cross-section and thin section.

4.3.2 Characterisation of groupings

Rather than classification on a conventional typological basis, a new system of ceramic classification including fabrics points to the importance of approaching the technological aspect of ceramic studies. Warren (1972) classified the pottery from Myrtos-Fournou Koriphi based on shapes, surface decorations and fabrics. Likewise, Wilson's pottery study of the EM Knossos on Crete (1985, 1994, 2007) and the FN/ECII-III Ayia Irini on Kea (1999) established the new approach of ware groups through fabrics, surface decorations and shapes. It suggests that the fabric classification (both macroscopically and microscopically) allows a better understanding of the development of pottery manufacture from a production perspective. Therefore, the classification of fabrics is stressed in the process of grouping in this study.

Although the groupings may be tentative, they support the characterisation of fabrics, providing a means by which to associate groups of vessels with a particular technological tradition and the production group(s). This thesis presents the stylistic and technological groupings to fill in the gap, showing a progression from one style to another which revolved around the development of pottery technology. The principle is the grouping of vessels through the assessment of their similar or different characteristics of each vessel. The framework of analytical techniques is designed to identify whether the differences observed signify markers for technology or provenance.

4.3.2.1 Macroscopic examination

The macroscopic investigation allows the examination of various aspects of vessels from fabrics for reflecting choices and manipulation of raw materials, surface colour and finishes for firing conditions, shapes and decoration for functional or decorative attributes. In this research, the investigation of macroscopic properties primarily prioritised macroscopic fabrics in terms of clay colour, texture and inclusions and followed with the surface finishes, details of forms of diagnostic sherds (rim, neck, base, etc.).

Over 5500 sherds were examined based on technological and typological features. These potsherds were divided into different macroscopic fabric groups according to differences in texture and inclusions. The texture is determined by the coarseness of the clay paste in conjunction with the observation of voids. The inclusions were mainly classified by size, colour and shapes. Thus, the whole assemblage was divided into coarse, medium and fine wares and sub-divided by different inclusions.

The second step of macroscopic classification involved subdivision by surface modification and typological features. Details of the size of the vessel and sherds of diagnostic morphology gave additional indications about vessel type and possible function. The pottery sherds examined included also non-diagnostic sherds (in terms of morphology) in order to give a general picture of the appearance and characteristics of the ceramic assemblage. The diagnostic sherds (rim, handle, lug and base) are used as shape indicators and provide information for the stylistic and technological details in terms of specific features and forming methods if observable. The surface texture and surface colour are essential elements of the appearance of a pot. The smooth surface texture can be subclassified into various finishing techniques such as slipping, burnishing, polishing and scoring and distinguished from the untreated plain wares. The surface and slip colour vary according to the original composition of the raw materials and the physiochemical reactions that take place during the firing process. Slipped vessels exhibit a range of slip colour. In order to avoid ambiguity, this work remains descriptive in terms of colour and surface effect.

Furthermore, the observation of cross section colour is an important reference to the firing conditions. The variation between core and margins may be used to indicate both firing atmosphere and heating gradients (Rye 1981). In general, a core with red, buff to brown in colour suggests an oxidising atmosphere and grey to black indicates incomplete oxidising or reducing atmosphere. The distribution of grey cores and sharp/diffuse boundaries indicates the degree of oxidising/reducing atmosphere, an incomplete oxidising atmosphere or the change of firing conditions. To summarise, the macroscopic examination gives insight into the technological choices and inherent constraints in pottery production.

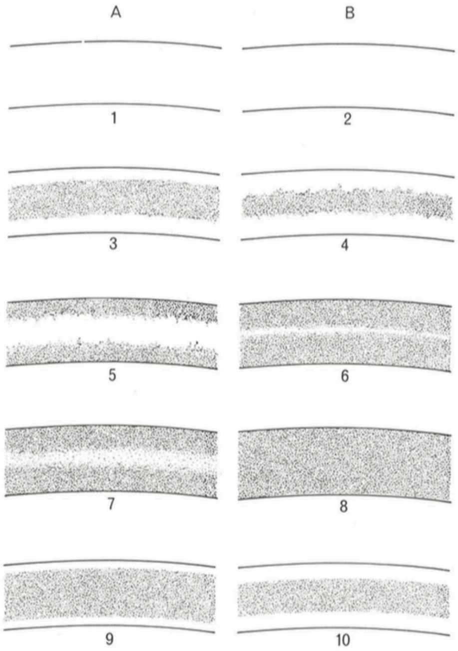


Fig. 4.1: Variations in cross section. Column A: fine texture. Column B: coarse texture. 1-2, fully oxidised. 3-4, not fully oxidised with diffused grey core. 5-7, not fully reduced with diffuse light core. 8, fully reduced with no core. 9-10, changing atmosphere with sharp grey core. (Rye 1981: 116, fig. 104).

Based on the macroscopic examination, the chosen samples are arranged to be examined using an integrated analytical framework by thin section petrography, scanning electron microscopy (SEM) and X-ray diffraction (XRD) that available to this research to further investigate the formation of groupings, various aspects in the reconstruction of pottery technology and making the suggestion of provenance.

4.3.2.2 Thin section petrography

Thin section petrography is the main analytical method of the presented work that contributes substantial insight into the reconstruction of pottery production and has been used to groups and suggest the provenance of the ceramic assemblage.

In the 1960s, Shepard (1963) and Peacock (1969) demonstrated the potential of ceramic petrography to characterise groups of vessels on the basis of their fabrics and a ceramic technological analysis. Thin section petrography has been widely used as one of the major analytical methods in the Aegean ceramic studies (e.g. Betancourt and Myer 2000; Boileau and Whitley 2010; Burke *et al.* 2018; Day *et al.* 1999, 2012; Hilditch 2007; Hilditch *et al.* 2008, 2012; Kiriatzi *et al.* 2011; Mentesana 2016; Vaughan 2006; Whitbread and Mari 2014; Wilson and Day 1994, 2000; Yiouni 1995). Thin section petrography is foremost in the system of grouping to explore the similarities and differences between samples. As pointed out by the above-mentioned scholars, thin section petrography can group samples with similar characteristics of paste which is fundamentally the constitution of clay and aplastic inclusions together with the possible addition of tempering materials or the mixing of different plastic raw materials. Consequently, petrographic groups are able to illuminate similar or different choices and manipulations of raw materials and firing procedures and also point to distinct geographical areas (e.g. Wilson and Day 1994). Therefore, the nature of thin section petrography not only contributes to the reconstruction of pottery technology, but also further explores the technological choices made by the potters and their traditions which provides information on the characteristics of production centres.

Subsequently, the petrographic groups of the Kontopigado assemblage were compared to the available reference materials in the different regions to identify products of specific production centres and subsequently possible production places/areas. Combining these early attempts of the integrated ceramic analytical techniques based on the Aegean Bronze Age materials allowing this study for microscale investigation of pottery technology and provenance and macroscale interregional pottery exchange and interactions between communities.

Specifically, the large quantity of very similar sherd material, including wasters, suggests local production at Kontopigado. Therefore, thin section petrography allows us to characterise and reconstruct the critical technological sequences in the local pottery production, in order to investigate the continuity and innovation in paste recipes and firing regimes over time. This enables the examination of organisational and technological development in this great time of change in the Early Bronze Age Aegean, a key focus of this study.

The 190 samples prepared as thin sections were studied under a Leica DM2700P optical polarising microscope. Photomicrographic images of fabrics were taken with the Leica Application Suite V4.3. The petrographic description in this work follows the recording system proposed by Whitbread (1995). Each thin section is assigned to particular fabric groups based upon the compositional and textural relationship between the groundmass and aplastic inclusions. The composition of the groundmass gives an indication to the origins of the clay sources. The occurrence of minerals and rock fragments as well as textural concentration features along with their frequency, size, sorting, distribution, shape and orientation are able to identify the geological environments and very importantly, related to the stage of paste manipulation (Whitbread 1995). The colour and the optical activity of the groundmass reflect the vitrification of the clay and thus can be used to infer broad ranges of relative firing temperature and firing conditions (Whitbread 1995). The microstructural change over the course of firing can be further observed by SEM with higher magnification (see section 4.3.3.1 below). As a result, technological and geological dimensions of raw material selection and processing as well as firing technology can be detected by petrographic analysis.

4.3.2.3 Summary of grouping and suggestion of provenance

To summarise, the methods of grouping are mainly dependent on thin section petrography to give greater detail on the technological aspects of production. Each petrographic group is represented by specific technological choices and practices that are held by a group of potters. This forms their particular technological tradition in production which results in final products with their unique associated characteristics. The recognisable technological traditions distinguish different potter groups and technological knowledge sharing between the potting communities demonstrates specific spatial and temporal characteristics.

In terms of suggestion of provenance, the petrographic groups can be compared and linked to other reference assemblages and provide a more detailed geological reality which may locate the specific technological tradition of the production group(s) within specific places and areas of manufacture in the landscape. In addition, through mineralogical characterisation within petrographic groups, it is possible to identify the geological environment and specific sources using geological maps and sampled clay deposits (e.g. Boileau *et al*. 2010; Dorais *et al*. 2004; Gauss and Kiriatzi 2011) (Freestone 1991: 399; Whitbread 1995: 374). As a result, the petrographic groupings and consideration for provenance also facilitate understanding of the circulation of pottery and exchange network which are important issues in the broader picture of EB I-II Aegean that discussed in Chapter 6 and 7.

4.3.3 Reconstruction of technological sequences in ceramic production

Beyond raw material choice and manipulation (mainly investigated by thin section petrography) and forming (mainly assessed by macroscopic comment where feasible on this fragmented assemblage), it is in the surface modification that the assemblages of the two periods stand out as being different. Most ceramic materials in both phases in the Kontopigado assemblages are characterised by various colours of slip, as well as some treated with further modification of smoothing, burnishing, etc. The slip and surface layers can be observed petrographically, however, this study mainly employs SEM in association with an energy-dispersive X-ray detector (EDX) to conduct elemental analysis of the surface layer and ceramic body. Through the comparison of elemental compositions between the slip layer and ceramic body, it is possible to suggest the similar or different materials are prepared for slip. Therefore, the variables in the operational sequence of surface treatment in terms of the nature of slips and different techniques are suggestive of investment of material preparation, time and effort that reflect the technological and organisational aspects in the pottery production in this research.

The detailed investigation of firing practices is also stressed in this research. This is due to the very different nature of pottery from the two phase-specific fills of Kontopigado that reflects a major change in the choices and manipulation of raw materials in relation to the operation of firing strategies between EH I and EH II period. Previous studies of archaeological ceramics reveal some aspects of firing strategy in terms of temperature and atmosphere by mineralogical and microstructural analysis. The mineralogical transformation in the paste at different phases of firing can be detected using X-ray diffraction (XRD) analysis (Maggetti 1982). Moreover, the microstructural examination of the degree of vitrification using scanning electron microscopy (SEM) with energy dispersive X-ray spectrometry (EDX) can determine the firing temperature in different paste compositions (Freestone and Middleton 1991; Maniatis and Tite 1978; Tite *et al*. 1982; Tite 1992). In order to provide a more comprehensive understanding of firing practices and the relationship between the composition of the various colours of slip and firing conditions, this study investigates the microstructural change and mineralogical transformation in the firing process through SEM and XRD respectively.

4.3.3.1 Scanning electron microscopy with energy dispersive X-ray spectrometry (SEM-EDX)

Scanning electron microscopy (SEM) has been an important analytical method used for pottery firing analysis since the 1970s (Maniatis and Tite 1975; Tite and Maniatis 1975; Kilikoglou 1994). The SEM coupled with EDX microanalysis provides information on microstructure including sintering and the vitrification stage of the matrix and surface layer, providing a basis for estimating firing temperature. Furthermore, the semi-quantitative chemical composition of the clay body and the surface layer through the examination of fresh fracture and the topography in the polished section is useful to offer the compositional data with the additional categorisation of the calcareous/non-calcareous materials. Moreover, the adherence between the clay body and the surface layer and its thickness and density are observable to justify the nature of the surface treatment.

Seventy-six samples were selected and prepared as fresh fracture and polished specimens. They were analysed using a JEOL JSM-6510 equipped with an energy-dispersive X-ray spectrometer (EDX) INCA 250 (Oxford Instruments) at CCiTUB, Scientific and Technological Centers, Universitat de Barcelona, operating with 20 kV accelerating voltage and a working distance of 13-17mm to take images in secondary-electron (SEI) and backscattered-electron (BSE) mode.

Previous studies show that the content of CaO plays an important role in the firing process (Fabbri *et al.* 2014; Kilikoglou *et al.* 1988; Maniatis and Tite 1981). Calcareous materials can withstand a higher temperature as the microstructure remain stable between 850 and 1050°C, which allows a broad temperature range for the potters to achieve a reasonably vitrified body (Maniatis and Tite 1975, 1981; Nicholson and Patterson 1989). In contrast, the microstructure of the non-calcareous materials changes rapidly within the range of 750/800-1050°C and leads to collapse over 1050-1100 °C and therefore requires more attention from the potters (Maniatis and Tite 1981). Based on the CaO content detected by SEM-EDX, the paste is classified as low calcareous or non-calcareous (<6% CaO), calcareous (6-10% CaO) or high calcareous (>10% CaO) (Maniatis and Tite 1981; Day and Kilikoglou 2001).

The secondary electron images (SEI) are mainly taken of fresh fractured samples to allow the examination of microstructure. The degree of sintering and vitrification in the microstructure offers an estimation of the equivalent firing temperature (EFT) and is significantly influenced by the firing atmosphere and the CaO content (Tite and Maniatis 1975). Therefore, a combination of the vitrification stage, firing conditions and the CaO content can be used to estimate the equivalent firing temperature (Table 4.1) (Maniatis and Tite 1975, 1981; Kilikoglou 1994). Furthermore, the variation of vitrification in the core and margins are important to judge variability in microstructural development that suggests the homogeneous or heterogeneous distribution of heat, given the firing duration and heating gradient. Previous studies by SEM demonstrate the significant development of microstructure during firing (Maniatis and Tite 1981; Tite and Mantiatis 1975). When the microstructure shows no sign of vitrification in clay particles, it is classified as No Vitrification (NV), indicating an equivalent firing temperature <750/800°C (Tite and Maniatis 1975: 122; Maniatis and Tite 1981: 61; Day and Kilikoglou 2001: 122). Initial Vitrification (IV) is defined with the appearance of smoothed and glassy clay filaments in both the calcareous and non-calcareous clays in the range of 800-850°C in the oxidising atmosphere and 750-800°C in the reducing atmosphere (Kilikoglou 1994: 70-75; Maniatis and Tite 1975: 20; Maniatis and Tite 1981: 61; Maniatis *et al.* 1984: 217-20). After 800/850°C, the microstructure demonstrates significant differences between non-calcareous and calcareous clays. For non-calcareous clay, the extensive smoothed glass filaments represent an Extensive Vitrification (V) in a range of 850-950°C in oxidising atmosphere and 800-900°C in reducing firing atmosphere (Kilikoglou 1994: 70-75; Maniatis and Tite 1975: 229, 1981: 61, 68; Maniatis *et al.* 1984: 217-20; Tite and Maniatis 1975: 20). When the firing temperature is over 950°C in oxidising conditions and over 900°C in a reducing atmosphere, the smoothed layers coalesce into the larger smoothed area which classified as Continuous Vitrification (CV) (Kilikoglou 1994: 70; Maniatis and Tite 1981: 61; Maniatis *et al.* 1984: 217-20). Along with Continuous Vitrification, a high concentration of fine bloating pores (CV(FB)) (0.1-5 μm) is taken as a sign of fast heating rate (Maniatis and Tite 1975: 230, 1981: 61; Maniatis *et al.* 1983: 776). On the other hand, the calcareous clays display Extensive Vitrification (Vc) of a stable microstructure with smoothed glass filament and small spherical bubbles (1-5 μm) due to the escape of gas in a range of 850-1050°C regardless of the firing atmosphere (Maniatis and Tite 1981: 65-6; Maniatis *et al.* 1981: 267, 1983: 778). With the increasing temperature, sometimes there is an intermediate stage, so-called Advanced

Vitrification (Vc+), which is characteristic for the coarser cellular structures and larger merged smoothed zones (Kilikoglou 1994: 71; Maniatis and Tite 1981: 70; Tite and Maniatis 1975: 122). The microstructure exhibits the coalesced smoothed zone with coarse bloating pores (>5 μm) is defined as Continuous Vitrification (CV(CB)) when the firing temperature is increased above 1080 °C (Maniatis and Tite 1981: 65; Tite and Maniatis 1975: 22).

Vitrification stage	Non-calcareous (Oxidising)	Non-calcareous (Reducing)	Calcareous (Oxidising)	Calcareous (Reducing)
NV	<800°C	<750°C	<800°C	<750°C
IV	800-850°C	750-800°C	800-850°C	750-800°C
V-/Vc-		750-850°C		800-850°C
V/Vc	850-950°C	800-900°C	850-1050°C	850-1050°C
V+/Vc+		>900°C	1050-1080°C	1050-1080°C
CV	950-1050°C	900-1000°C	>1080°C	>1080°C

Table 4.1: The equivalent firing temperature (EFT) estimated based on the vitrification stages and the content of calcium oxide (Modified after Faber 2004; Maniatis and Tite 1975, 1981; Kilikoglou 1994).

The EDX microanalysis for major and minor elements is used to distinguish the degree of differences in elemental composition between the clay body and surface layer. Principally, the nature of the surface layer and the manufacturing methods are revealed by the concentration of aluminium, potassium, calcium, magnesium and iron oxide due to the suspension, refinement or the use of completely different raw materials. The backscattered electron (BSE) images mainly from the polished samples, but sometimes from fresh fractures were acquired to consider the thickness and compactness of the surface layers, showing the characteristics of the surface layer, which can reveal information about different treatments by the potter. As a result, SEM-EDX analysis aimed particularly at identifying the degree of vitrification in the microstructure of the pottery for the examination of firing behaviours and distinguish the different surface treatments by chemical characterisation.

4.3.3.2 X-ray diffraction analysis (XRD)

The mineralogical transformation due to firing was studied using powder X-ray diffraction (XRD) analysis to estimate firing temperature. Approximately 1g weighted fragment was cut from 41 designated pottery sherds and the external surface was removed and ground into a very fine powder in an agate mortar. The powdered sample was fixed onto the holder and presses hard to create a flat, even surface to avoid any preferential orientation. The prepared samples were analysed with a Siemens D 500 diffractometer with Cu-K_{α} radiation at N.C.S.R. Demokritos in Athens. Each holder was scanned over an angular 2θ range from 3 to 60° in the step of 0.03° at a rate of 3 seconds per rotation. Each complete scan for one holder took 1 hour and 35 minutes. The X-ray diffractometers produce graphs that contain specific peaks characteristic of the individual minerals. Software X'Pert HighScore was used to evaluate mineralogical phase identification at the Departament d'Història i Arqueologia, Barcelona.

The mineralogical alterations and their relations to the estimation of equivalent firing temperature are well-established (Maggetti 1982). According to the evaluation of peaks, not only the mineral identification based on the position, the angle °2θ and d-value, but also intensity indicates the degree of decomposition of minerals and appearance of high-temperature minerals in the firing phase in the range of 30-35°2θ. The identification of important minerals provides specific indications to low- or high-fired ceramics. In general, the presence of clay minerals (illite-muscovite), calcite in the low-fired pottery and the appearance of new minerals such as gehlenite, pyroxene, mullite, spinel, etc. in the high-fired pottery.

The association to firing temperature is attested by reference to experimental studies: the decomposition of calcite begins >700°C and dehydroxylation of illite at 800°C and both are no longer detectable up to 950°C (Cultrone *et al.* 2001: 624, 629). The appearance of newly-formed minerals, so-called 'index' minerals, are formed in high temperature for a sufficient firing time such as gehlenite at 800°C, diopside (usually marked as pyroxene) at 800°C, mullite at 950-1000°C, spinel at 950-1000°C (Cultrone *et al.* 2001: 624, 633; Grifa *et al.* 2009; Molera *et al.* 1998: 201; Noghani *et al.* 2014: 180; Noll 1991: 105; Ouahabi *et al.* 2015: 410-11; Traoré *et al.* 2003). In addition, the appearance of specific minerals reflects not only the firing temperature but also the products of the reaction between the minerals (phyllosilicates, feldspars) in the primary phase as well as the calcium and iron oxides (Cultrone *et al.* 2001; Ouahabi *et al.* 2015). For example, gehlenite (Ca2Al2SiO7) is composed by the reaction of calcite, quartz and clay minerals at 800°C (Cultrone *et al.* 2001; Grifa *et al.* 2009; Noghani *et al.* 2014: 180). Furthermore, the X-ray intensity to indicate abundance of minerals. the during firing also depends on the grain size and frequency of the minerals, and thus the XRD interpretation is required to combine with petrographic results.

4.3.3.3 Methodologies of the reconstruction of ancient firing

Firing, while one of the most challenging stages in the pottery manufacturing process to the potters, is also problematic for archaeologists to reconstruct in analytical approaches to production. In order to obtain a comprehensive understanding of firing processes, this work assesses the variable firing parameters by combining ethnographic, scientific and experimental insights.

Analytical approaches to pottery firing are usually based on the estimation of equivalent firing temperatures (EFT). However, in certain circumstances, a wide range of firing temperature estimates can result from one firing episode (such as a bonfire firing) (Gosselain 1992; Maggetti *et al.* 2011). Furthermore, some have argued that there is no clear correlation between the maximum firing temperature and the type of firing structure used (Gosselain 1992). Indeed, a high maximum firing temperature can be reached by two very different firing practices (Livingstone Smith 2001, 2007; Maggetti *et al.* 2011) and thus show a problem of equifinality in the archaeological inferences of firing procedures.

Nevetheless, this critique from ethnographic literature is not always negative in its assessment of what can be understood from analytical studies. Gosselain's (1992; 1994) analysis of ethno-thermometric data suggests that the heating rate and firing duration are the main critical parameters to identify the firing techniques. In particular, the heating rate has been emphasised by Gosselain and Livingstone-Smith (1995) as the key to distinguish the different firing structures. In addition to ethnographic work, experimental study suggests that the heating gradient can also infer the different firing structures (Thér *et al.* 2019). Therefore, it is important to looking at the combination of firing parameters to reconstruct pottery firing. In general, the open firing or so-called 'bonfire' is characterised by low maximum firing temperature, rapid heating rate, short soaking time, short firing duration, oxidising or reducing atmosphere, non-uniform firing and possible contact between vessels and fuel (Daszkiewicz and Maritan 2017; Livingstone Smith 2001; Maggetti *et al.* 2011; Maritan *et al.* 2006; Nodari *et al.* 2004). On the other hand, kiln firing is characterised by high maximum firing temperature, low heating rate, long soaking time, long firing duration, oxidising, reducing and redox atmosphere and the homogeneous distribution of the heating as well as the separation of pottery and fuel (Daszkiewicz and Maritan 2017; Livingstone Smith 2001; Maritan *et al.* 2006; Nodari *et al.* 2004).

The complexity involved in the variability of firing parameters has been measured by a variety of analytical techniques. Maniatis *et al.* (1981, 1983) suggested that the content of calcium in the paste has a crucial effect on the firing process. Calcareous clay reacts differently from non- or low-calcareous materials in higher firing temperature and results in the different forms of microstructure (see also Molera *et al.* 1998). Furthermore, the firing atmosphere is an important factor in calcium-rich materials. For example, studies showed that a reducing atmosphere enhances the stability of calcium, preventing its decomposition at a low firing temperature (Fabbri *et al.* 2002; Letsch and Noll 1983; Maggetti *et al.* 2011; Maritan 2004; Maritan *et al.* 2006). In addition, the presence of calcium along with iron and its mineralogical transformation, combined with firing temperature and atmosphere, contribute to the colour of the final product (Maniatis *et al.* 1981, 1983; Molera *et al.* 1998, 2015; Noll *et al.* 1975). Therefore, the firing temperature changes over the course of firing, which can be observed by the colour of vessels. The chromatic variations in cross-sections for the estimation of firing atmosphere are also observable macroscopically. By the examination of the optical activity and the colour of the matrix in thin section petrographic analysis, the firing temperature and atmosphere can be estimated (Rye 1981; Whitbread 1995).

As a consequence, the final products are not determined solely by the firing temperature estimated, but are also associated with the chemical and mineralogical composition of the paste, the heating rate, firing duration in the maximum firing temperature, cooling period, firing atmosphere as well as firing structure. In other words, the variability of firing parameters is affected by choices made from the beginning of the pottery manufacturing process (raw material selection) to the last stage of firing.

To conclude, it is evident that there are gaps between ethnographic and archaeological case studies, but science has the means to dig into the technological practices of firing which may be able to bridge the gap. The analysis of pottery firing in this thesis is to focus on the consistency and homogeneity, the similarities and differences in firing regimes and to understand how well potters appreciate and control the firing strategy in the pottery manufacturing process during the transitional period.

Characteristics	**Analytical method**	**Firing parameters**
Optical activity	Petrography	Firing temperature
Colour a) matrix colour b) cross section	a) Petrography b) Macroscopic observation	Firing temperature, atmosphere & heating gradient
Vitrification	SEM	Firing temperature, heating gradient, firing duration
Mineralogical phases	XRD	Firing temperature

Table 4.2: Strategy for firing studies in this work.

4.4 Summary

In conclusion, this thesis focuses on the three related frameworks of methodology: grouping, technological reconstruction and suggestion of provenance. Unlike some analytical studies, provenance studies do not form a major part of this research and it is mainly analysed by thin section petrography. This thesis does identify vessels and materials imported to Attica, as well as suggesting the movement of pottery between different production locations on the peninsula. Beyond this, the current study comprises a unique opportunity to examine the production site at Kontopigado and the radical transformation in ceramic production which can be seen macroscopically between two periods: a putative transition of critical importance for the Aegean Early

Bronze Age (Renfrew 1972). Therefore, this thesis concentrates on technology to illuminate technological innovation and change and also provides insights into changes in the organisation of production.

The multi-analytical study of ceramics from Kontopigado intends to bridge the theoretical approaches explored in Chapter 2 through the methodological framework of technological reconstruction. From a ceramic perspective, the analytical methods employ the widely accepted techniques – macroscopic, petrographic, microstructural and elemental analysis – in which the combination of these analytical techniques offers detailed compositional information of the exploited raw materials and also equally importantly, provides information on how different raw materials are selected and manipulated by potters based on different technological choices and practices and thus characterise different technological traditions in pottery manufacture. Furthermore, it also offers a great potential of diachronic change and continuity in pottery production from raw material selection, paste manipulation, forming, surface treatment to the last stage of firing. As a result, the integrated analysis provides clear information on the range of pottery technologies and their location of production, as well as characterising patterns of consumption by the Attic communities in the Early Bronze Age.

Chapter 5 Pottery analysis and results

This chapter presents the results of an integrated programme of study, both macroscopic and analytical, of the Kontopigado EBA pottery assemblage. It presents and discusses the macroscopic, microscopic and chemical characterisation of the ceramics and their interpretation in terms of grouping, provenance and the reconstruction of technology. Thin section petrography forms the core of the chapter and it is on the grounds of the petrographic groups that SEM-EDX and XRD are applied. The integrated results aim to 1) understand the raw material choice and manipulations involved in the production of each fabric and identify the possible provenance, 2) recognise the different types of products produced in similar fabrics, 3) identify different methods of producing surface finishes, especially different techniques used within a locality or region, 4) to understand specific firing strategies employed in different wares and 5) ultimately, to compare the technological changes in paste manipulation and firing practice between EH I and EH II.

5.1 Macroscopic examination

Here the primary macroscopic fabric groups of the EH I-II Kontopigado ceramic assemblage are summarised. These are distinguished on the basis of clay and inclusion types (macroscopic fabric) and details of forming, surface modification and finish where possible in this rather fragmented assemblage. The relative frequency of vessel types is also outlined to represent their typological and technological association. In general, each distinctive macroscopic group has a clear coherence in terms of the other analytical parameters studied. Macroscopic observation of the cross section colour relates closely to firing, is of particular significance to offer hints about firing conditions and is very important in its combination with the more detailed analytical results from SEM and XRD regarding firing, as discussed in sections 5.3 and 5.4.

Macroscopic groups/ Ware type	MG 1	MG 2	MG 3	MG 4	MG 5
RSB shallow bowl	Few	Common		Few	Few
RSB bowl	Few	Common			
RSB deep bowl/basin	Few	Common		Rare	Few
RSB dish			Rare	Few	
RSB sauceboat			Few		
RSB jar/jug				Few	
BGS sauceboat			Frequent		
BGS saucer			Common	Few	
BGS goblet			Rare		
BGS basin			Common	Few	
BGS jar			Few		Common
DS saucer			Few		
DS jar/jug			Few	Few	
WS bowl				Common	
PS bowl				Rare	
PS goblet			Rare		
Burnished/Polished bowl	Few			Common	
Burnished/Polished jar	Few			Few	
Plain shallow bowl	Frequent	Common	Few		
Plain bowl	Frequent	Common	Few		
Plain cup			Rare		
Plain dish			Few		
Plain Jar/jug	Frequent	Common	Rare	Few	
Baking plate	Common				
Cheese-pots	Frequent				
Pithoi		Few		Few	

Table 5.1: The relative frequency of vessel type in each macroscopic group.

Macroscopic groups/ Ware type	MG 6	MG 7	MG 8	MG 9
RSB shallow bowl			Rare	
RSB bowl			Rare	
RSB deep bowl/basin			Rare	
DS closed vessel				Rare
Burnished/Polished/Scored bowl/basin		Rare	Common	
Burnished jar		Rare		
Plain shallow bowl	Rare			
Plain bowl		Few		
Plain deep bowl/basin	Rare		Rare	
Closed vessel	Rare	Rare		
Baking plate		Rare	Rare	
Pyxis		Rare		

Table 5.1 continued: The relative frequency of vessel type in each macroscopic group.

5.1.1 Macroscopic group 1 (Schist fabric)

This fabric contains a high frequency of fine to coarse schist and silver mica, frequently with elongate voids (probably indicating organic temper) with an orange, red to brown surface. The core varies between different colours, linked to the mottled surface as well as the varying, broadly oxidising conditions. Additionally, several examples exhibit a diffuse grey core which may infer incomplete oxidisation. It suggests the use of open or 'bonfire' firing and perhaps fast firing in some cases. This is the largest group in the EH I assemblage which is indicative of broadly local production. While its relative frequency declines significantly in EH II.

Figure 5.1: Cross section for MG1 (Kon18/5).

Beyond forming a high proportion of the assemblage, an indication of local provenance comes from the great range of variability and in terms of morphology. In addition, it is also represented by a variety of vessel shapes from fine to large coarse vessels with different degrees of surface treatment (mostly burnishing). The typical repertoire comprises plain bowls, shallow bowls, basins, cups, baking plates and jugs/jars, occasionally burnished bowls, as well as red to dark brown slipped and burnished shallow bowls and bowls, in addition to a substantial number of cheese-pots. Some vessels show unique decorations such as impressions of a row of diagonal lines on the lip, or incised strokes on the vessel wall.

5.1.2 Macroscopic group 2 (Sandy fabric)

This group is composed of several fabric subgroups which vary considerably, is present in both phases, but primarily in EH I. In general, this is a sandy fabric that contains very fine silver mica, very fine rose gold mica, very fine to fine white and black rounded inclusions with rounded to elongate voids. The fabric colour ranges from buff-pink, orange, red to brown, sometimes mixed or with a diffuse grey core, indicating not only oxidising and incomplete oxidising atmosphere, but also the imperfect control of firing due to the possible open or 'bonfire' firing of pottery (Day and Kilikoglou 2001). Furthermore, the mottled surface of the burnished and plain ware is also characteristic of open or 'bonfire' firing.

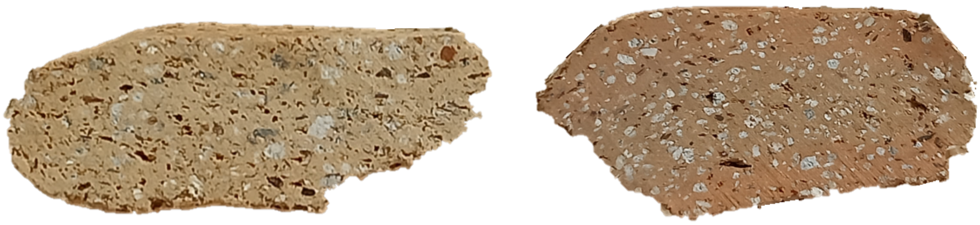


Figure 5.2: Cross sections of MG2 (Kon18/26 (left) and Kon18/31 (right)).

The associated ware types consist of red, dark brown to black slipped and burnished shallow bowls, bowls, deep bowls and straight-sided bowls, burnished and very few polished shallow bowls and plain basins or bowls, shallow bowls, jugs and jars, as well as small numbers of pithoi and cheese-pots.

5.1.3 Macroscopic group 3 (Very fine calcareous fabric)

This fabric is characterised by a very fine red to grey soapy matrix with very fine to fine white and/or black inclusions, sometimes grading to having no visible inclusions. The colour of cross section ranges from buff, pink, orange, brown, grey to orange-brown-orange, suggesting that different firing atmospheres were utilised (oxidising, reducing and mixed atmospheres).

Figure 5.3: Cross sections of Kon18/106 (left) and Kon18/159 (right) to illustrate the variation within MG3.

In this macroscopic fabric, the fabirc colour is closely associated with the colour of the slips, which may demonstrate how well the firing conditions are controlled. More importantly, the sandwich grey core structure suggests the control of changes in firing atmosphere, which may imply the existence of a firing structure to secure the desired sequence of atmospheres.

The fabric occurs only in EH II with a wide range of surface treatments and shapes, including frequently bluish grey to white slipped and/or burnished, fewer red, dark brown to black slipped and/or burnished and sometimes plain vessels with varied sizes from small tableware such as sauceboats, saucers, bowls, shallow bowls, dishes, conical cups, goblets to medium and large bowls. In addition, a few over-fired wasters with bluish grey slip are classified into this group, providing an important indication of local production.

5.1.4 Macroscopic group 4 (Medium-fine white sand fabric)

This group is identified by very fine to medium white quartz aggregates, creamy white/yellow (possible calcareous material (micrite?)), black and red inclusions in the buff to grey medium clay. The cross section colour varies from buff, red, grey to completely black, commonly with a well-defined grey core, indicating different firing conditions according to surface finish. It is important to note the common occurrence of the sandwich-like structure of grey core in this group.

Figure 5.4: Cross sections of Kon18/124 (left) and Kon18/136 (right) to illustrate the sandwich structure.

This fabric is the second most common fabric of the whole assemblage in EH II, mostly associated with a variety of medium-sized vessels including mainly bowls, dishes and high collared jars/jugs and a few shallow bowls, and rarely in straight-sided basins and jars. The surface modification is overwhelmingly slipped and polished, sometimes with traces of polishing on the surface, and some of them are very lustrous in their finish. The slip is dominantly light-coloured, such as white to creamy white, but a few are red to black. Several overfired wasters in this macroscopic fabric have been identified suggesting its local production at Kontopigado in EH II.

5.1.5 Macroscopic group 5 (Silver mica and limestone fabric)

This group is defined by the presence of silver mica and subangular white inclusions with elongate voids. A coarse fabric, it has a porous and gritty texture, with a core that is commonly buff to red in colour, suggesting a generally oxidising atmosphere. In a very few examples the colour ranges from greyish buff to grey, suggesting a reducing atmosphere. The two different firing regimes are consistent with the different surface finishes. The buff to red core is associated with red slipped and burnished shallow bowls and deep bowls, while the reduced grey core is associated with the coarse grey/white slipped vessels. Moreover, some sherds exhibit an orange colour with a higher degree of smoothing/polishing on one side and grey/white slipped porous surface on the reverse side which has a close affinity to the limestone and schist fabric, mostly in jars, found at Koropi in central Attica (10%) (Douni 2015: 156-8) and Ayia Irini on Kea (Wilson 1999: 84-8).

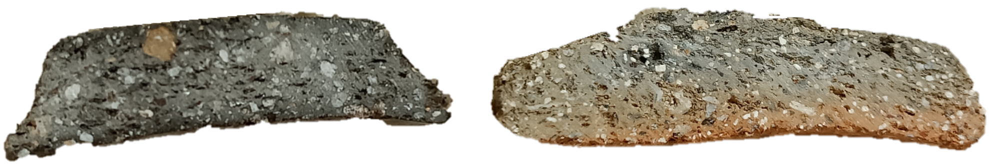


Figure 5.5: Cross sections of Kon18/28 (left) and Kon18/40 (right) to illustrate the typical MG5.

5.1.6 Macroscopic group 6 (Calcite-tempered fabric)

This group contains fine to coarse angular white crystalline calcite as temper and very fine sub-rounded black inclusions, with medium angular to sub-angular voids in a red to dark grey clay. The surface colour ranges from red, through to brown and dark brown, sometimes mottled. Frequently the surface colour is varied on the exterior and interior on the same vessel. The red and black mottling on the surface seems to reflect poor control of firing condition while at times difficult to distinguish from clouding from the use of these cooking pots.

This fabric comprises only a small proportion of the Kontopigado assemblage. However, it seems that it is relative frequency is slightly more common in the EH II period than in the previous phase. The rarity of calcite-tempered fabric is suggestive of a non-local origin. Calcite-tempered pottery has been found in Argolid and Corinthia in EH I and EH II period, though most likely the product of a variety of production centres (Burke 2017: 256-7).

Figure 5.6: Cross sections of Kon18/41 (left) and Kon18/129 (right) for MG6.

5.1.7 Macroscopic group 7 (Highly silver micaceous fabric)

The fabric contains abundant shiny silver mica, is orange-red to black in surface colour, and sometimes smoothed. The fabric colour is orange, red to brown in colour, sometimes mixed for the plain ware and generally grey for vessels with a black surface.

Figure 5.7: Cross section of Kon18/81 for MG 7.

The ware types found with this fabric consist of plain bowls, and vessels with a black surface including a black burnished jar, a baking plate and a pyxis. An extremely micaceous fabric group, it seems to be imported, as such highly micaceous fabrics are often linked with the micaceous schists of the Cycladic islands in the literature (e.g. Hilditch 2013). However, although this abundant iridescent silver mica might suggest a Cycladic origin, there is also the possibility of an Attic origin, due to its micaceous environment (Krohe *et al*. 2010). Therefore, it is suggested that the discrimination of Cycladic from Attic micaceous fabrics might not always be straightforward. Indeed, the reliance on the character of highly silver mica to form a group may mask a variety of sources featuring micaceous content.

5.1.8 Macroscopic group 8 (Gold mica fabric)

This fabric is distinguished by the presence of very fine to medium-fine gold mica which is visible on the surface and in cross section. The visible shiny gold mica is well-known as a distinctive feature identified with fabrics from the island of Aegina (Gauss and Kiriatzi 2011). The fabric colour ranges from red, through brown to black, mostly consistent with the surface colour, suggesting intentional variation in firing atmosphere according to surface finish. The baking pans in this fabric are mottled and the mixed colour of red and grey in cross section is possibly the result of bonfire firing, though most of these are cooking vessels and may have been affected by carbon deposition in use.

Figure 5.8: Cross sections of Kon18/29 (left) and Kon18/56 (right) belong to MG8.

The main ware types in this macroscopic fabric consist of red to black slipped and burnished bowls, shallow bowls, straight-sided basins and heavy polished/scored straight-walled vessels, black burnished shallow bowls, bowls, straight-walled deep bowls and basins, and plain open vessels as well as baking pans. Specific features are observed, such as a shallow groove or a row of linear impressions on lips as well as dimpled bases. Overall, the EH I and EH II shape repertoire in this fabric are the same, with perhaps a higher percentage of larger-sized deep bowls and basins present in the later phase. There are indications that the number of the Aeginetan red slipped and burnished vessels decreases in EH II. The relatively high frequency of this gold mica fabric at Kontopigado compared to its presence elsewhere (e.g. fewer examples in Midea: Alram-Stern 2018; Burke *et al.* 2018) reflects a close relationship in production and consumption between the island of Aegina and Alimos, on the Attic shore only a short distance away.

5.1.9 Macroscopic group 9 (Yellow green fabric)

Figure 5.9: Cross section of Kon18/153 to illustrate typical MG9.

The chalky buff-green fabric has been argued to very characteristic of Corinthian origin (Burke *et al*. 2017). The fabric consists of subangular and subrounded black inclusions in buff-green matrix. The greenish tint with rare core-margin colour differentiation suggests a high firing temperature of a calcareous clay in a stable firing environment.

This fabric is particularly rare in the Kontopigado assemblage and restricted to EH II levels. Furthermore, it is always accompanied by a black slip. The buff-green fabric and its association with the black slips is notably prevalent in several EH sites in Corinthia (Attas *et al*. 1987; Burke *et al*. 2017) but have been found imported to the Argolid (e.g. Midea: Alram-Stern 2018; Burke *et al*. 2018) and Koropi in Attica (Burke *et al*. 2017: 111).

5.1.10 Comments on forming

Although most materials are too fragmentary to allow a complete reconstruction of forming techniques, some parts of vessels bear useful evidence (see Figure 5.10). All vessels seem to have been handmade and there is no evidence of wheel-thrown or turning devices in both phases. The thick base fragments and thick-walled body fragments sometimes show joints. The great difference is in the baking pans for their evidence of moulding against surfaces and slab building for the base part.

Figure 5.10: Joints in sections.

5.1.11 Summary

In total, nine macroscopic fabric groups have been identified within the EH I and II Kontopigado assemblages, primarily distinguished by compositional and technological variation of the fabric.

MG1 is the dominant group in the EH I assemblage and was used to manufacture a variety of vessels. MG2, MG4 and MG5 display poorly to moderately sorted medium to semi-fine sandy fabrics, which seem related to each other. MG2 and MG5 display a similar micaceous paste with medium to semi-fine inclusions which is distinguished by the mica type and the degree of textural coarseness. These are mainly found in EH I. MG4 is distinctive, with medium-sized white and creamy white/yellow inclusions, possibly quartz and micrite aggregates and is the dominant group in EH II semi-fine and semi-coarse vessels.

MG3 is predominantly used for small tableware in the EH II period. The micaceous MG7 is perhaps of Cycladic origin, whereas its marked similarity to MG1 requires further microscopic analysis. MG6 and MG8 are considered to be imports with the distinct tempering traditions of calcite and volcanic rock fragments respectively.

5.2 Thin section petrography

Thin section petrography is presented here to characterise and group the pottery sampled, to examine its production technology and, where possible, to assign provenance. A total of 190 samples were selected to represent the variation seen macroscopically, with respect to composition, typology, style and technology, within both the EH I and EH II ceramic assemblages at Kontopigado. Petrographic analysis aims to characterise the compositional and technological variation, mainly with regards to aspects of paste manipulation which are not visible macroscopically such as clay mixing, tempering, indications of forming (where possible), as well as firing conditions. The correlations of the petrographic groups and their characterisation with typological and stylistic groups, macroscopic groups and reference materials from other sites enable us to reconstruct technology and potential provenance and thus can lead to an understanding of potting traditions and their variation over time and space. The complete standardised petrographic descriptions are attached in Appendix II.

5.2.1 Fabric group 1 (Dominant muscovite schist fabric)

Sample no.	Vessel shape	Surface treatment
Kon18/2	Closed vessel	
Kon18/5	Bowl	
Kon18/14	Deep bowl/basin	Red slip and burnish
Kon18/16	Baking plate	Burnish
Kon18/17	Bowl	
Kon18/23	Bowl	
Kon18/24	Pedestalled open vessel	
Kon18/30	Baking plate	Burnish
Kon18/33	Cheese-pot	
Kon18/35	Jar	
Kon18/45	Cylindrical cup	
Kon18/51	Closed vessel	
Kon18/53	Shallow bowl	Red slip and burnish
Kon18/54	Bowl	
Kon18/55	Bowl	
Kon18/58	Jug/jar	
Kon18/67	Bowl	
Kon18/68	Jar	
Kon18/69	Shallow bowl	Brown slip and burnish

Sample no.	Vessel shape	Surface treatment
Kon18/71	Cheese-pot	
Kon18/73	Deep bowl	
Kon18/74	Basin	Burnish and applique
Kon18/75	Basin	
Kon18/77	Shallow bowl	Red slip and burnish, impression on lip
Kon18/78	Bowl	
Kon18/79	Bowl	
Kon18/80	Miniature conical cup	
Kon18/88	Bowl	Brown slip and burnish
Kon18/90	Shallow bowl	Burnish
Kon18/91	Bowl	Burnish
Kon18/96	Bowl	Burnish
Kon18/97	Closed vessel	
Kon18/100	Handle	Red slip and burnish
Kon18/130	Bowl	
Kon18/199	Basin	Black slip

This fabric is characterised by the bimodal distribution of moderately sorted, subangular medium-fine to coarse-grained, dominant to common muscovite-opaque schist, few to very few polycrystalline quartz and discrete quartz grains, few to rare phyllite and common to few voids in a micaceous groundmass that varies from yellow, through orange, to red and black in PPL and XP. All samples are homogeneous in terms of texture and types of inclusions, with few exceptions consisting of very rare to absent micrite, sparite and microfossils. The common presence of elongate voids suggests the addition of organic vegetal matter as temper and burnt out during the firing stage. Furthermore, Kon18/14, 16, 58, 68, 77, and 91 appear to have a higher amount of organic materials added to the paste. Additionally, the presence of TCFs possibly indicates clay mixing (e.g. Kon18/2 and 79) (Figure 5.11).

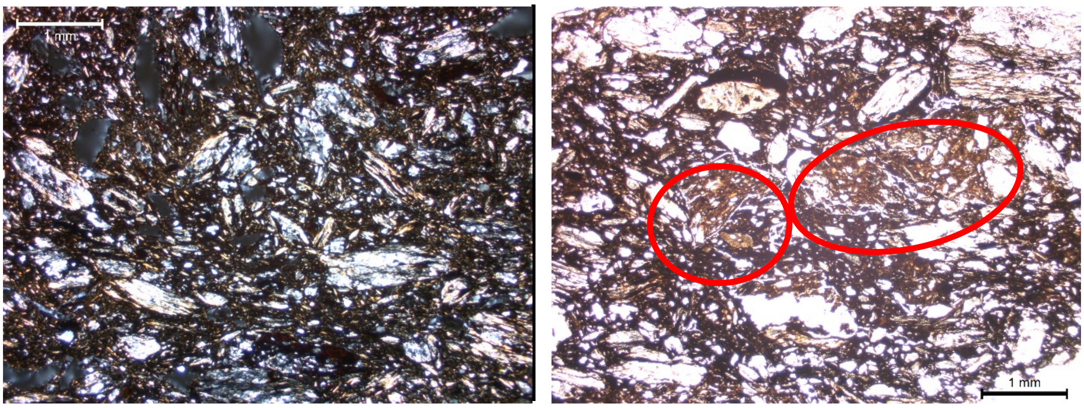


Figure 5.11: Photomicrographs of Kon18/2 (left) to illustrate a typical example of FG1 in XP and Kon18/79 (right) to show TCFs indicated by the red ellipses, PPL.

The optical activity ranges from highly active to inactive, suggesting a wide range of firing temperatures. Most exhibit a slight heterogeneity in core-margin colour, suggesting incomplete oxidation. In addition, Kon18/199 consists of very rare limestone and has an oxidised interior and a reduced exterior, suggesting a partially reducing atmosphere, presumably to achieve the black slipped exterior. The slightly heterogeneous composition and the firing colour within the EH II sample (Kon18/199) suggest a similar paste recipe (merely with additional micrite and limestone) as EH I, but in a developed EH II version of a black slipped basin.

This fabric comprises the majority of pottery present in the EH I period, with some also present in EH II, and is associated with the widest range of ware types in varying degrees of the coarseness of the vessel repertoire, in particular the red slipped and/or burnished ware and plain vessels in the EH I period. In EH II, it is present in only very small numbers, mostly plain medium to coarse ware. The wide range of optical activity in FG1 reflects varied firing temperatures, perhaps with an indication that red slipped and/or burnished pottery are low- to moderately fired, while the plain fine to coarse ware is higher-fired.

FG1 is compatible with the Athens Schist in the geology of Attica, indicating that this fabric is a possible local production. The schist deposits in the area adjacent to Kontopigado or their alluvial derivative are possible sources.

This petrographic fabric largely corresponds to MG1 (Schist fabric) which is sometimes difficult to distinguish from MG7 (Highly silver micaceous fabric). Microscopically, MG7 consists of slightly higher grade schist fragments, commonly biotite schist, few to common epidote with very rare to absent phyllite which is broadly compatible with schist deposits in Cyclades (Hilditch 2007: 239) (refer to the Cycladic loner in Kontopigado, Figure 5.39).

5.2.2 Fabric group 2 (Biotite schist and shimmer phyllite fabric)

Sample no.	Vessel shape	Surface treatment
Kon18/133	Open vessel	Polish/scoring
Kon18/167	Open vessel with ring foot	Black brown slip
Kon18/176	Jar	

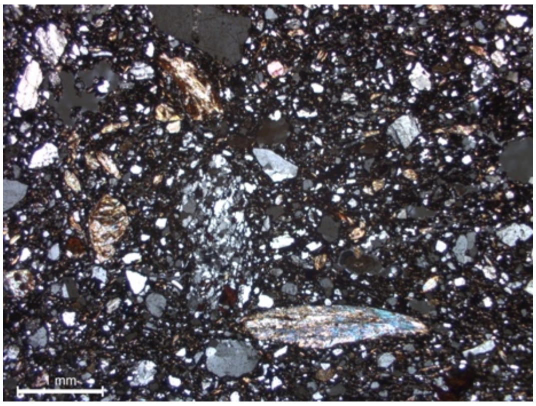


Figure 5.12: Photomicrograph of Kon18/167 illustrating FG2, XP.

FG2 is a coarse fabric, consisting of few to very few micaceous phyllite with an almost shimmer appearance from yellow to blue, consisting of muscovite, sometimes biotite and amphibole, in addition to few to very few biotite schist and discrete angular monocrystalline quartz in the coarse fraction and common quartz and few pyroxene as well as mica laths in the fine fraction. The groundmass ranges from reddish brown to dark grey, suggesting a reducing or partial reducing atmosphere. The very weak to absent optical activity may suggest a relatively high firing temperature.

This fabric bears some resemblance to FG1 but with the additional presence of biotite schist, shimmer phyllite and pyroxene (both in coarse and fine fraction). In general, the mineralogical composition is broadly compatible with Attic geology.

5.2.3 Fabric group 3 (Micrite and serpentine fabric)

Sample no.	Vessel shape	Surface treatment
Kon18/15	Bowl	Red slip
Kon18/22	Shallow bowl	Red slip and burnish
Kon18/95	Shallow bowl	Red slip and burnish
Variant		
Kon18/39	Deep bowl/basin	

Micrite and serpentine are the main inclusions of this fabric group, with common to few micrite, few polycrystalline quartz, very few to rare sparite, rare serpentine and very rare to absent sedimentary and metamorphic rock fragments, calcium carbonate as well as rare TCFs in the non-calcareous red-firing matrix. Inclusions display a bimodal grain size distribution, suggesting the use of temper. The presence of TCFs (clay pellets) may suggest clay mixing. The groundmass shows slightly to moderately optical activity, indicating a moderate firing temperature in an oxidising atmosphere.

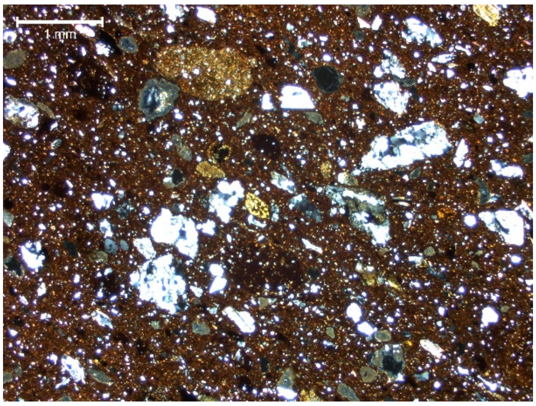


Figure 5.13: Photomicrograph of Kon18/95 to illustrate FG3, XP.

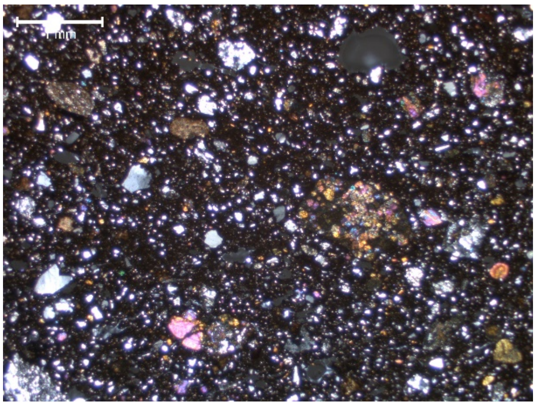
Kon18/39 is the coarser version of the main group, with a higher percentage of voids. The partial elongate voids and inclusions exhibit orientation parallel to the vessel margins. The aplastic inclusions are poorly sorted, showing a weak bimodal grain size distribution. The presence of clay pellets is a possible sign of clay mixing. The moderately active reddish orange groundmass suggests the same firing regime with a relatively lower firing temperature.

The main group is exclusively associated with red slipped and/or burnished shallow bowls and bowls, and is one of the main fabrics of the red to brown slipped and/or burnished ware in the EH I Kontopigado assemblage. The mineralogical composition is indicative of the ophiolite formation; however, the overall texture suggests a different source from the more common FG6 and FG8, discussed below, which also feature ophiolitic petrology. This fabric belongs to one of the main groups in the MG2 sandy fabric with abundant white inclusions. As a result, it comprises the presence of a different technological tradition in the manufacture of red slipped and burnished ware in the EH I period. This demonstrates the consumption at Kontopigado of similar pottery from different production centres, showing wide exchange and consumption choices in this early phase.

5.2.4 Fabric group 4 (Ultrabasic and marble fabric)

Sample no.	Vessel shape	Surface treatment
Kon18/7	Shallow bowl	Red slip and burnish
Kon18/27	Jar	
Kon18/36	Shallow bowl	Red slip and burnish, mottled
Kon18/37	Bowl	Red and brown slip and burnish, mottled
Kon18/46	Basin	Red to brown slip and burnish
Kon18/66	Bowl	Red slip and burnish
Kon18/83	Shallow bowl	Red slip and burnish
Kon18/87	Shallow bowl	Red and brown slip and burnish
Kon18/188	Shallow bowl	Brown slip (exterior) and red slip (interior)

This fabric is distinctive for the presence of ultrabasic rock fragments and marble in a orange to dark brown matrix. The inclusions are common to few pyroxene and micrite, few ultrabasic rock fragments and marble (sometimes grades into sparite), very few polycrystalline and monocrystalline quartz, feldspars as well as rare coarse biotite schist and microfossils with very rare to absent serpentine and chert. The few TCFs in Kon18/46 are considered an indication of clay mixing. The overall matrix colour varies from orange to dark brown and the low to absent optical activity suggests a relatively high firing temperature in an oxidising atmosphere. The dark brown core in Kon18/7 and mottled grey colour in Kon18/37 are indicative of incomplete oxidisation (both of EH I date), while Kon18/188 has a reduced grey core, reflecting the common firing regime in the EH II period. Kon18/46 displays a highly active groundmass and thus suggests a much lower firing temperature.



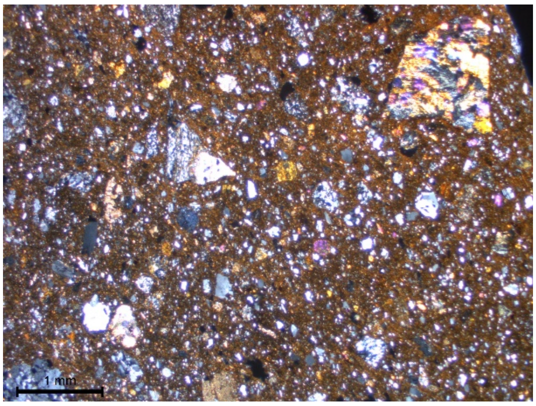


Figure 5.14: Photomicrographs of Kon18/37 (left) and Kon18/46 (right) show typical examples with different matrix colours of FG4 in XP.

The predominant ware types within this fabric group are red to brown slipped and/or burnished shallow bowls, bowls, basins and a plain narrow-necked jar (Kon18/27). The fabric is not compatible with the local geology, but at present there are no known comparatives and thus the place of production is unclear. The fabric is categorised as one of the main classes of imported red slipped and/or burnished ware and is commonly found within the EH I Kontopigado assemblage, but in far smaller numbers in EH II.

5.2.5 Fabric group 5 (Calcite well-sorted sand fabric)

Sample no.	Vessel shape	Surface treatment
Kon18/104	Bowl	White slip and polish
Kon18/109	Bowl	
Kon18/113	Shallow bowl	
Kon18/115	Bowl	Pink slip
Kon18/120	Basin	White slip
Kon18/121	Basin	
Kon18/124	Bowl	
Kon18/126	Collared jug/jar	Red slip and burnish
Kon18/136	Jug	Red slip (exterior)
Kon18/137	Bowl	Black brown slip
Kon18/138	Basin	Red slip
Kon18/139	Bowl/sauceboat	
Kon18/142	Jar	
Kon18/144	Dish	Burnish (interior)
Kon18/146	Saucer	Brown slip (exterior) and buff white slip (interior)

Sample no.	Vessel shape	Surface treatment
Kon18/148	Bowl	Polish
Kon18/149	Bowl	Polish
Kon18/151	Jar	Red slip
Kon18/154	Bowl	White slip
Kon18/155	Pithos	
Kon18/160	Jar	Red slip, mottle
Kon18/163	Jar	Grey/white slip
Kon18/169	Goblet	Bluish grey to white slip
Kon18/170	Basin	White slip
Kon18/171	Basin	Black slip
Kon18/173	Jug	Brown slip
Kon18/178	Basin	
Kon18/181	Bowl	
Kon18/186	Shallow bowl	
Variants		
Kon18/102	Bowl	
Kon18/103	Bowl	
Kon18/123	Saucer	
Kon18/131	Pithos/jar	
Kon18/134	Jar (waster?)	
Kon18/145	Bowl	Bluish grey slip
Kon18/161	Shallow bowl	White slip
Kon18/172	Collared jar	Red slip
Kon18/174	Bowl	
Kon18/180	Dish	
Kon18/185	Open vessel	Brown slip
Kon18/192	Bowl	Brown slip
Kon18/194	Shallow bowl	Red slip and burnish

The samples within this group vary from fine to medium-fine. The associated aplastic inclusions contained comprise a similar suite of rocks and minerals but vary in their relative proportions. This fabric presents common to few monocrystalline quartz grains and calcareous materials, including angular calcite, subangular to rounded micrite and sparite, common to rare marble, few to rare metamorphic rock fragments (muscovite-biotite schist, muscovite schist, crenulated phyllite, biotite-muscovite phyllite and polycrystalline quartz) and epidote group minerals. There are few to absent bioclastic limestone and microfossils, very rare to absent chert (some radiolarian), basalt and serpentine fragments.

The groundmass sampled from this group varied from having visible microcrystalline calcite and sparry calcite to invisible ones. There are different types of textural concentration features (TCFs), from red, yellow to brown, with rounded to angular shapes, probably clay pellets and clay streaks, which may indicate clay mixing. In particular, there are some clay relic TCFs in this fabric (see Kon18/149 in Figure 5.15). In addition, the fine brown clay pellets have been identified in LBA Kontopigado, suggesting a long tradition in the use of the same clay deposit (Gilstrap 2015: 82, FG1, fig. 6.1).

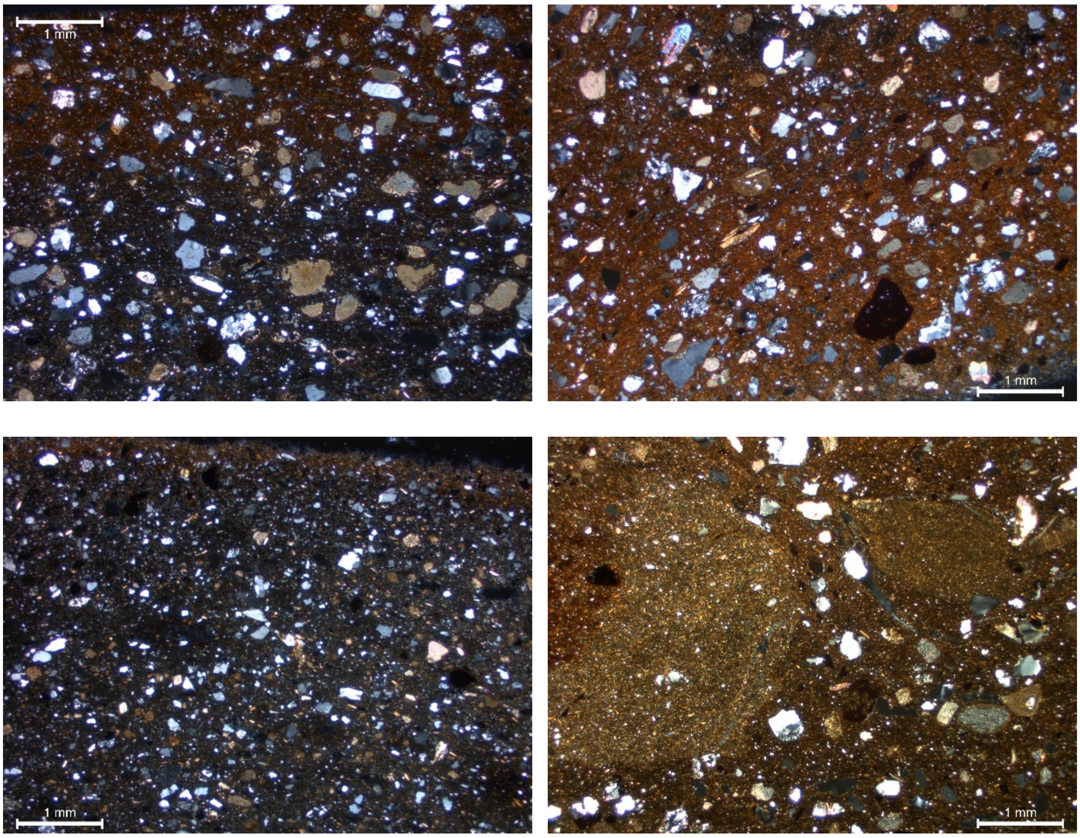


Figure 5.15: Photomicrographs of Kon18/136 (upper left), Kon18/160 (upper right) and Kon18/137 (bottom left) show the internal variation of FG5. Kon18/149 (bottom right) shows the commonly present of TCFs suggestive of clay mixing, all in XP.

The aplastic inclusions in the coarse fraction are well-sorted, sometimes angular, in particular calcite and quartz, and demonstrate a bimodal grain size distribution which suggests a deliberate paste manipulation, possibly adding temper. There is evidence of inconsistency in the tempering process. Kon18/104, 124 and 146 which have a higher volume of quartz and metamorphic related inclusions in the groundmass. For example, clear different content of temper can be seen in Kon18/120 (Figure 5.16).

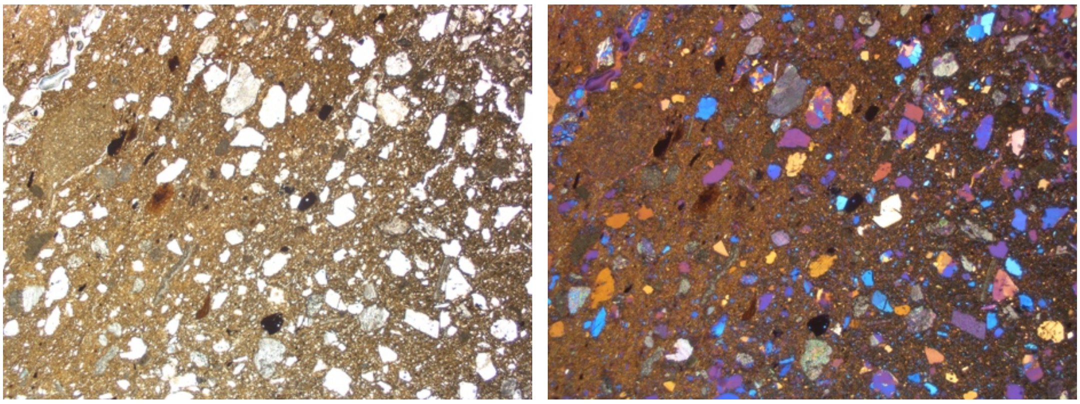


Figure 5.16: Photomicrographs of Kon18/120 to demonstrate the variability in the amount of aplastic inclusions between coils in PPL (left), and with a lambda plate (right).

Besides, the microstructure of Kon18/181 contains common voids with orientation parallel to the vessel margins inferring to the deliberate addition of a substantial amount of sand temper (Müller *et al*. 2015: 835) (Figure 5.17). Additionally, the diffused groundmass and its slight optical activity are suggestive of a higher firing temperature.

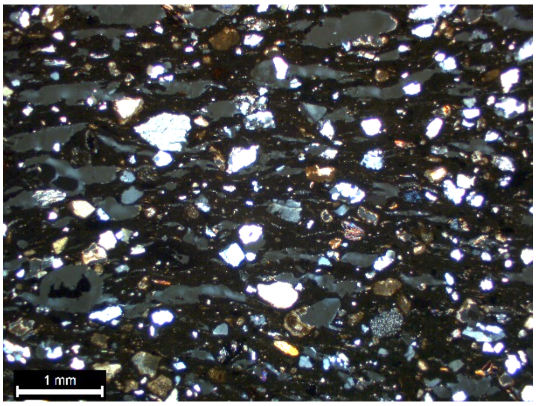


Figure 5.17: Photomicrograph of Kon18/181 showing the alignment of elongate voids, XP.

The mineralogical composition derives from a wide range of metamorphic and ophiolite rocks, of varying degrees of coarseness, suggesting their derivation from the locally heterogeneous Neogene sedimentary deposits, probably with different grades of similar composition sands as tempering materials. Mentesana *et al*. (2016b) and Liard *et al*. (2018) consider these types of well-sorted sand temper to be derived from the sandy layers in the calcareous Neogene deposits. Such Neogene deposits are available within the area of Alimos and seem to be the sources of raw material for this local ceramic production (wasters are present in this fabric).

The matrix colour ranges from yellow to dark grey, suggesting the use of both oxidising and reducing firing atmospheres. Optical activity varies from moderate to strong with low-fired samples and the high-fired ones show weak to absent optical activity. Macroscopically, this fabric is largely correlated with MG4 (Medium-fine white sand fabric) and the finer example of this petrographic fabric matches with part of the coarse subgroup of MG 3 (Very fine calcareous fabric), emphasising the links between fine tableware and the medium-fine and medium vessels. The macroscopic observation suggests the commonly present sandwich structure is an indication of firing performed in a mainly oxidising atmosphere with an intermediate period of reduction, which potentially is a common scheme in the EH II period.

This fabric is the dominant fabric within the EH II assemblage, containing a wide range of vessel shapes and surface modifications. It matches comparative material from EM IIA early Poros-Katsambas (Poros 97/10) in Crete. In addition, a small group of materials at Koropi has a very similar fabric, well-sorted and sand-tempered (e.g. Koropi 02/02, 26 and 31). The mineralogical composition suggests the same geological environment with slight differences textually. This may be due to the sites not being entirely contemporaneous and slight differences in production over time.

5.2.6 Fabric group 6 (Micrite and quartz sand in calcareous matrix fabric)

Sample no.	Vessel shape	Surface treatment
Kon18/21	Bowl	Red slip and burnish
Kon18/25	Closed vessel	Red slip
Kon18/26	Shallow bowl	Red slip and burnish
Kon18/31	Shallow bowl	Burnish
Kon18/42	Bowl	Brown slip and impression on lip
Kon18/44	Basin/bowl	Red slip (exterior) and black slip (interior)
Kon18/84	Deep bowl	Light brown to red slip and burnish
Kon18/101	Sauceboat or saucer?	Bluish grey slip
Kon18/177	Jar	Polish
Kon18/191	Bowl	Red slip and burnish

This fabric is characterised by the presence of moderately to well-sorted medium-grained inclusions, consisting of common to rare rounded calcite (frequently grading into micrite and/or sparite), quartz, common to absent microfossils, few to rare polycrystalline quartz and muscovite schist fragments, very few to very rare phyllite (frequently contains opaque and sometimes biotite mica laths) and opaque in the optically inactive greenish-brown to brown calcareous matrix. Rarely, it additionally contains sedimentary rock fragments (sandstone, siltstone, rounded mudstone and shale, green-brown limestone), metamorphic rock fragments (biotite schist, altered serpentine), plagioclase and alkali feldspars and chert. Most inclusions are moderately to well-sorted, medium- to coarse-grained with rounded calcareous materials and rock fragments in contrast to the fine calcareous groundmass and thus display a bimodal grain size distribution, suggesting the deliberate use of sand temper.

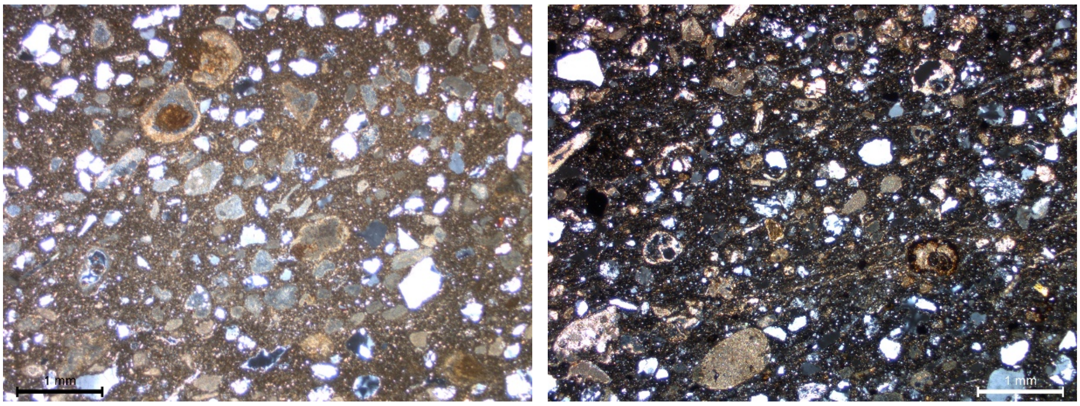


Figure 5.18: Photomicrographs of Kon18/21 (left) and Kon18/44 (right) to illustrate the variation in FG6, both XP.

Furthermore, the calcareous materials in Kon18/21 and 177 are almost exclusively micrite, with no clear presence of sparite. Therefore, it may be suggested that the relatively coarser and rounded sparite comprises tempering material derived from naturally varied deposits, or that disappearance of sparite is the result of firing inducing its decomposition to micrite. Moreover, the appearance of clay pellets as well as the clay striations in Kon18/101 indicates the mixing of a calcareous clay with a fine brown quartz-rich clay (Figure 5.19).

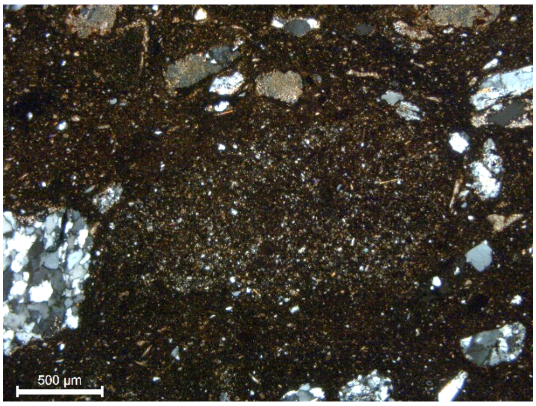


Figure 5.19: Photomicrograph of Kon18/101 showing a clay pellet, XP.

This fabric links to the local geology of Neogene clay and of marly limestone, limestone (mainly bioarenite and biomicrite), sandstone and silts, mainly from schists deposits in the region of Alimos and the Athens Schist (flysch) with fragments of chert, limestone, ophiolites, quartz and other minerals/rock fragments also compatible with the area (Papavassiliou *et al*. 1982) (Figure 3.16 in Chapter 3), indicating the likely local provenance for the majority of EH II vessels.

This fabric is almost exclusively associated with the red to brown slipped and/or burnished ware in EH I and was subsequently used to produce different types, such as a bluish grey slipped ware, a red slipped and burnished dish and a polished jar in the EH II period. Therefore, it may be argued that the differences in firing strategy reflect temporal variances within a single workshop and the manufacture of novel shapes and surface finishes.

5.2.7 Fabric group 7 (Dark brown micrite and metamorphic coarse fabric)

Sample no.	Vessel shape	Surface treatment
Kon18/28	Jar	Burnish
Kon18/40	Shallow bowl	
Kon18/85	Basin	Grey/white slip
Kon18/86	Pithos	
Kon18/98	Closed vessel	Grey/white slip

This is a distinctive fabric that occurs in the EH I typical shapes (e.g. Kon18/28, 40 and 86), but also in EH II vessels (e.g. Kon18/85 and 98) whose shape and surface finish suggest a later date. The fabric is largely correlated with MG5.

The characteristic feature of this fabric is the presence of common micrite, few muscovite and biotite mica, calcareous mudstone and very few coarse higher grade metamorphic rock fragments (highly birefringent angular mica schist, rounded phyllite) with polycrystalline quartz and very few to rare microfossils in a dark brown coarse micaceous matrix. It also contains rare to absent siltstone, chlorite mica, epidote, plagioclase and alkali feldspars. The aplastic inclusions are moderately to poorly sorted and show a bimodal grain size distribution, suggesting the addition of temper. In addition, Kon18/85, 86 and 98 contain a higher amount of mega to meso elongate voids in the microstructure and their orientation is weakly parallel to the vessel margins, possibly as a result of heavy sand temper (Müller *et al*. 2015) (Figure 5.20).

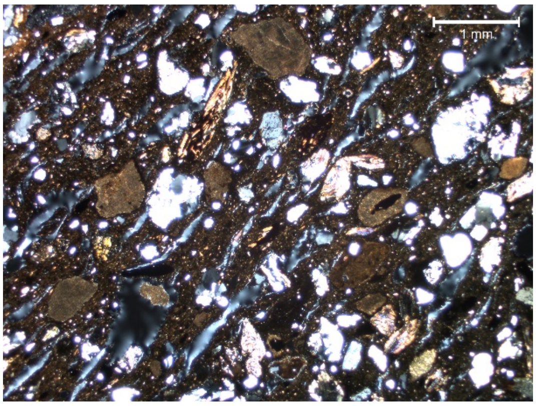


Figure 5.20: Photomicrograph of Kon18/85 to illustrate FG7, XP.

In general, this group is optically inactive, which suggests a relatively high firing temperature, with the exception of Kon18/86, which displays moderate activity suggestive of a lower firing temperature.

The medium-grade metamorphic rock fragments, in particular mica schist, derive from a mica-rich metamorphic rock series. Currently, there is no compatible material to link its origin with the common provenance of mica-rich metamorphic parent rock material from the relevant geological zones of regional metamorphism such as the Attica-Cycladic high pressure metamorphic belt (Krohe *et al*. 2010). On the other hand, this fabric, in terms of its inclusions in the coarse fraction, is similar to the local FG6, but with a higher amount of sand temper and a slightly different composition in the fine fraction. This group has a coarse micaceous matrix, sometimes packed with microfossils (sponge spicules?), whereas FG6 is a predominately greenish-brown calcareous matrix. Additionally, the highly birefringent mica schist fragments are also present within a cooking vessel (Chytra) in the LBA Mycenaean Kontopigado assemblage (Gilstrap 2015: 112, FG17A: Alimos 12/96). However, FG7 is finer and less diverse in its composition. It may suggest that the same tempering material is available in the local area and is continuously exploited over a long period of time. In addition, the same fabric is identified in a jar (AI 97/69) at EB II Ayia Irini on Kea and a closed vessel with white slips from Koropi (Koropi 02/98).

5.2.8 Fabric group 8 (Medium calcareous and metamorphic with opaques)

Sample no.	Vessel shape	Surface treatment
Kon18/9	Closed vessel	
Kon18/43	Bowl	Red slip and burnish
Kon18/47	Pithoid jar	
Kon18/59	Pithos	
Kon18/82	Shallow bowl	Brown slip and burnish
Kon18/94	Collared jar	Brown slip and burnish and red slip
Kon18/127	Saucer	Red slip
Kon18/135	Jar (waster)	Black slip
Kon18/141	Jar (waster)	
Kon18/147	Saucer	Brown slip (exterior) and buff white slip (interior)
Kon18/152	Closed vessel	
Kon18/157	Jar (waster)	
Kon18/164	Shallow bowl	Black slip
Kon18/166	Jar	Brown slip
Kon18/182	Jug (waster)	
Kon18/183	Jug (waster)	
Kon18/190	Basin	Red slip and burnish

This fabric group is found in pottery of both EH I and EH II that is mostly slipped and burnished. It is characterised by low- to medium-grade metamorphic rock fragments, calcareous materials and very rare sedimentary rock fragments with frequent to very few voids in the medium-fine groundmass. The main inclusions are common to few muscovite phyllite and schist fragments, consisting of muscovite mica, biotite mica, amphibole and opaques, as well as biotite schist and amphibolite, common to few angular calcite, subrounded to rounded marble, micrite, very few to very rare polycrystalline quartz, accompanied by very few to absent serpentine, microfossils, very rare to absent sandstone, mudstone, alkali and plagioclase feldspars and chert.

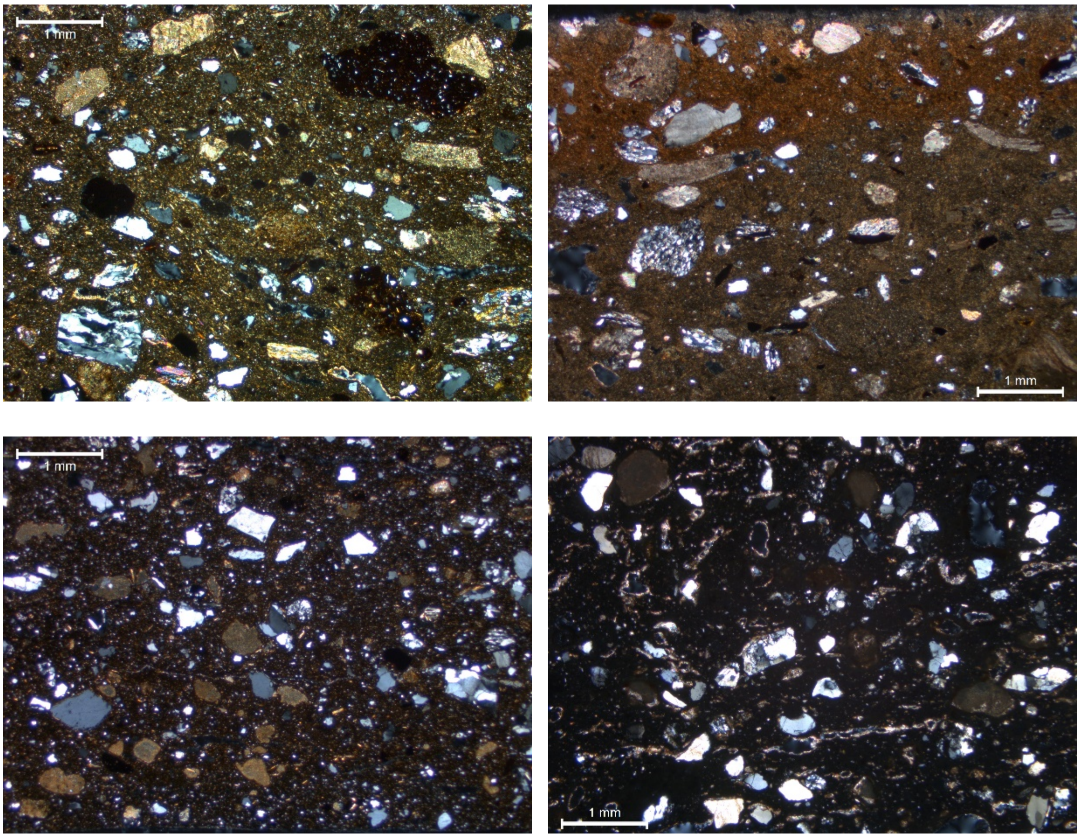


Figure 5.21: Photomicrographs of four samples to illustrate the textural variation of FG8: Kon18/59 (upper left), Kon18/190 (upper right), Kon18/152 (bottom left) and Kon18/183 (bottom right), all XP.

The aplastic inclusions are well to moderately poorly sorted with varied coarseness from fine to very coarse grains, and thus present a skewed bimodal grain size distribution, indicating possible tempering materials from the alluvial deposits. Kon18/147 shows a fine brown clay zone in contrast to the coarser grains of temper on the edge of the attached ring foot of a plain medium saucer, clear evidence for sand tempering (Figure 5.22). Furthermore, the porous microstructure may be the result of a large amount of sand temper (Müller *et al*. 2015: 835). In addition, the common presence of TCFs (possibly clay pellets) and clay striations suggests the common practice of mixing of a calcareous clay with a brown medium fine clay. Two samples (Kon18/47 and 59) which are storage jars seem to contain angular to subangular textural concentration features (possibly grog).

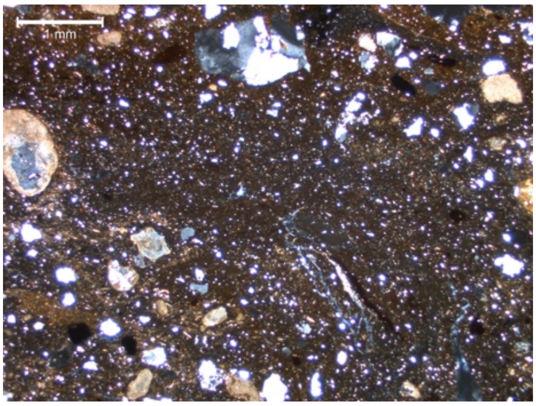


Figure 5.22: Photomicrograph of Kon18/147, showing zone of fine clay matrix in contrast to the more packed margins, XP.

The clay matrix in this fabric seems to be different from that in FG5 and FG6, even though they have sand temper of the same composition. This fabric stands out by the presence of overfired wasters (Kon18/135, 141, 157, 182 and 183) as clear evidence for local production at Kontopigado in EH II.

In terms of firing technology, it clearly presents different firing strategies in association with ware types. The slightly active to inactive matrix suggests a higher firing regime for jars, in contrast to the moderate to strongly active matrix for largely EH I red to brown slipped open vessels such as shallow bowls, bowls and basins which were fired at a lower firing temperature.

Parallels have been found in coarse slipped closed vessels from Koropi (Koropi 02/91, 96, 97, 101, 105 and 106) and a yellow to white slipped transport jar (AKR03/69) from Akrotiri on Thera. The chemical results from Koropi also suggest the common origin of coarse slipped ware at Koropi and transport jars from Poros-Katsambas (Crete), Ayia Irini (Kea) and Akrotiri (Thera) (Hein pers. comm.; Day and Wilson 2016; Douni 2015: Annexe IV, FG2, Group D; Wilson *et al*. 2008: 265). As a consequence, it suggests that the previously characterised fabric – and therefore production centre – may now be assigned to a provenance at Kontopigado, showing the exchange of pottery, along with its contents, between sites in west and central Attica through the western Cyclades as far as Crete.

5.2.9 Fabric group 9 (Marble, schist and sand fabric)

Sample no.	Vessel shape	Surface treatment
Kon18/49	Basin	
Kon18/92	Open vessel	Slipped, red to brown/black mottled

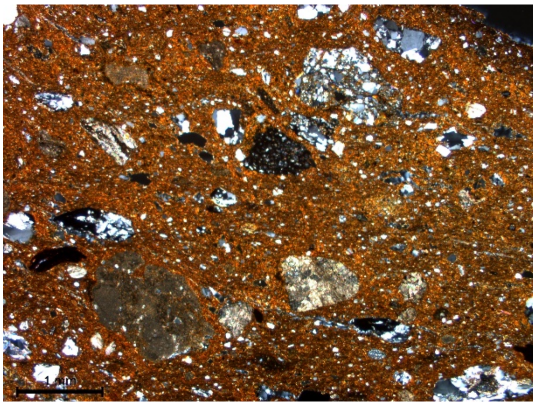


Figure 5.23: Photomicrograph of Kon18/49 to illustrate FG9, XP.

This group is heterogeneous with respect to the percentage of inclusions and colour of the groundmass. The most distinctive feature is the presence of marble, muscovite-biotite-opaque schist and rock fragments of a wider range of mineralogy ranging from greywacke sandstone, siltstone, polycrystalline quartz and phyllite accompanied by plagioclase feldspar. The groundmass varies from orange to brown and exhibits slight to moderate optical activity, indicating a lower firing temperature. The aplastic inclusions have a clear bimodal grain size distribution, strongly suggesting that the coarse sand is temper intentionally added by the potter. This distinct fabric has only been recorded in the EH I deposits.

5.2.10 Fabric group 10 (Coarse calcareous fabric)

Sample no.	Vessel shape	Surface treatment
Kon18/93	Jar	Red slip
Kon18/200	Closed vessel	Brown slip

This fabric is characterised by fine quartz and muscovite mica laths in a moderately active brown fine clay that is tempered with coarse-grained calcareous and rock fragments, consisting of few marble, limestone, calcite (frequently grades into sparite and micrite) and polycrystalline quartz, very few mica schist and microfossils, rare to absent serpentine, highly birefringent phyllite, bioclastic limestone, sandstone, mudstone and chert. It displays moderate optical activity, suggesting a relatively low firing temperature.

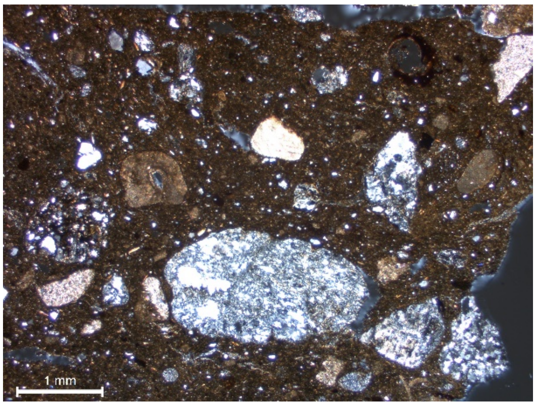


Figure 5.24: Photomicrograph of Kon18/93 to illustrate FG10, XP.

Petrographically, the overall suite of minerals and rock fragments is similar to the closely related sand-tempered fabrics (dominantly FG5), but this group exhibits coarser grains of recrystallised calcite, limestone, polycrystalline quartz together with more frequent highly birefringent mica phyllite and no epidote group minerals. As a result, it is suggested that the raw materials of this fabric may be derived from a geological zone which has a close similarity in composition to FG5.

5.2.11 Fabric group 11 (Very fine mica and quartz fabric)

Sample no.	Vessel shape	Surface treatment
Kon18/106	Sauceboat	Bluish grey to white slip (exterior) and creamy white slip (interior)
Kon18/110	Saucer	Silver grey slip (exterior) and white slip (interior)
Kon18/111	Dish	
Kon18/117	Sauceboat	Bluish grey to white slip
Kon18/140	Large bowl (waster)	Bluish grey slip
Kon18/143	Sauceboat	Grey to white slip
Kon18/156	Sauceboat	White slip (exterior) and bluish grey to white slip (interior)
Kon18/165	Sauceboat	Bluish grey slip (exterior) and dark brown slip (interior)

Sample no.	Vessel shape	Surface treatment
Kon18/168	Bowl	Bluish grey slip (exterior) and dark brown to red slip (rim and interior)
Kon18/184	Goblet	Pink slip
Kon18/195	Bowl	
Kon18/197	Saucer	Black slip
Kon18/198	Sauceboat	Brown slip

This group is characterised by an extremely fine fabric, with a mixture of micaceous and calcareous material in the matrix, together with sparite, micrite, fine-grained polycrystalline and monocrystalline quartz as well as rare to absent siltstone, limestone, biotite mica, microfossils and opaques in the coarse fraction. Kon18/110, 140 and 197, with reduced grey cores, contain predominantly fine silt quartz inclusions and have a lesser content of mica laths in the fine fraction (Figure 5.25-6). The presence of rare textural concentration features (TCFs) presumably represents clay pellets, a possible sign of clay mixing. A subtle variation in Kon18/143 is the presence of rare medium-grained siltstone, limestone and calcareous materials (sparite and micrite), leading to a bimodal grain size distribution. However, considering the subrounded to rounded shape and even distribution of the abovementioned clasts, they are more likely to be natural inclusions in the sediment introduced by the process of clay mixing. This is based on the identification of red fine TCFs in which the smaller grained, rounded and widely distributed red fine silts may be seen as clay pellets of one of the plastic material ingredients. Furthermore, the clear signs of clay mixing are attested by a clay pellet of the mixture of greenish-brown calcareous and red fine clay within the Kon18/184 (Figure 5.26).

The optical activity ranges from weak to highly active, suggesting different firing sequences corresponding to varied surface finishes. Besides, Kon18/198 bears a strong birefringent matrix which goes into parallel extinction.

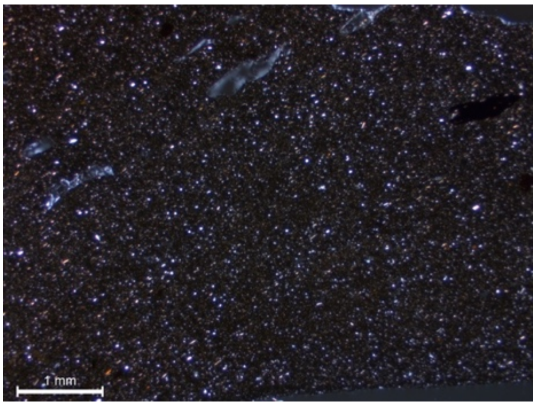


Figure 5.25: Kon18/197 shows the reduced clay matrix with the predominate fine silt quartz inclusions and very few mica and calcareous materials in the fine fraction, XP.

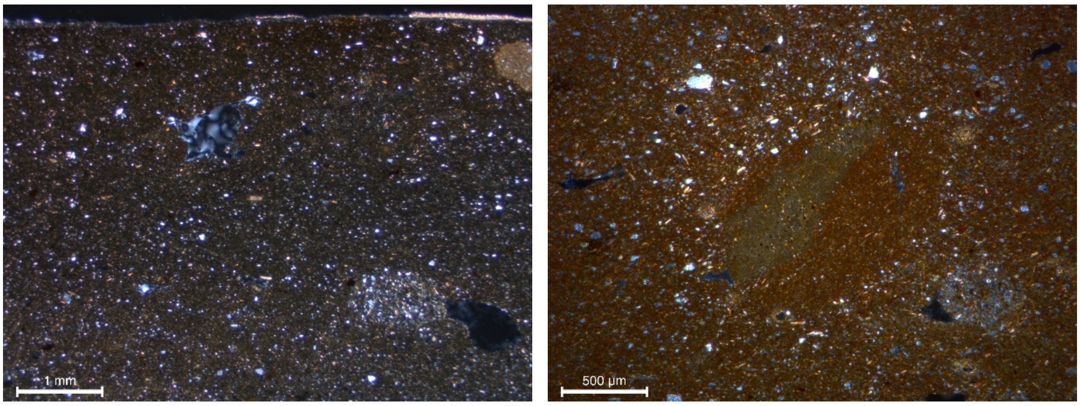


Figure 5.26: Photomicrographs of Kon18/110 (left) within FG11 shows the reduced clay matrix with predominate fine silt quartz inclusions and rare mica and calcareous materials in the fine fraction; Kon18/184 (right) to illustrate clay pellets of the mixture of greenish-brown calcareous and red fine clay. Both in XP.

This fabric is mostly associated with the novel shapes of tableware such as sauceboats, saucers, goblets and dishes introduced in the EH II period. By the identification of the overfired wasters (e.g. Kon18/140) compatible with this fabric, it confirms their place of production as Kontopigado and consequently, it also suggests that the bluish grey to white slipped ware is one of the main locally produced products of EH II at the site. Furthermore, both the mixed clays and the range of inclusion types are compatible with the range of compositions derived from the Neogene deposits and the micaceous Miocene deposits in the local region of Alimos, near Ayios Kosmas (Gilstrap 2015: 73; Papavassiliou *et al*. 1982). This area has been used as the main source of raw materials from prehistoric to the Classical period (Kaza-Papageorgiou pers. comm.). Moreover, the heterogeneously mixed calcareous and micaceous matrix and the presence of red siltstone in this fabric are reminiscent of the very fine samples from the LBA Mycenaean Kontopigado production (Gilstrap 2015: 81-2). As a consequence, it is clear that the same range of raw materials is exploited and used for a long time, suggesting a very long potting tradition at Kontopigado. Besides, the characteristic siltstone found also in the fabric of a yellow mottled sauceboat (AI88/61) from Ayia Irini on Kea, presumably indicates an import from Kontopigado. However, the further provenance and technological characterisation within this group as well as between comparative materials will require further analysis, including neutron activation analysis and perhaps intensive clay prospection.

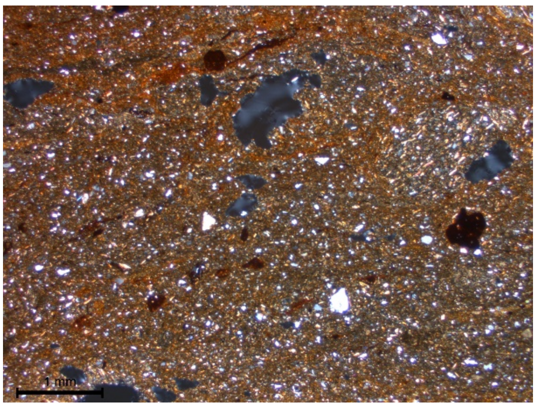
5.2.12 Fabric group 12 (Micrite and red mudstone in calcareous clay)

Sample no.	Vessel shape	Surface treatment
Kon18/107	Shallow bowl	
Kon18/108	Open vessel	
Kon18/158	Sauceboat	Bluish grey slip (exterior) and highly burnished (interior)
Kon18/159	Sauceboat	Red slip

Variants

Kon18/105	Jar	Black slip
Kon18/175	Conical cup	

This fabric is related to FG11 in terms of its similar texture and composition with the additional TCFs in the fine calcareous and micaceous matrix. The common presence of yellow to red clay swirls, striations and clay pellets possibly indicates the sign of clay mixing or heterogeneity of the raw material which survives processing (Figure 5.27: Kon18/107). Kon18/105 and 175 are the coarse version of the main group with slightly coarser grains of inclusions including quartz, calcite, muscovite schist and muscovite-biotite mica schist fragments, as well as rounded serpentine (Figure 5.27).



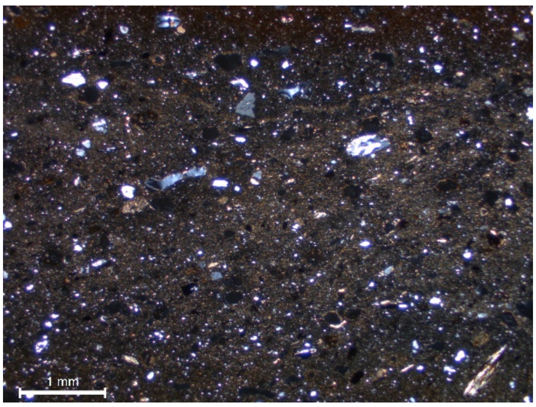


Figure 5.27: Photomicrographs of variants within FG12, XP (Kon18/107, left and Kon18/105, right).

The groundmass displays low (Kon18/105, 107, 108 and 175) to moderate (Kon18/158 and 159) optical activity, revealing the different range of firing temperature attribute to the individual surface finishes. The black slipped jar and plain pottery seem to be higher fired. In addition, Kon18/105 is high-fired and the reduced greyish brown core contains a lower level of mica laths.

The ware types seen within this group are associated with the new shapes of tableware such as conical cups, sauceboats, open vessels (bowl or dish?), as well as in a small number of the continuing shallow bowls. It seems that the conical cups and medium-sized shallow bowls and open vessels with no deliberate surface treatment are mostly manufactured in this fabric in the Kontopigado assemblage.

This fabric is compatible with the local fabric at LH III Kontopigado (Gilstrap 2015: 72-4, FG1), especially in terms of the sign of clay mixing and the presence of siltstone, suggesting this fabric is one of the main local fabrics that seem to continue through to the Mycenaean period.

5.2.13 Fabric group 13 (Medium quartz and polycrystalline quartz fabric)

Sample no.	Vessel shape	Surface treatment
Kon18/114	Jar	Black slip (exterior and inner rim)
Kon18/118	Jar	Grey slip

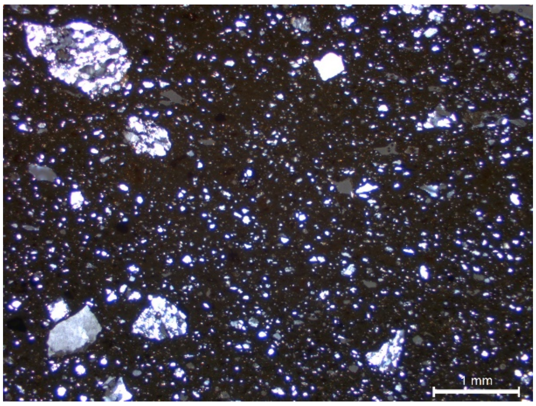


Figure 5.28: Photomicrograph of Kon18/114 illustrating FG13, XP.

This fabric is distinctive by the presence of very few medium- to fine-grained polycrystalline and monocrystalline quartz, very rare micrite and red silty particles in a greenish-brown fine clay. It is closely related to FG11, in particular the wasters (Kon18/140), in terms of texture and inclusion types with the higher proportion, and slightly coarser grains of polycrystalline and monocrystalline quartz. The group is associated exclusively with jars that have traces of black or grey slips and its optical inactivity suggests a high firing temperature. The colour is buff and light brown, suggesting a relatively oxidising atmosphere.

5.2.14 Fabric group 14 (Coarse subrounded calcite and sand fabric)

Sample no.	Vessel shape	Surface treatment
Kon18/112	Bowl	
Kon18/193	Bowl	

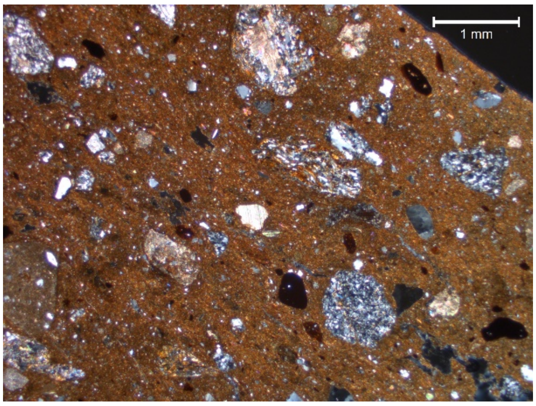


Figure 5.29: Photomicrograph of Kon18/193 illustrating FG14, XP.

This group is related to the FG5, in terms of its similar texture and inclusion types, but varies in terms of its grain size and the relative proportion of inclusions. It is distinguished by few to very few medium- to coarse-grained, subrounded sparite, rounded micrite, muscovite-biotite schist, angular polycrystalline and monocrystalline quartz, rare microfossils, marble and opaques, together with a wide range of sedimentary and/or low- to high-grade metamorphic rock fragments as well as very rare serpentine and chert. Additionally, the presence of TCFs may suggest the sign of clay mixing. Furthermore, the medium- to coarse-grained aplastic inclusions in contrast to the finer orange groundmass shows a bimodal grain size distribution which may indicate the addition of temper. The slight to moderate optical activity, suggests a relatively higher firing temperature for the plain bowls.

Similar to FG5, the sand tempering materials may derive from the local metamorphic and ophiolite deposits, possibly from the area of Athens Schist in the vicinity, as well as the alluvial/fluvial sediments and the calcareous sand from the Neogene sediments.

5.2.15 Fabric group 15 (Metamorphosed rock fragments and zoisite fabric)

Sample no.	Vessel shape	Surface treatment
Kon18/10	Closed vessel	
Kon10/81	Closed vessel	Black burnish

This fabric is characterised by metamorphic petrology, including metamorphosed sedimentary and igneous rock fragments, zoisite and epidote in the orange to brown clay matrix bearing quartz and few epidote with very few voids. The main inclusions include common to few muscovite-epidote-quartz schist, few to very few epidote and polycrystalline quartz, micrite, muscovite mica and zoisite, rare to absent serpentinite, chlorite schist, shale/slate, mudstone, siltstone, limestone as well as orthoclase and plagioclase feldspar (some altered), presenting a bimodal grain size distribution and may consider as sand temper. The rounded clay pellets sometimes composed of very fine-grained quartz are the possible sign of clay mixing. Both samples exhibit variability from slight to moderate optical activity, generally indicating a low firing temperature, as well as an unevenly vitrified matrix due to a low level of control of firing conditions.

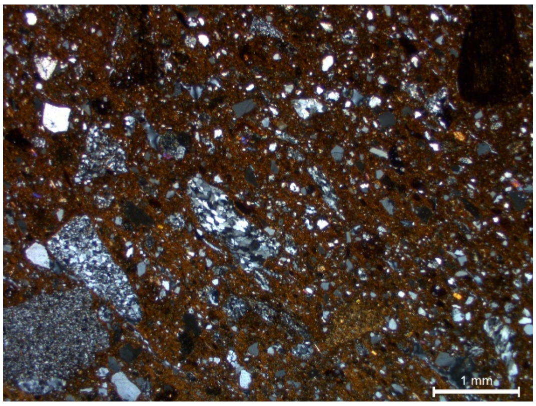


Figure 5.30: Photomicrograph of Kon18/10 illustrating FG15, XP.

There are both black burnished and plain pottery examples from Koropi (Koropi 02/30, 35, 133, 135) that show similarities in fabric, with metamorphosed sedimentary and igneous rock fragments accompanied by epidote in the matrix, but sometimes tempered with crushed calcite. Further work is required to suggest provenance, but as examples exist in Koropi and Ayia Irini, it is worth noting that similar burnished vessels, especially bowls, are also present commonly in the EB II Cyclades (Hilditch 2013; Wilson 1999: 67-9, 2013: 406-7, see also Sampson and Fotiadis 2008; Sotirakopoulou 1986; Televantou 2008).

5.2.16 Fabric group 16 (Crushed calcite fabric)

Sample no.	Vessel shape	Surface treatment
Kon18/41	Closed vessel	
Kon18/129	Bowl	
Kon18/187	Shallow bowl	

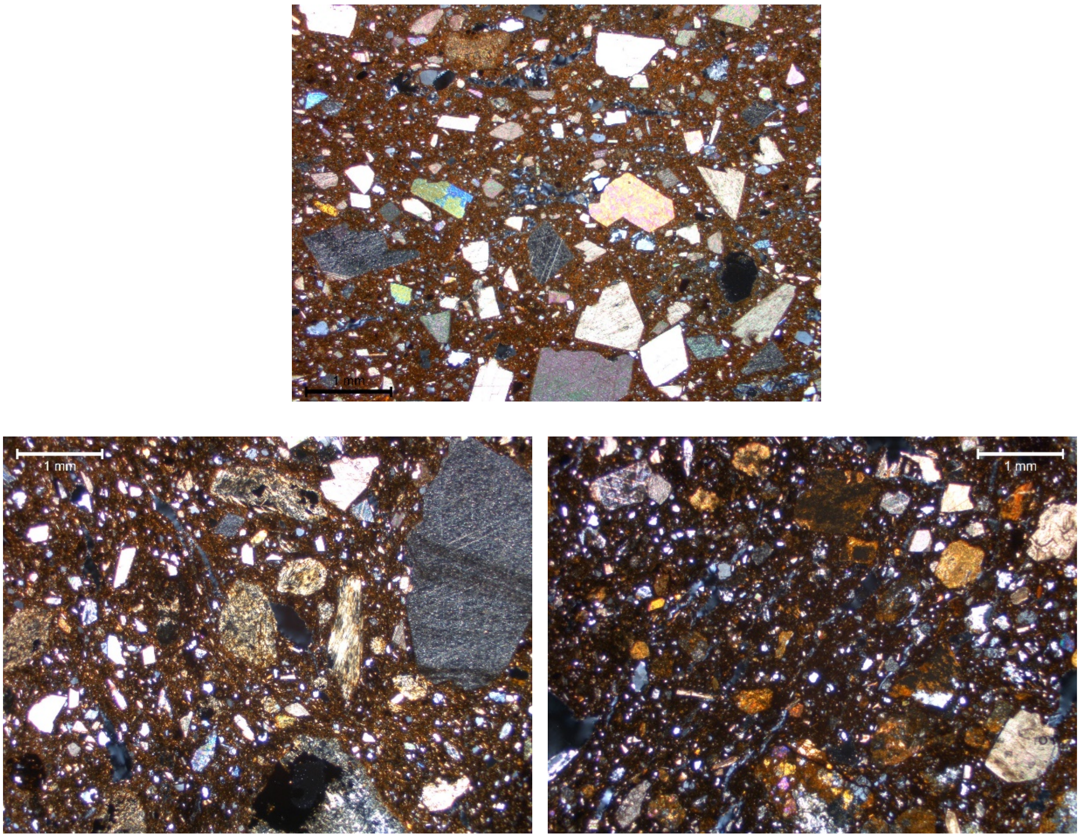


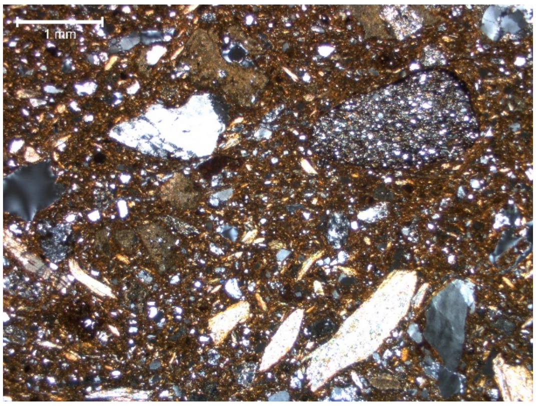
Figure 5.31: Photomicrographs of Kon18/41 (upper), Kon18/129 (bottom left) and Kon18/187 (bottom right) to address the distinctive and rather varied individuals classified within FG16. All in XP.

This fabric group is characterised by the presence of crushed calcite temper in an orange to red matrix with few to rare voids. However, all three samples present different mineralogical compositions and textures. Kon18/41 contains common angular calcite with two modes (fine- and coarse-grained), very few polycrystalline quartz, rare micrite and opaque as well as very rare shale and mudstone. Kon18/129 and 187 predominantly contain serpentinite, altered igneous rock fragments and angular calcite and other inclusions, mainly mica schist fragments and polycrystalline quartz in addition to the rare to absent accessory minerals such as alkali feldspar, pyroxene, amphibole and biotite mica. Furthermore, the abundance of the fine to coarse grains of serpentinite and altered igneous rock fragments and the bimodal grain-size distribution indicate ophiolite parent rock materials also being added to the matrix as temper. However, these two samples differ in terms of the main tempering material. Kon18/129 is dominated by serpentinite and additionally contains marble and quartz-clinozoisite aggregates, whereas Kon18/187 contains altered and metamorphosed igneous rock fragments with very few micrite and very rare biotite mica schist. Both samples are slightly to moderately optically active, indicating they are slightly lower fired than Kon18/41. As a result, it implies that these vessels are products of different production centres which has a shared knowledge and technological tradition of deliberately adding crushed calcite temper in the paste manipulation process.

The angular calcite strongly suggests the use of fresh crushed calcite temper can be recognised by the naked eye which in this case, correlates with MG6. Such calcite-tempering is attested across the Cyclades and is commonly found on the mainland and Crete (see Burke 2016: 256-7; Day *et al*. 2012; Vaughan 2002; Vaughan *et al*. 1995; Papadatos and Nodarou 2018; Whitbread and Mari 2014). This indicates a shared technological knowledge between the potting communities in the EBA Aegean. Subsequently, it is likely that there are numerous locations for producing pottery with calcite-tempering across the various sources and the petrographic differences amongst these three samples suggest their importation from different locations.

5.2.17 Fabric group 17 (Coarse sedimentary and metamorphic fabric)

Sample no.	Vessel shape	Surface treatment
Kon18/8	Deep bowl/basin	
Kon18/11	Closed shape	
Kon18/19	Cheese-pot	
Kon18/57	Bowl	
Kon18/70	Baking plate	



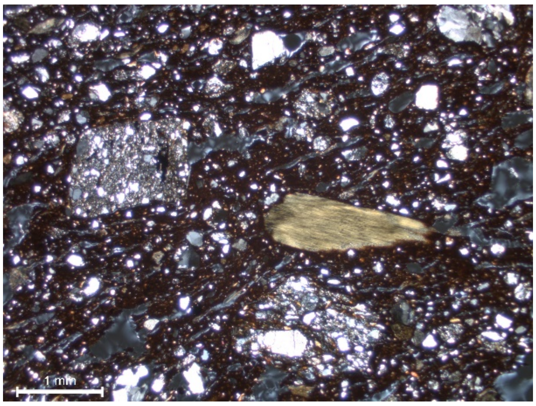


Figure 5.32: Photomicrographs of Kon18/8 (left) and Kon18/11 (right) illustrating FG17, XP.

This fabric is characterised by coarse-grained sedimentary and metamorphic rock fragments in the yellow, red to dark grey matrix with few voids. The coarse fraction is composed of a wide range of sedimentary and low- to medium-grade rock fragments, ranging from few to very rare sandstone (in particular greywacke), siltstone, micrite and mudstone, very few to very rare talc, muscovite phyllite (mostly yellow shimmering) and polycrystalline quartz as well as very rare to absent muscovite-biotite phyllite, biotite schist, sillimanite schist, kyanite and serpentine. The optical activity ranges from slightly to strongly active, reflecting a varied firing regime. Those with a red to dark grey groundmass (Kon18/11 and 19) have weak optical activity, implying a higher firing temperature, while the low-fired yellowish-brown groundmass (Kon18/8, 57 and 70) exhibits moderate to high optical activity. The contrast between very coarse inclusions and fine fraction reveals a bimodal grain size distribution and thus suggests that sand temper is intentionally added to the clay. The mineralogical composition has some similarities to some Neolithic pottery from Nea Makri, Attica, but the metamorphic grade and overall texture differ (Miragaia 2020 pers. comm.). Two of the five samples in this fabric are a cheese-pot and a baking plate, shapes that are usually expected to be local products. However, this fabric might suggest that some of the perforated vessels and baking pans may be imported from elsewhere in Attica taking their place with other plain wares in the assemblage for food processing and cooking during the EH I period at Kontopigado.

5.2.18 Fabric group 18 (Talc schist fabric)

Sample no.	Vessel shape	Surface treatment
Kon18/119	Jar	
Kon18/179	Jar	

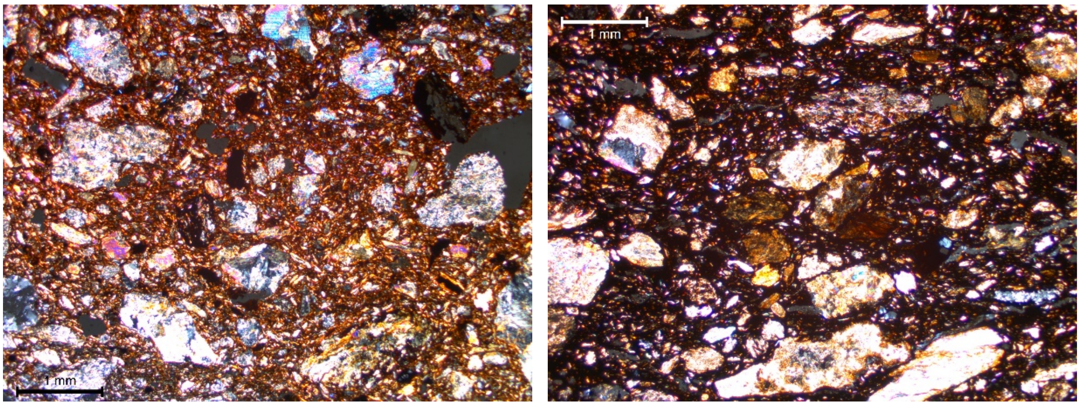


Figure 5.33: Photomicrographs of Kon18/119 (left) and Kon18/179 (right) illustrating the frequent fragments of talc schist in FG18, XP.

This group is recognisable by the frequent talc schist, very rare quartz, mica and feldspar aggregates and very rare to absent serpentinite and kyanite in a reddish brown fine groundmass. This fabric is used for closed jars with flaring collar and comparative materials have been found at Ayia Irini on Kea, Akrotiri on Thera and Poros-Katsambas on Crete (Day and Wilson 2016; Wilson 1999: 69-71). The talc ware is considered by Vaughan and Wilson (1993) to be imported from Siphnos, though its precise source within the western Cyclades has yet to be established (Hilditch 2013: 474; Wilson 1999). The talc jars first appear in the EH II Kontopigado assemblage, demonstrating their long-distance connection and the position of Kontopigado at the western end of the 'Western String' of Attic-Cycladic routes.

5.2.19 Fabric group 19 (Intermediate volcanic fabric)

Sample no.	Vessel shape	Surface treatment
Kon18/1	Bowl	Red slip and burnish
Kon18/4	Baking plate	
Kon18/6	Basin	Burnish
Kon18/13	Basin	
Kon18/18	Closed vessel	
Kon18/20	Basin	Black burnished
Kon18/29	Shallow bowl	Black slip and burnish
Kon18/56	Basin	Burnish
Kon18/76	Basin	Red to black slip and burnish
Kon18/189	Bowl	Heavy polish
Variant		
Kon18/162	Open vessel	

The distinctive feature of this fabric is the common presence of intermediate volcanic rock fragments (most probably andesite?), accompanied by common to rare biotite mica, amphibole and plagioclase feldspar, very few quartz and very rare altered orthoclase feldspar in the coarse fraction. There are slight differences in the mineralogical composition of the intermediate volcanic rock fragments. More specifically, Kon18/1 and 4 have more frequent rhomboid green amphibole as the main component of the intermediate volcanic rock alongside biotite mica and plagioclase feldspar in a glassy matrix. In comparison, Kon18/6, 13, 18, 20, 29, 56, 76 and 189 consist of distinctively pale yellow clinopyroxene, amphibole, biotite mica as well as the associated minerals such as plagioclase feldspar. The bimodal grain size distribution and the angularity of inclusions infer the possible practice of tempering with materials derived from the volcanic geological areas. FG19 is compatible with the diagnostic Non-calcareous Volcanic Fabric of Aeginetan provenance (Kiriatzi *et al*. 2011: 93-9). The same division of the compositional difference within the Aeginetan materials suggests the use of different tempering sources of volcanic rock fragments within the island of Aegina (Kiriatzi *et al*. 2011: 131-3).

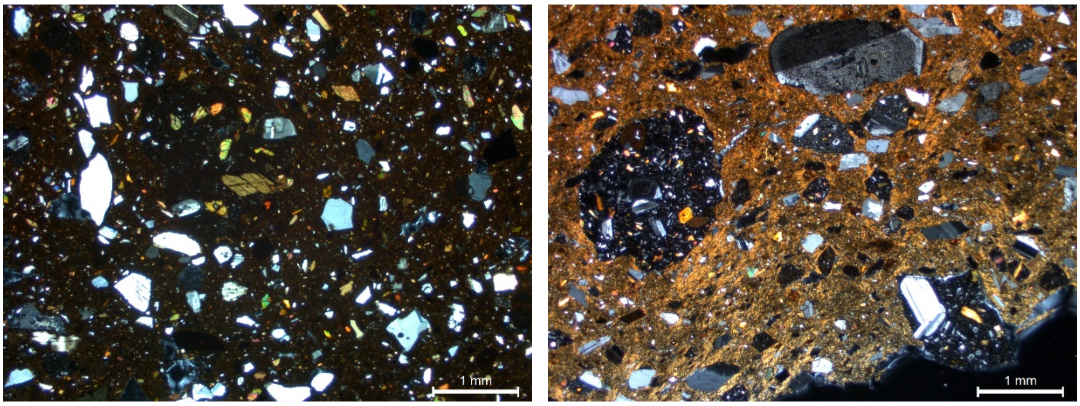


Figure 5.34: Photomicrographs of Kon18/1 (left) and Kon18/18 (right) to illustrate variability within volcanic FG19, XP.

Furthermore, technical variations in the process of paste manipulation are observed in this group. Kon18/56 has micritic limestone as temper and the presence of clay pellets may indicate the sign of clay mixing. Kon18/76 displays significant variation in the proportion and the state of the volcanic rock fragments (mostly altered) as well as the additional TCFs may suggest a different manipulation process. The red to brown non-calcareous matrix shows moderate to strong optical activity whereas Kon18/1, 4 and 13 are optically inactive, suggesting variability in the degree of vitrification and therefore firing temperature.

This fabric is present in both EH I and EH II Kontopigado, attesting to the sustained consumption of Aeginetan vessels and has been recorded in thin section also at EH II Koropi (Douni 2015: 164, FG9) and during EH I and EH II at a variety of sites in the northeast Peloponnese (Alram-Stern 2018; Burke *et al*. 2018) suggesting the wide exchange of Aeginetan products and perhaps a long-lived reputation of the island production centre.

5.2.20 Petrographic loners

The following section presents a number of loners, some are closely related to distinctive fabrics defined above but have been separated due to important differences, some of them seem to be compatible with Attic geology, and others lack comparatives in general. As a whole, the general feature of these loners seems to show there is more variability in the EH I assemblage.

Sample no.	Vessel shape	Surface treatment
Kon18/32	Closed vessel	

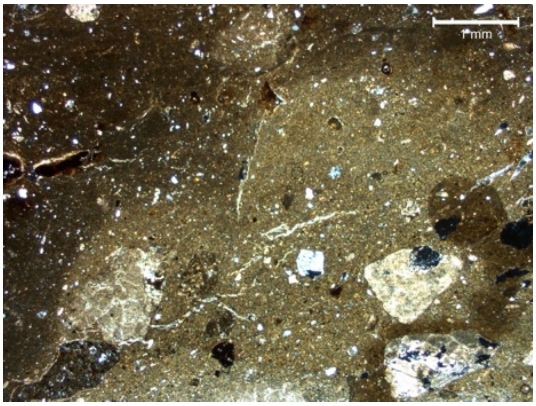


Figure 5.35: Photomicrograph of Kon18/32, XP.

This sample is composed of very few coarse inclusions, mostly consisting of micrite, limestone, chert (frequently radiolarian) and rare serpentine in the heterogeneous very fine calcareous groundmass. The aplastic inclusions are moderately sorted and have a moderately bimodal grain size distribution, probably representing deliberate tempering of micrite limestone. The clay matrix is optically inactive as being indicative of a high-fired closed vessel. This loner seems to be compatible with Attic geology.

Sample no.	Vessel shape	Surface treatment
Kon18/34	Handle	Red slip and burnish

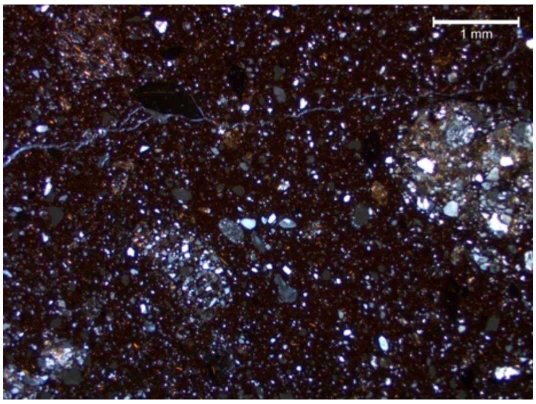


Figure 5.36: Photomicrograph of Kon18/34, XP.

This sample is loosely packed with few coarse sedimentary rock fragments and rare micrite and plagioclase feldspar in the fine quartz-rich groundmass. The matrix has an optically inactive core and slightly activity in the margins, suggesting the overall high firing regime. The bimodal grain size distribution may suggest the coarse sedimentary rock fragments as sand temper being deliberately added by the potter. It is not compatible with the local metamorphic geology.

Sample no.	Vessel shape	Surface treatment
Kon18/38	Closed vessel	

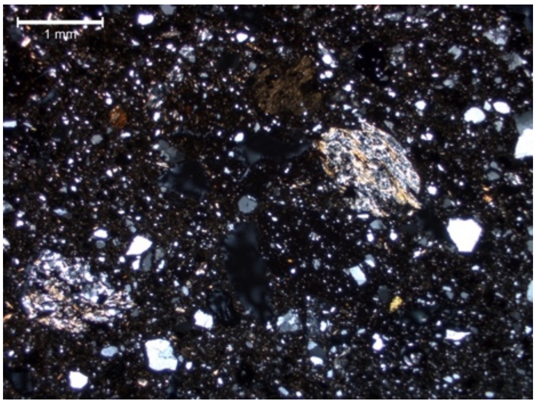


Figure 5.37: Photomicrograph of Kon18/38, XP.

This sample comes from a plain closed vessel with thick vessel walls and is manufactured using few coarse muscovite schist and quartz, very few opaques accompanied by rare to very rare polycrystalline quartz, sedimentary rock fragments, plagioclase feldspar and chert. There are TCFs suggestive of clay pellets from clay mixing. The reduced inactive matrix suggests incomplete oxidisation.

While it does not fit into the main defined fabrics, most of the metamorphic rock fragments in the coarse fraction are compatible with the local geology.

Sample no.	Vessel shape	Surface treatment
Kon18/48	Shallow bowl	Black slip and burnish

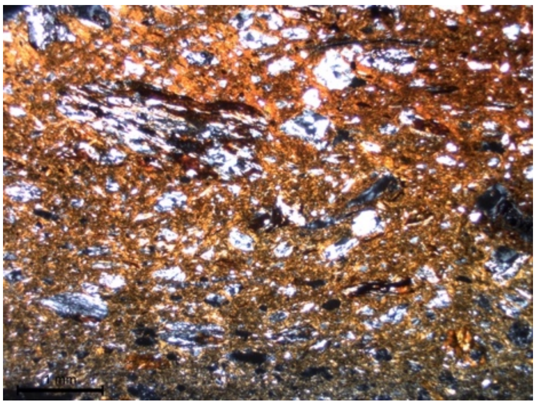


Figure 5.38: Photomicrograph of Kon18/48, XP.

This sample mainly consists of common biotite schist, few polycrystalline quartz and very few opaques. Overall, this loner is macroscopically and petrographically similar to FG 1, but contains more frequent biotite mica schist, in contrast to FG1, which is dominated by muscovite mica schist.

The strongly active matrix, the variation of orange to brown colouration throughout the section and the mottling in the core suggest a low firing temperature and inconsistent redox conditions in firing, possibly indicative of pit firing. It may be an Attic product.

Sample no.	Vessel shape	Surface treatment
Kon18/50	Pyxis	

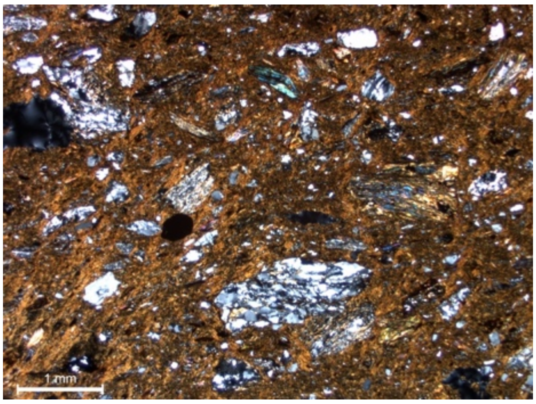


Figure 5.39: Photomicrograph of Kon18/50, XP.

This loner contains frequent muscovite-chlorite fine schist (mostly shimmer appearance with internal crenulation cleavage), very few polycrystalline and monocrystalline quartz, as well as cataclasite, muscovite and chlorite mica, opaque and rare marble. The mixed moderate to high optical activity reflects a low firing temperature range. This is a black pyxis, in typological terms often attributed to Cycladic ceramic production. Furthermore, the predominantly metamorphic-derived rock fragments within this fabric suggest a mixture of metamorphic schist and marble deposits of the Attic-Cycladic metamorphic belt (Higgins and Higgins 1996; Krohe *et al*. 2010). In particular, some of the metamorphic rocks that display cataclasites with massive recrystallisation belong to a higher-grade metamorphism than that of the main fabric groups which have their origin in Attica. An island origin within the Attic-Cycladic complex remains the most likely.

Sample no.	Vessel shape	Surface treatment
Kon18/52	Handle	

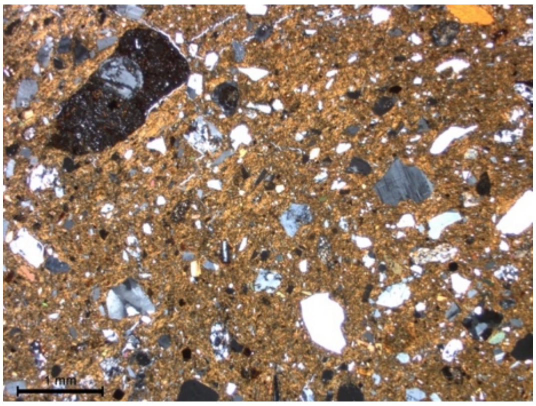


Figure 5.40: Photomicrograph of Kon18/52, XP.

This fabric is related to FG19 through its volcanic rock fragments, twinned and/or zoned plagioclase feldspar, biotite mica and amphibole in addition to few to very few polycrystalline and monocrystalline quartz as well as calcareous inclusions, limestone, metamorphosed calcite, sparite and micrite. The TCFs, namely clay pellets, may indicate clay mixing. The optical activity is low suggestive of a relatively high firing temperature. It contains a similar range of inclusions types Kiriatzi's variant of her FG 1A (sample KOL 113) (Kiriatzi *et al*. 2011: 95-6), suggesting an Aeginetan origin.

Sample no.	Vessel shape	Surface treatment
Kon18/89	Deep bowl	Red slip and burnish

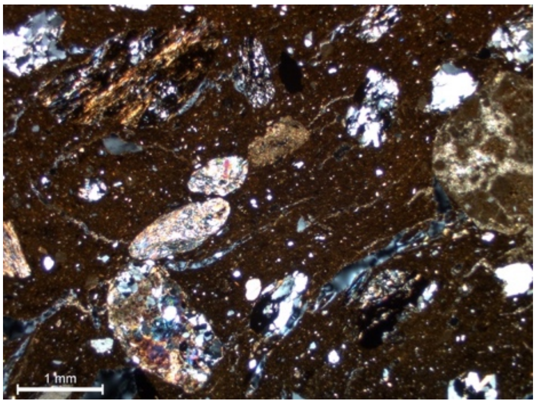


Figure 5.41: Photomicrograph of Kon18/89, XP.

This fabric is composed of coarse-grained muscovite-opaque schist fragments and micrite limestone in a quartz-rich brown fine matrix. The main inclusions together with very few marble fragments and very rare epidote are reminiscent of FG5, but this fabric exhibits more frequent marble clasts and calcite (including micrite and sparite) and more frequent inclusions of slightly higher grade of metamorphism, indicated by highly birefringent fine muscovite mica schist with shimmer aggregate. The heterogeneous colour and slight to moderate optical activity reflect a less consistent low firing temperature range and incomplete oxidisation. Although this sample does not fit into the main group FG5, its schist fragments and limestone seem to be broadly compatible with an Attic origin.

Sample no.	Vessel shape	Surface treatment
Kon18/116	Jar	Smooth

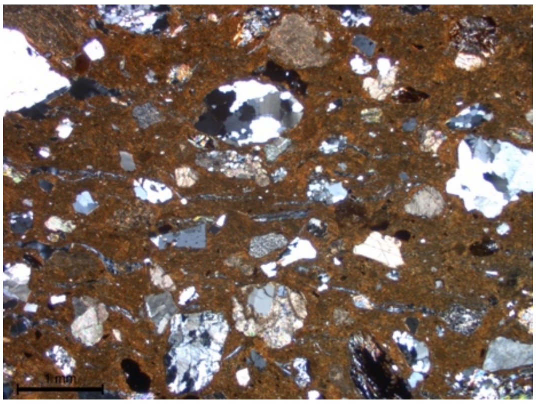


Figure 5.42: Photomicrograph of Kon18/116, XP.

This sample resembles FG8, but has a fine, highly birefringent matrix with very few inclusions in the fine fraction. It is tempered with well-sorted sand-sized polycrystalline and monocrystalline quartz, calcite, limestone and muscovite phyllite (mostly highly birefringent), and orthoclase feldspar in the coarse fraction. The matrix is strongly optically active, suggesting a very low firing temperature. These inclusions are compatible with an Attic provenance and bear strong similarities to local fabrics.

Sample no.	Vessel shape	Surface treatment
Kon18/122	Jug	White slip

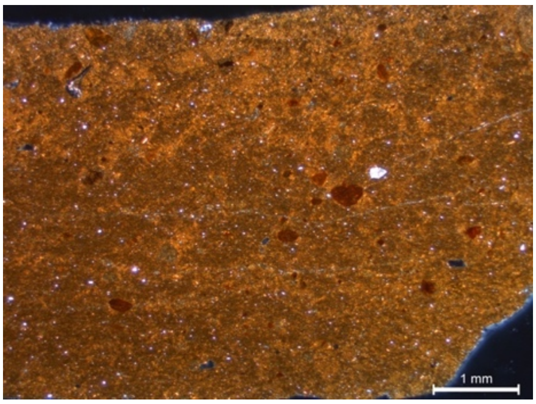


Figure 5.43: Photomicrograph of Kon18/122, XP.

This is characterised by a yellowish orange fine matrix with rare red mudstone and very rare quartz in the coarse fraction. The inclusions are very fine and well-sorted which may imply refinement. The strong optical activity reflects a low firing temperature. Imported shallow bowls and plates, mostly red to black slipped, of this fabric most likely from Euboea are also known at Ayia Irini on Kea during the EC II late Kastri phase (Wilson 1999: 141-3, III-543: AI88/84) and fine slipped pottery at EH II Koropi (Douni 2015). This sample comes from a white slipped jug, emphasising the consistent presence of the imported Euboean pottery in light-coloured slipped vessels in the broader region of Attica.

Sample no.	Vessel shape	Surface treatment
Kon18/125	Pipe	

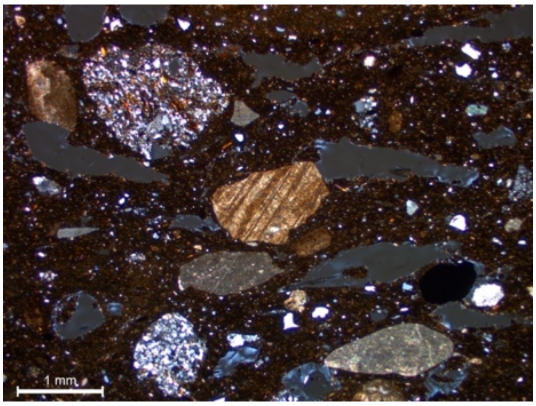


Figure 5.44: Photomicrograph of Kon18/125, XP.

There are many examples of this fabric on site, of which one sample has been taken for examination. This sample contains very coarse aplastic inclusions, mainly marble, calcite, micrite, biotite schist, muscovite mica schist, and common voids in a brown calcareous groundmass. The strong bimodal grain size distribution and the elongate vugh voids may indicate the introduction of sand temper and organic temper into the paste. The slight optical activity suggests a relatively high firing regime.

This sample is essentially the coarse version of the local fabric. In terms of the petrology of its sand inclusions, it is clearly related to the main EH II local fabric FG5, but stands out for its very coarse sand grains and accompanying large voids, which seem to be the remains of organic temper. This characteristic coarse fabric with organic inclusions seems to be used to make water pipes.

Sample no.	Vessel shape	Surface treatment
Kon18/128	Pedestalled bowl	

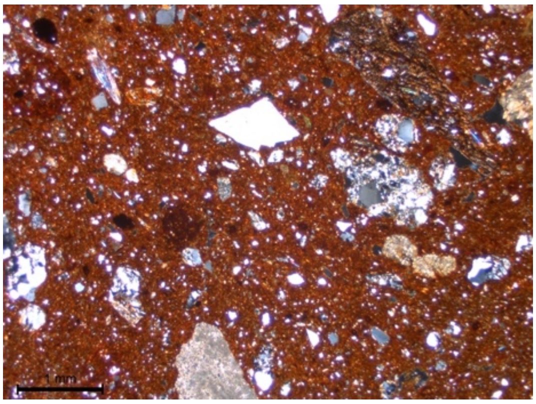


Figure 5.45: Photomicrograph of Kon18/128, XP.

This fabric is characterised by coarse aplastic inclusions of metamorphic and sedimentary and origin in an optically inactive red firing clay matrix. The coarse fraction consists of few biotite-muscovite mica schist, muscovite schist, sparite, micrite, polycrystalline and monocrystalline quartz along with very few sandstone and red siltstone. The poorly-sorted inclusions display a skewed bimodal distribution, probably representing deliberate tempering with sand. The TCFs are similar to those in FG5 (in particular Kon18/149), suggesting similar raw material sources. The homogenous colour and the optically inactive matrix indicates a higher firing temperature in a controlled oxidising atmosphere.

Sample no.	Vessel shape	Surface treatment
Kon18/132	Closed vessel	

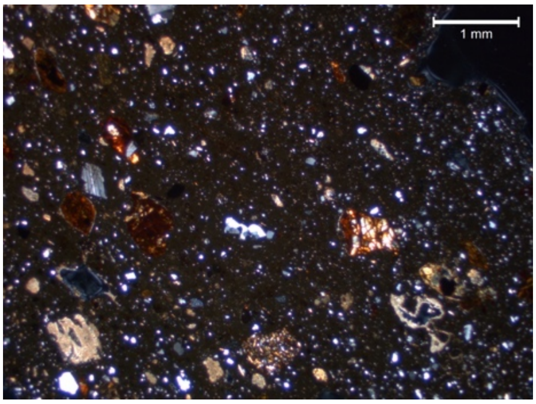


Figure 5.46: Photomicrograph of Kon18/132, XP.

This sample is characterised by few coarse red serpentine inclusions, frequently with relics of olivine, pyroxene and basalt fragments, very few polycrystalline quartz, micrite, chert, plagioclase and alkali feldspars, biotite mica along with quartz, micrite and opaque in the fine fraction. The bimodal grain size distribution suggests tempering with materials derived from ophiolitic outcrops. The fabric is not compatible with a provenance nearby Kontopigado, but ophiolitic fabrics occur within Attica.

The optically inactive matrix suggests a high firing temperature. This is a distinctive fabric both macroscopically and petrographically and occurs in very small numbers within the Kontopigado assemblage.

Sample no.	Vessel shape	Surface treatment
Kon18/150	Sauceboat	Red slip

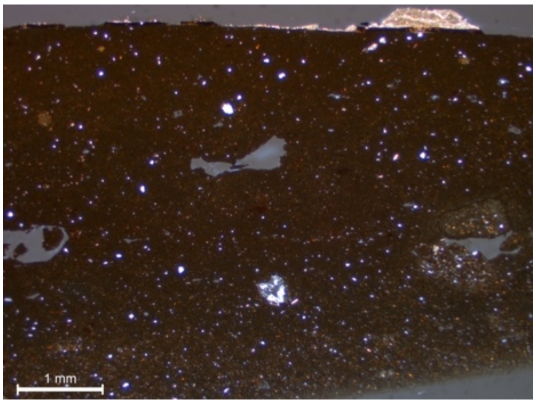


Figure 5.47: Photomicrograph of Kon18/150, XP.

This is a very fine fabric with very few red TCFs and well-sorted rare inclusions, consisting of siltstone, calcareous limestone, muscovite mica schist, polycrystalline quartz and microfossils. The clay matrix is moderately optically active. A similar fabric is present at LBA Lazarides (Lazarides 12/09 and 13) and it is suggested that it derived from Neogene deposit in the northeast Peloponnese (Gilstrap 2015: 117-8). However, the comparison of such a fine fabric in a thin section is difficult without further typological and chemical evidence.

Sample no.	Vessel shape	Surface treatment
Kon18/153	Closed vessel	Black slip

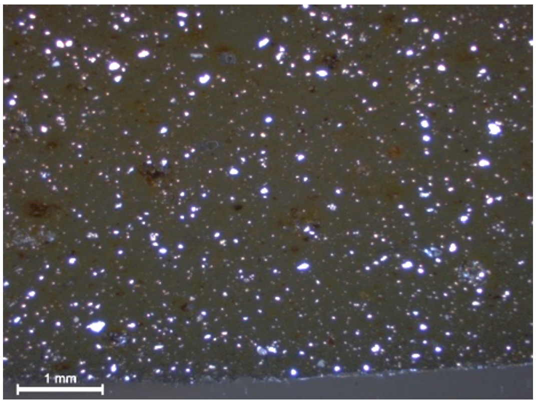


Figure 5.48: Photomicrograph of Kon18/153, XP.

This sample is very distinctive, with few quartz and red TCFs in a characteristic, very fine olive green groundmass. The greenish groundmass and the optical inactivity suggests a high-fired and highly calcareous clay. This fabric comes from a black slipped closed vessel belonging to MG9. The buff-pink-buff colour in the break and the black slip suggests the vessel was fired in an oxidising atmosphere, followed by a reduction phase during the last stage to produce the iron-reduced black (Noll *et al*. 1975: 602). The fabric matches those common in EH II Corinth also found imported to Tsoungiza-Nemea and Midea in the Argolid (Burke *et al*. 2018: 153-4; Burke *et al*. 2020: 33).

Sample no.	Vessel shape	Surface treatment
Kon18/196	Cooking pot	

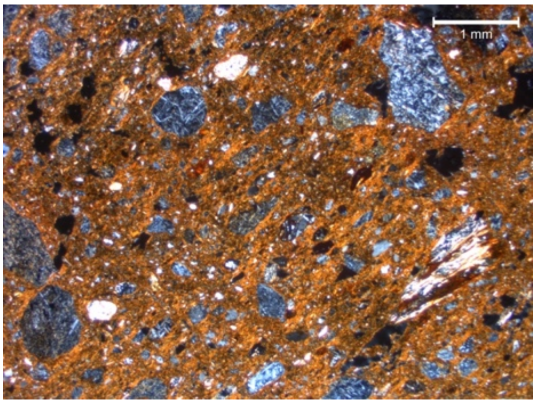


Figure 5.49: Photomicrograph of Kon18/196, XP.

This sample consists of common serpentinite, very few mica schist and very rare calcite with very few voids in the orange groundmass. The aplastic inclusions show a bimodal grain size distribution, tempering with materials of ophiolitic origin, and the moderate optical activity in the matrix indicates a moderate firing temperature. The rarity of this fabric and its substantially different petrology suggests a non-local origin.

5.2.21 Summary

We have defined several large fabric groups and some loners. The majority of the pottery seems to be compatible with an Attic provenance, with certain exceptions, and some samples whose provenance cannot be ascertained. There are distinct differences petrographically between EH I and EH II pottery. It appears that there is more variability in EH I in comparison with the much more consistent and standardised fabrics in EH II.

The production debris from EH II seems to be consistent with the large fabric groups and that agrees with the identification of a production centre. In addition, in EH I, it seems to have some fabrics related to ones from the later phase, certainly in terms of raw materials. There are notable sources of importation, including the ones that appeared to be common in both phases, for example, Aegina, but there are some of them only identified in EH II such as talc ware in the Cyclades, fine vessels from Corinth and the Argolid.

In terms of the local material, thin section petrography not only broadly provides insight into provenance, but also suggests that there are marked differences in firing temperature and atmosphere and level of control. The differences in firing, the consistency of the clay matrix, all appear to be developments in the production sequence and the technology of firing. Although such observations seem clear in the petrographic thin section, SEM and XRD are more appropriate techniques to further investigate these intriguing differences.

5.3 The reconstruction of firing

This section is dedicated to the detailed investigation of firing practices in ceramic production. Both SEM and XRD are well-established analytical techniques for the assessment of firing and here are combined and integrated with macroscopic observation to assess firing conditions, both in terms of equivalent firing temperatures and the atmospheric conditions of firing that related to surface finish.

Petrographic analysis has already suggested some aspects of firing, through consideration of mineralogical suites in the coarse fraction and the relative percentages of calcium components, as well as the degree of optical activity and this is also taken into consideration.

Additionally, SEM-EDS bulk chemical data offers a reliable guideline for assessing the calcareous component of clay paste, important for the interpretation of vitrification microstructures observed. The integrated analytical examinations regarding firing practices are discussed according to the different petrographic groups, in order to characterise groups in terms of their firing technology and their relation to the paste recipes used in the pottery manufacturing process. The analytical factors for the final assessment of firing of the examined samples are referred to in Table 5.2.

Table 5.2: Table showing firing information and equivalent firing temperature (EFT) for samples, where EFT is estimated based upon the comparison of the temperature ranges between the vitrification stage of the ceramic body examined by SEM and the mineralogical transformation by XRD. NV = no vitrification; IV = initial vitrification; V = extensive vitrification; V+ = advanced vitrification; CV = continuous vitrification, C = calcareous, FF = Fast firing.

Sample	Fabric group	CaO	Vitrification	Optical activity	Colour	Firing Atmosphere	XRD temp (°C)	EFT (°C)
Kon18/35	1		IV/V, FF	Slightly active to inactive	grey, mottled	O	900-950	750-900
Kon18/68	1		FF	Slightly active to inactive	orange-grey-thin orange, mottled	O	950-1000	>950
Kon18/69	1	low	NV	Strongly active	grey	O		<800
Kon18/90	1	low	NV	Moderately active	red-brown	O	800-850	<800
Kon18/199	1		NV	Slightly active to inactive	dark grey-orange	O	<800	<800
Kon18/176	2		CV	Slightly active to inactive	red	O	950-1000	>1000
Kon18/22	3	low	NV	Slightly active	orange/red	O	900/950	<800
Kon18/95	3		NV	Moderately to slightly active	orange	O		<800
Kon18/7	4	low	NV	Slightly active	thin red-dark brown -thin red	O	850-900	<800
Kon18/36	4	high	NV/IV	Slightly active	red	O		<750-850
Kon18/37	4	low	V	Slightly active to inactive	grey, mottled	O	850-900	850-900
Kon18/66	4	medium	NV	Slightly active	orange	O	850-900	<800
Kon18/188	4	high	V/V+	Inactive	black	R		1000-1080
Kon18/115	5	low	IV	Moderately active	buff	O	<800	<750-800
Kon18/126	5		IV	Moderately active	thin buff-bluish grey-thin buff	O	800-850	≃ 800
Kon18/131	5	low	V/V+, FF	Slightly active	pink-bluish grey-pink	R	<1000	>900

Table 5.2 continued: Table showing firing information and equivalent firing temperature (EFT) for samples, where EFT is estimated based upon the comparison of the temperature ranges between the vitrification stage of the ceramic body examined by SEM and the mineralogical transformation by XRD. NV = no vitrification; IV = initial vitrification; V = extensive vitrification; V+ = advanced vitrification; CV = continuous vitrification, $_{C}$ = calcareous, FF = Fast firing.

Sample	Fabric group	CaO	Vitrification	Optical activity	Colour	Firing Atmosphere	XRD temp (°C)	EFT (°C)
Kon18/138	5	low	NV	Slightly active	red	O	<800	<800
Kon18/151	5		NV	Moderately active	red-brown-red	O		<800
Kon18/154	5		IV/Vc	Moderately active	orange-grey	O	<800	750-850
Kon18/155	5		V	Inactive	pink-dark grey-buff	O		800-900
Kon18/160	5		IV	Moderately active	mixed red/black	O	<800	800-850
Kon18/161	5	high	IV/Vc−	Slightly active	brown	O	850-950	≃ 850
Kon18/163	5	medium	Vc/Vc+	Slightly active	grey	R	800/850-950/1000	850-1080
Kon18/169	5	high	Vc	Moderately to slightly active	thin buff-light grey	R	800/850-950/1000	850-1050
Kon18/170	5	high	NV	Moderately active	orange	O	>800	<800
Kon18/172	5		IV/V	Moderately to slightly active	thin red-grey-thin red	O	<800	750-800
Kon18/178	5		IV	Moderately active	red-grey-red	O	<800	750-800
Kon18/180	5		IV	Moderately active	red-light brown-red	O		750-800
Kon18/181	5	low	V/V+	Slightly active	thin orange-grey-thin orange	R	>800-850	>850-900
Kon18/186	5		V+	Slightly active	orange-dark brown-orange	O	≃950/1000	>1050
Kon18/21	6		IV	Inactive	buff	O		800-850
Kon18/42	6	high	Vc-	Inactive	grey	O	850-950/1000	≃ 850

Table 5.2 continued: Table showing firing information and equivalent firing temperature (EFT) for samples, where EFT is estimated based upon the comparison of the temperature ranges between the vitrification stage of the ceramic body examined by SEM and the mineralogical transformation by XRD. NV = no vitrification; IV = initial vitrification; V = extensive vitrification; V+ = advanced vitrification; CV = continuous vitrification, $_C$ = calcareous, FF = Fast firing.

Sample	Fabric group	CaO	Vitrification	Optical activity	Colour	Firing Atmosphere	XRD temp (°C)	EFT (°C)
Kon18/44	6		Vc+	Inactive	red-grey	O	≅950	1050-1080
Kon18/84	6	high	Vc-	Inactive	buff	O	800/850-950/1000	800-850
Kon18/101	6	low	V+	Slightly active to inactive	brown-grey-orange	O		850-1080
Kon18/177	6		V/V+	Slightly active	buff	O	≃950/1000	1000-1080
Kon18/191	6		Vc	Moderately to slightly active	orange-brown-buff	O		850-950
Kon18/40	7			Inactive	grey-orange	O	800/850-950/1000	
Kon18/85	7	low	V+	Slightly active	grey	R	<850	1000
Kon18/86	7			Moderately to strongly active	orange	O	800/850-950/1000	
Kon18/98	7	high	V+	Inactive	grey	R		1050-1080
Kon18/9	8			Slightly active	orange-brown-orange	O	<850	
Kon18/47	8			Strongly to moderately active	brown-black-brown	O	<850	
Kon18/59	8			Slightly active	buff orange-grey	O	≃800-850	
Kon18/94	8	low	IV	Moderately to slightly active	grey	O	≃800-850	750-800
Kon18/157	8			Slightly active to inactive	dark grey	R	>950/1000	
Kon18/164	8	medium	IV/Vc	Moderately active	thin brown-grey-thin brown	R		750-900
Kon18/190	8	low	NV	Strongly active	orange-grey-thin buff	O	<800	<750

Table 5.2 continued: Table showing firing information and equivalent firing temperature (EFT) for samples, where EFT is estimated based upon the comparison of the temperature ranges between the vitrification stage of the ceramic body examined by SEM and the mineralogical transformation by XRD. NV = no vitrification; IV = initial vitrification; V = extensive vitrification; V+ = advanced vitrification; CV = continuous vitrification, $_C$ = calcareous, FF = Fast firing.

Sample	Fabric group	CaO	Vitrification	Optical activity	Colour	Firing Atmosphere	XRD temp (°C)	EFT (°C)
Kon18/106	11	medium	Vc	Slightly active	orange-grey-orange	R		850-1050
Kon18/110	11	high	IV	Slightly active	grey	R		750-800
Kon18/117	11	medium	Vc	Slightly active	pink-bluish grey-pink	R		850-1050
Kon18/143	11	low to high	Vc	Moderately active	dark brown	R	800/850-950/1000	850-950
Kon18/156	11	low	V	Strongly active	dark brown	R		850-950
Kon18/165	11		Vc–/Vc	Slightly active to inactive	orange-grey	R		800-950
Kon18/168	11		Vc	Strongly to moderately active	orange	O		850-1050
Kon18/184	11	high	IV	Moderately active	pink/orange	O		750-850
Kon18/195	11		Vc	Slightly active	buff	O		850-1050
Kon18/197	11	low	V+	Moderately to slightly active	light grey	R		>900
Kon18/198	11	low	V	Moderately active	orange-light brown-orange	O		850-950
Kon18/105	12	low to high	V	Slightly active	buff-grey-red	R		850-1050
Kon18/158	12	high	Vc	Moderately active	brown-thin buff-thin dark grey	O		850-1050
Kon18/159	12	high	Vc	Moderately active	orange-brown	O		850-1050
Kon18/175	12	low	IV	Slightly active	thin pink-grey-thin pink	R		750-800

Table 5.2 continued: Table showing firing information and equivalent firing temperature (EFT) for samples, where EFT is estimated based upon the comparison of the temperature ranges between the vitrification stage of the ceramic body examined by SEM and the mineralogical transformation by XRD. NV = no vitrification; IV = initial vitrification; V = extensive vitrification; V+ = advanced vitrification; CV = continuous vitrification, $_{C}$ = calcareous, FF = Fast firing.

Sample	Fabric group	CaO	Vitrification	Optical activity	Colour	Firing Atmosphere	XRD temp (°C)	EFT (°C)
Kon18/10	15		NV	Moderately to slightly active	grey-red, mottled	O		<800
Kon18/81	15		NV	Moderately to slightly active	dark grey	R		<750
Kon18/1	19	low	NV	Inactive	red	O	<800	<800
Kon18/4	19	low	NV/V, FF	Inactive	mixed red/grey	O		<800-950
Kon18/6	19	low	NV	Moderately active	brown	O		<800
Kon18/13	19	low	NV/V, FF	Slightly active	orange	O		<800-950
Kon18/18	19	low	NV	Strongly to moderately active	dark brown	R		<750
Kon18/29	19	low	NV	Moderately active	dark	R		<750
Kon18/56	19	low	NV	Moderately to slightly active	dark grey	R	<800	<750
Kon18/76	19	low	NV	Moderately active	dark grey	R		<750
Kon18/48	loner	low	IV/V	Strongly to moderately active	mixed dark brown/red	R		750-800
Kon18/122	loner	low	NV/IV	Strongly active	orange	O		<750-800

5.3.1 FG1 (Dominant muscovite schist fabric)

Five samples were analysed from FG1. All have been examined by SEM and four out of five samples analysed by XRD.

Bulk chemical analysis by SEM-EDX shows all five samples are low calcareous (Figure 5.50), which is consistent with the petrographic examination. Kon18/69, 90 and 199 show non-vitrified (NV) microstructures, in contrast to Kon18/35 and 68 with extensive (V) to continuous vitrification with fine bloating pores (CV(FB)) as a sign of fast firing (Maniatis *et al*. 1983: 776; Maniatis and Tite 1975: 230; 1981: 61) (Figure 5.51), indicating EFTs around <800°C and 900-1000°C respectively. Such a finding is in overall agreement with the XRD patterns. In addition, it seems that both Kon18/35 and 69 show an unevenly vitrified microstructure, indicating a lesser degree of control of firing.

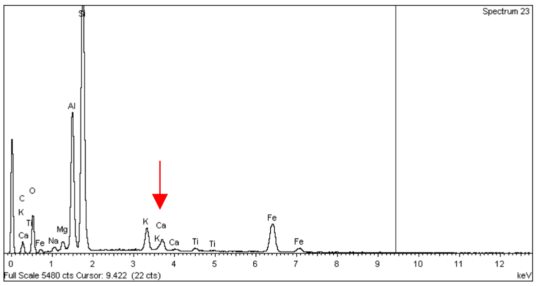


Figure 5.50: EDX spectrum of Kon18/68 showing low Ca content.

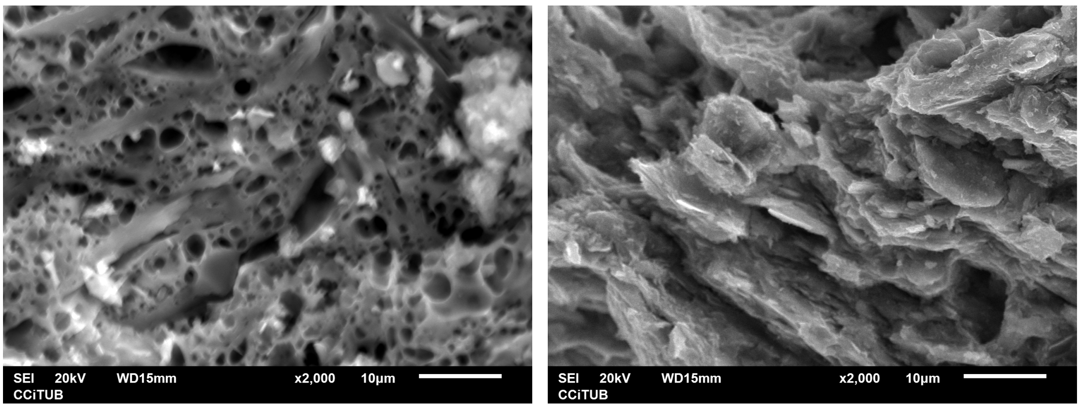


Figure 5.51: SEM photomicrographs of a plain ware (Kon18/68) with continuous vitrification and fine bloating pores (CV(FB)) (left); a burnished shallow bowl (Kon18/90) with NV microstructure (right).

The X-ray diffractogram shows the main peaks observed in this group including illite-muscovite, quartz, alkali feldspar, plagioclase and hematite (Figure 5.52). The presence of spinel in Kon18/35 and 68 may suggest a high firing temperature over 900°C. The high intense peaks of illite-muscovite usually indicate low firing temperature. In this case, however, they may reflect the abundant muscovite schist fragments present in the fabric.

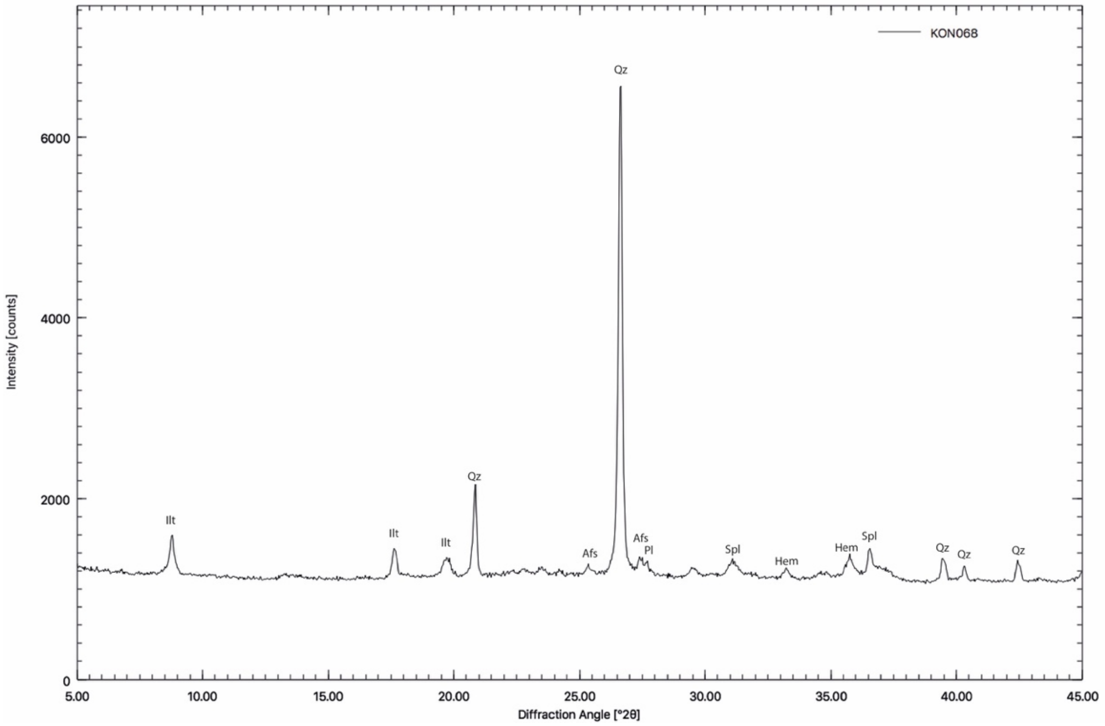


Figure 5.52: XRD diffractogram of Kon18/68. Afs: alkali feldspar, Hem: hematite, Ilt: illite-muscovite, Pl: plagioclase feldspar, Qz: quartz, Spl: spinel (abbreviations for XRD are after Whitney and Evans 2010).

Macroscopically, the colour in the break is commonly heterogeneous, ranges from the grey cores sometimes with red margins to mixed red and brown tones, suggesting the inconsistent firing of incomplete oxidising conditions.

Through the combination of microstructural examination of this fabric by SEM with the identification of mineralogical transformations by XRD, two main firing strategies can be distinguished: low-fired slipped and/or burnished vessels (Kon18/69, 90 and 199), and plain jars (Kon18/35 and 68), fired at a very high temperature over 900/950°C over a short duration with a very steep heating gradient (Maniatis and Tite 1981).

5.3.2 FG2 (Biotite schist and shimmering phyllite fabric)

Only one sample Kon18/176 from this fabric group was examined using SEM and XRD. SEM-EDX indicates it is low calcareous (Figure 5.53) which is consistent with the petrographic fabric.

The microstructure displays continuous vitrification (CV) with the layers coalesced into a smoothed zone. This shows that the vessel was fired over 1000°C (Figure 5.53) (Maniatis and Tite 1981). The diffraction pattern shows the absence of alkali feldspar and the presence of spinel suggesting a high firing temperature around 950-1000°C. Therefore, the results from SEM and XRD seem to be coherent, showing this coarse jar is fired with a high firing temperature in this EH II sample.

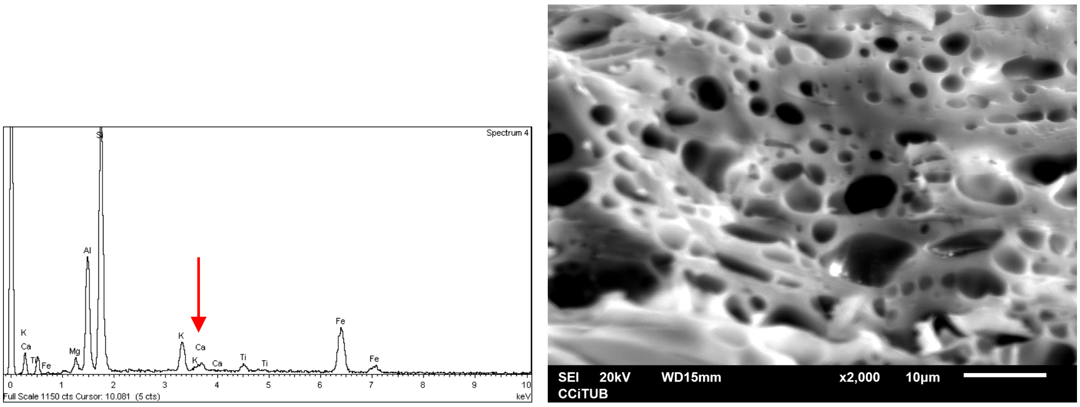


Figure 5.53: EDX spectrum of Kon18/176 showing low Ca content (left); SEM photomicrograph of Kon18/176 with continuous vitrification (CV) microstructure and fine to coarse bloating pores (right).

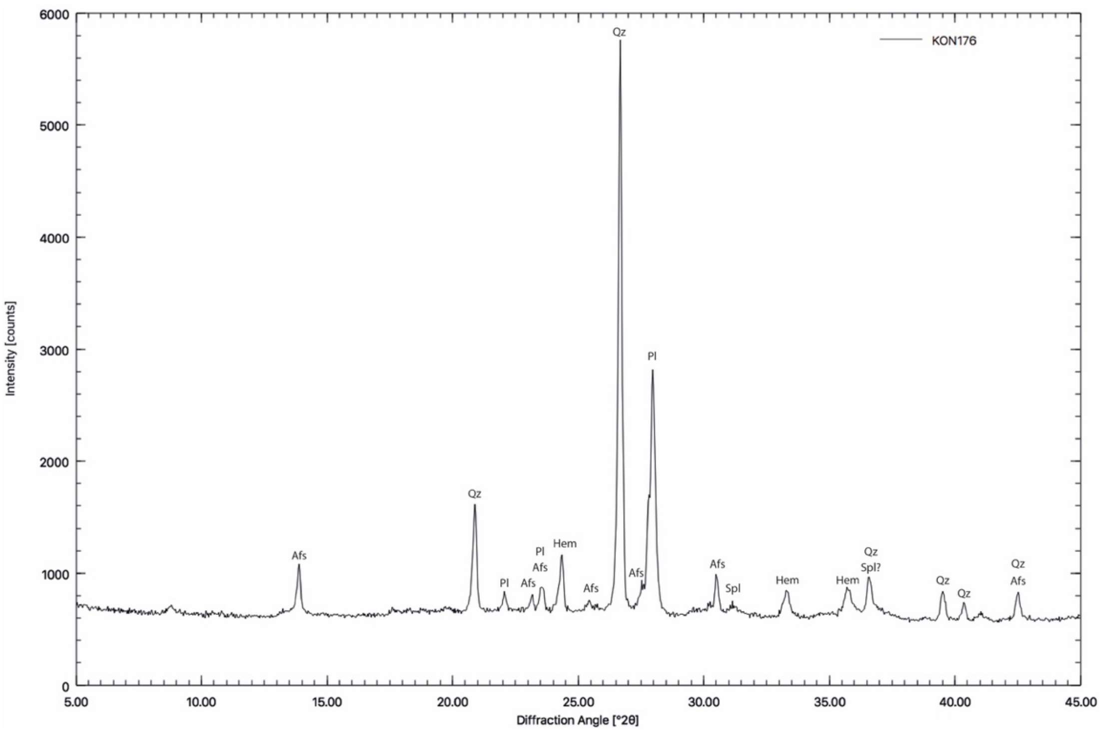


Figure 5.54: XRD diffractogram of Kon18/176. Afs: alkali feldspar, Cal: calcite, Hem: hematite, Pl: plagioclase feldspar, Qz: quartz, Spl: spinel.

5.3.3 FG3 (Micrite and serpentine fabric)

Two samples, Kon18/22 and 95, from FG3 were analysed by SEM and Kon18/22 by XRD. Bulk chemical analysis by SEM-EDX shows both samples are low calcareous (≃3%).

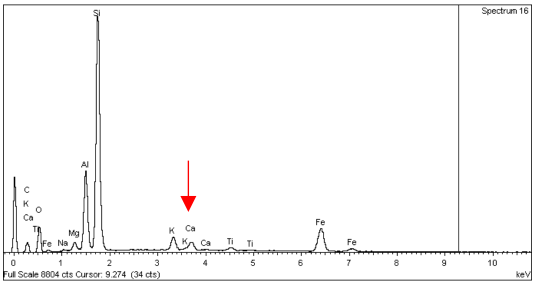


Figure 5.55: EDX spectrum of Kon18/95 showing low Ca content.

Both samples examined by SEM from this fabric (Kon18/22 and 95) have non-vitrified microstructures (NV), indicating a low firing temperature and the non-vitrified red slip layer also attests to a low temperature. In contrast to the non-vitrified core, the area close to the vessel wall is more vitrified, corresponding to the mixed colour in the break. Such a heterogeneous distribution of heat may be linked to open firing.

Such inconsistent firing may explain the different picture present by XRD, in which the diffractogram of Kon18/22 shows a new formation of spinel and potentially mullite, together with only one peak of illite-muscovite remaining. This suggests a different range of firing temperatures (Noghani *et al*. 2014: 180; Noll 1991: 105). Therefore, combined with SEM analysis, the firing temperature of Kon18/22 is estimated at c. 800°C with a maximum temperature of no more than 900/950°C.

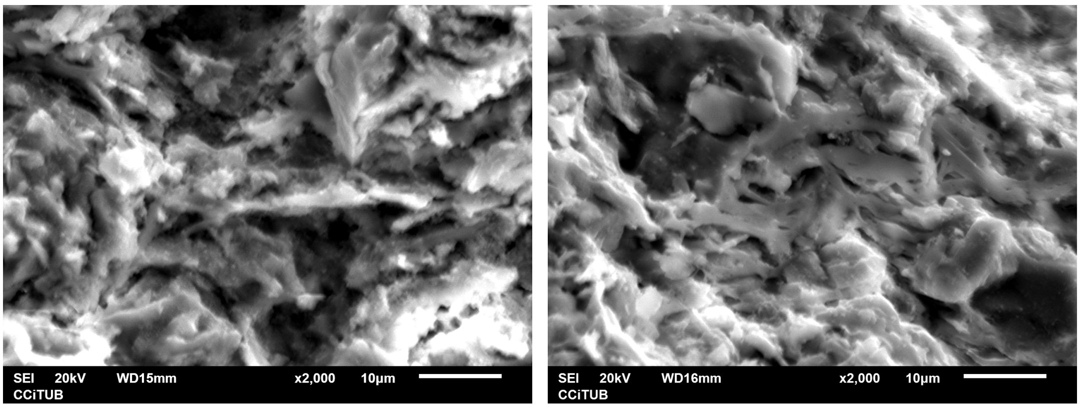


Figure 5.56: SEM photomicrographs of a red slipped and burnished shallow bowl (Kon18/22), showing NV microstructure in the core (left), in contrast to the more vitrified area close to the exterior surface (right).

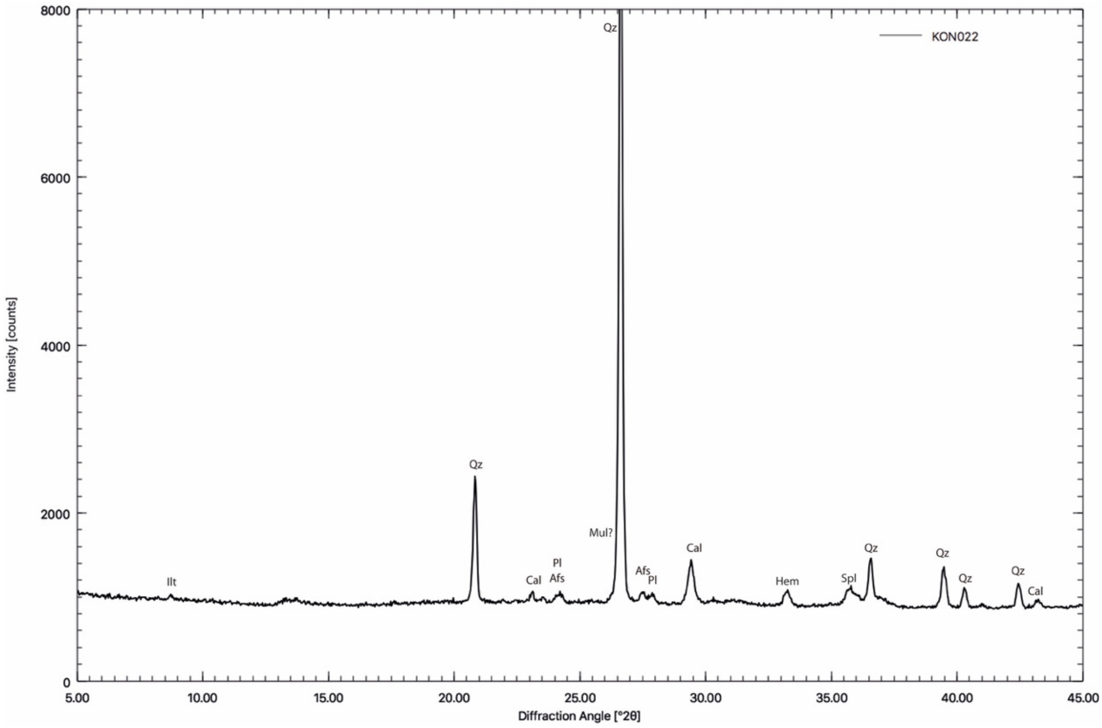


Figure 5.57: XRD diffractogram of Kon18/22. Afs: alkali feldspar, Cal: calcite, Hem: hematite, Ilt: illite-muscovite, Mul?: mullite (?), Pl: plagioclase feldspar, Qz: quartz, Spl: spinel.

5.3.4 FG4 (Ultrabasic and marble fabric)

Five samples were examined by SEM and three out of these five samples were analysed by XRD. Bulk chemical analysis demonstrates a range of low to high calcareous bodies. The microstructure generally displays no vitrification (NV) to initial vitrification (IV), suggesting a low firing temperature, with the exceptions of Kon18/37 and 188, which display extensive vitrification (V), indicative of a high firing temperature.

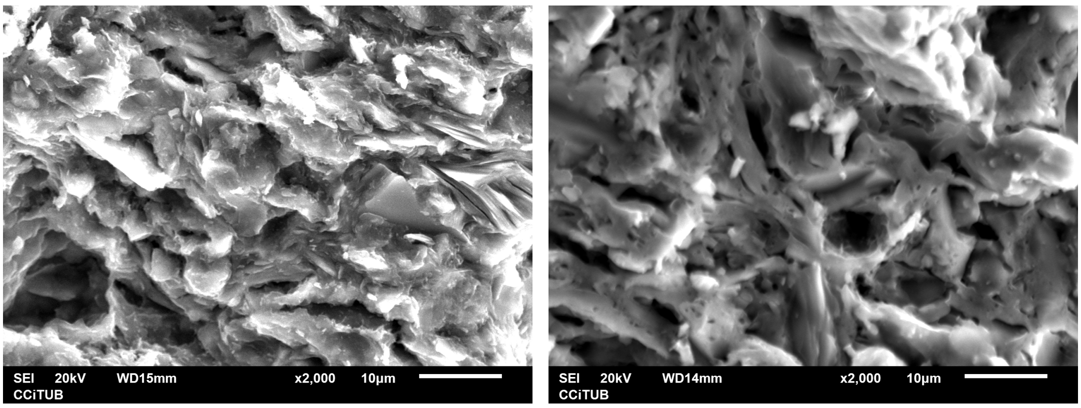


Figure 5.58: SEM photomicrographs of Kon18/7 showing NV microstructure (left) and Kon18/37 showing V microstructure.

The three samples examined by XRD show quartz and plagioclase as the most intense peaks, with important peaks such as illite-muscovite, alkali feldspar, calcite, hematite and pyroxene. Pyroxene usually occurs as a newly-formed mineral in the firing phase, however, the petrographic fabric indicates that pyroxene is also amongst the main aplastic inclusions and therefore belongs to the primary phase. The presence of hematite which develops around 800-850°C can be seen clearly in Kon18/37 and 66 (Figure 5.59). The lower peak of illite-muscovite in Kon18/37 is indicative of a higher firing temperature of c. 900°C.

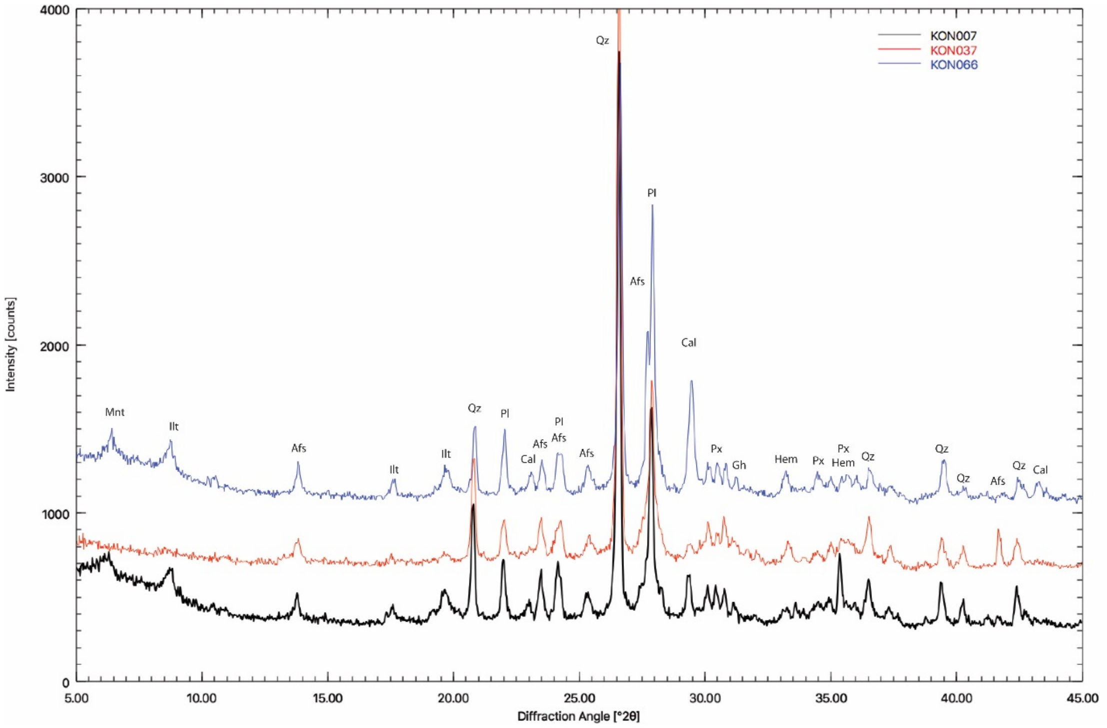


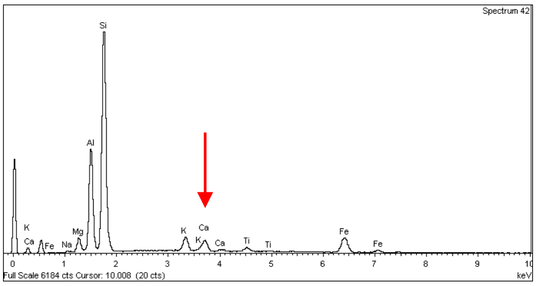
Figure 5.59: XRD diffractograms of Kon18/7, 37 and 66. Afs: alkali feldspar, Cal: calcite, Gh: gehlenite, Ilt: illite-muscovite, Mnt: montmorillonite, Pl: plagioclase feldspar, Px: pyroxene, Qz: quartz.

The samples examined in this group are exclusively associated with red to dark brown slipped and burnished shallow bowls and bowls, dominated by EH I examples and with only one of EH II date (Kon18/188). The colour in the break ranges from red to grey, sometimes a grey core with thin red margins, reflecting the different firing conditions. The inconsistent mottling surfaces accompanied by grey core may suggest incomplete oxidation, which produces localised reduction conditions or the presence of fuel in close contact with the vessel which is typically associated with open firing.

5.3.5 FG5 (Calcite well-sorted sand fabric)

In this fabric group, 17 samples were examined by SEM and 14 of them also by XRD. Bulk chemical composition analysed by SEM-EDX categorises this fabric group as low calcareous with rare exceptions (Figure 5.60).

The moderate to strong optical activity noted in the thin section, suggests a low firing temperature, agrees with the SEM and XRD findings. Many samples (8 of 17) show no vitrification (NV) or initial vitrification (IV) microstructures indicating the range of <750-800°C in reducing atmosphere and <800-850°C in oxidising atmosphere. Kon18/154 and 172 exhibit areas of high vitrification, suggesting firing above 800-850°C (refer to Figure 5.60). Kon18/161 is more calcareous and thus suggests an EFT of c. 850°C. Such lower firing temperatures are largely related to the slipped vessels with a range of slip colours from red, white and pink as well as small-sized plain pottery.



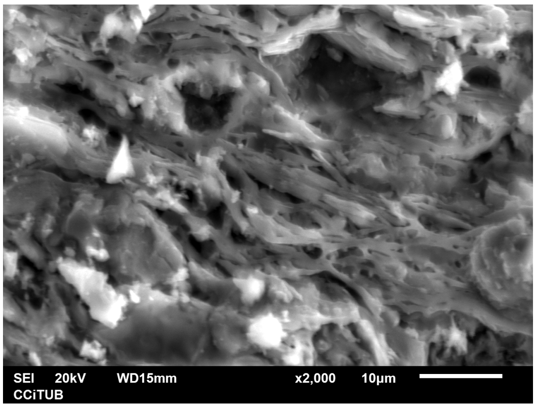


Figure 5.60: EDX spectrum of Kon18/154 illustrating low Ca content (left); SEM photomicrograph of Kon18/154 exhibiting a IV/Vc microstructure with a more vitrified zone in the centre of the image (right).

Kon18/155 exhibits extensive vitrification (V) microstructure, while Kon18/131 and 181 are slightly more vitrified between extensive vitrification (V) and advanced vitrification (V+), indicating firing >850-900°C, bearing in mind their low calcareous composition (Figure 5.61). On the other hand, Kon18/163 and 169 have higher Ca content and thus their extensive to intermediate vitrification (Vc/Vc+) microstructure indicates a firing range of 850-1080°C (Figure 5.61). Additionally, in Kon18/131, fine bloating pores suggest fast firing (Figure 5.61). This higher range of firing temperature is associated with coarse bluish grey to white or grey/white slipped vessels and coarse thick-walled vessels with surfaces untreated.

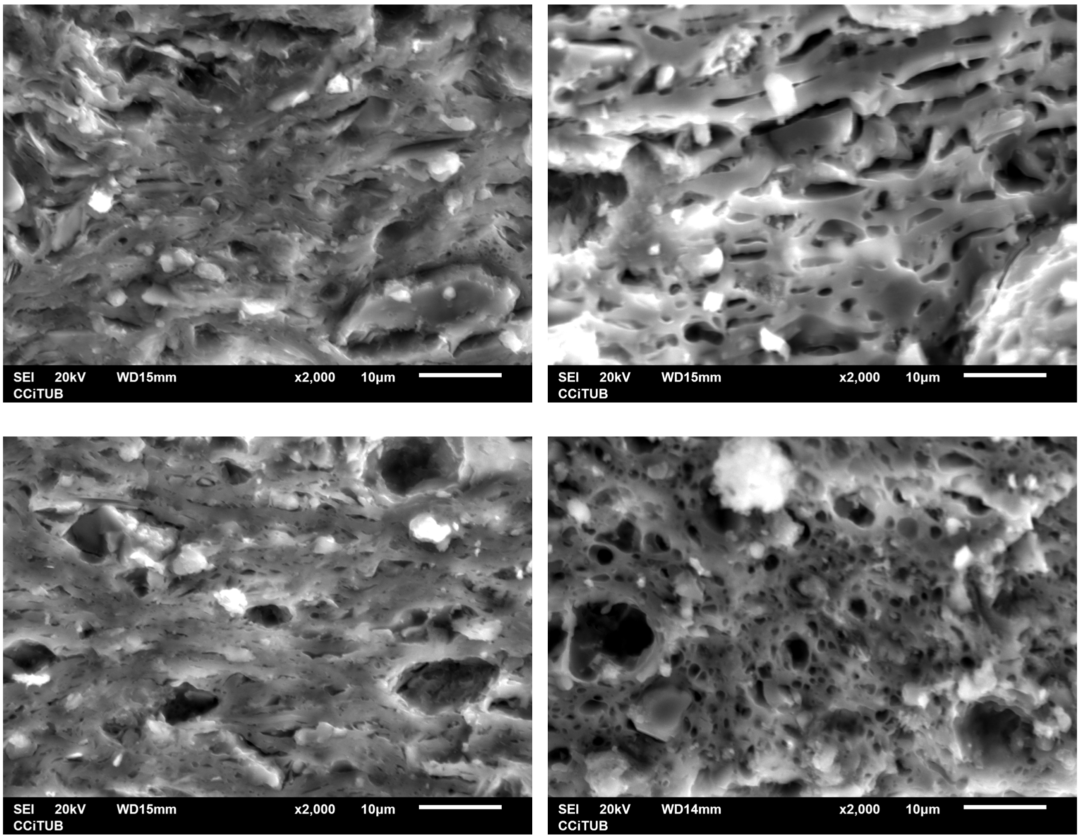


Figure 5.61: SEM photomicrograph of Kon18/155 displaying V microstructure (top left) and Kon18/169 displaying Vc microstructure (top right); Kon18/181 showing V/V+ microstructure (bottom left); Kon18/131 showing the V/V+ microstructure with fine bloating pores close to the vessel margins (bottom right).

XRD analysis of this fabric group identifies quartz, calcite, illite-muscovite, plagioclase and alkali feldspar and sometimes with hematite or wuestite. A firing temperature of <800°C may be estimated for most samples in this group (Ko18/115, 138, 154, 160, 172 and 178) based on the absence of developed firing phases and main well-preserved peaks of illite-muscovite. The intense peaks of calcite also support the low firing estimate. However, Kon18/126 shows smaller peaks of illite-muscovite and calcite and thus may be slightly higher fired, above 800 °C. Kon18/170 may be even higher fired, as suggested by the presence of mullite. The higher intensity of illite-muscovite of Kon18/170 may relate to the very micaceous matrix shown in thin section.

In another sample, Kon18/181, a substantial decrease of illite-muscovite and calcite together with the occurrence of mullite suggests higher firing above 800-850°C. In addition, it seems that plagioclase and calcite are inversely related. It is significant that when calcite reduces, plagioclase increases, suggesting plagioclase as the firing phase in this case. Furthermore, the appearance of wuestite is consistent with the grey core, inferring an intense reducing atmosphere (Maniatis 2009: 13-14). Kon18/161 is estimated to be fired at the highest temperature in this group due to the identification of well-developed pyroxene and gehlenite which formed at temperatures in excess of 850°C. Similarly, the marked increase in plagioclase is related to the decomposition of calcite and further indicates an EFT for Kon18/161 in the range of 850-950°C.

In general, this is a very homogeneous firing group, based on XRD. An evolution of mineralogical transformation according to the increase in firing temperature is clear (Figure 5.62). At the same time, the spectra of each sample are compatible with each other, with only small variations due to the decomposition of clay minerals and the formation of high temperature minerals, reflecting a similar firing pattern. Even the low-fired samples in this group reflect homogenous firing, which suggests a systematic and/or bulk production.

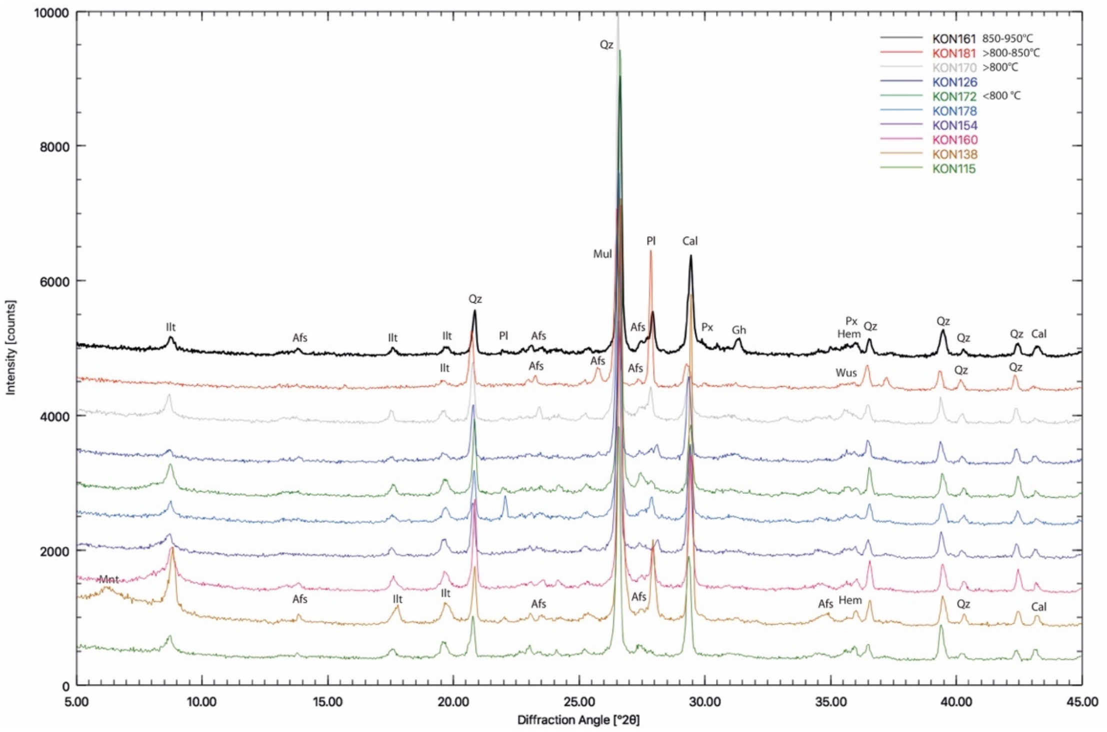


Figure 5.62: XRD diffractograms for the main fabric group showing a clear evolution of mineralogical transformation according to the firing temperature. Afs: alkali feldspar, Cal: calcite, Gh: gehlenite, Hem: hematite, Ilt: illite-muscovite, Mnt: montmorillonite, Mul: mullite, Pl: plagioclase feldspar, Px: pyroxene, Qz: quartz, Wus: wuestite.

Macroscopically, this group shows a variety of colour ranging from orange to grey, dominantly accompanied by grey cores. The four samples with orange to red colourations in the break are vessels with red slips or white slips on the surfaces, associating with firing in an oxidising atmosphere. Kon18/131 and 169 are bluish grey to white slipped vessels that exhibit grey cores, reflecting firing in a reducing atmosphere, and possibly firing in a kiln. Seven samples (Kon18/126, 151, 155, 172, 178, 181 and 186) of red slipped vessels and plain pottery have a sandwich structure with a grey or dark brown core, however, may suggest a higher temperature oxidising firing (Kilikoglou pers. comm.) (Figure 5.63).

Figure 5.63: Cross sections of Kon18/154 (left) and Kon18/178 (right) showing a grey core with orange/red margins.

This fabric group, dominated by pottery of EH II date, can be divided into two firing groups according to the different range of firing temperature, namely the low-fired, red and white slipped vessels and plain pottery, which stand in contrast to the high-fired coarse bluish grey to white slipped and coarse pottery. The firing conditions in terms of temperature and atmosphere are closely related to surface finish. The homogenous firing pattern demonstrates that in EH II, a more standardised firing process was used for ceramic production at Kontopigado, perhaps accompanied by the use of firing structures.

5.3.6 FG6 (Micrite and quartz sand in calcareous matrix fabric)

Seven samples from FG6 were examined using SEM and five of them by XRD. Bulk chemical analysis by SEM-EDX shows that all examined samples of this fabric have a higher CaO content (Figure 5.64).

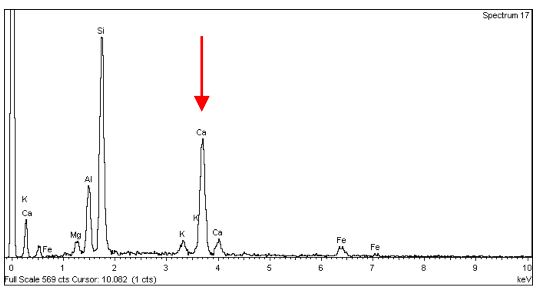


Figure 5.64: The EDX spectrum of Kon18/21 with a very high Ca content.

The EH I samples from this fabric are mostly associated with red to brown slipped and burnished vessels, showing the varying sintering stage and vitrification. The microstructural study by SEM depicts initial vitrification (IV) with some smoothed glass filaments in Kon18/21, slightly more vitrification in Kon18/42 and 84 (Vc-), and an intermediate stage in Kon18/44 (Vc+), all with the small bloating pores in the smoothed layers signifying the process of decarbonisation (Figure 5.65). In contrast, the EH II samples (Kon18/101, 177 and 191) of this fabric display a more consistent microstructure, ranging from extensive vitrification (Vc) to advanced vitrification (Vc+), giving an EFT range between 850°C and 1080°C (Figure 5.66).

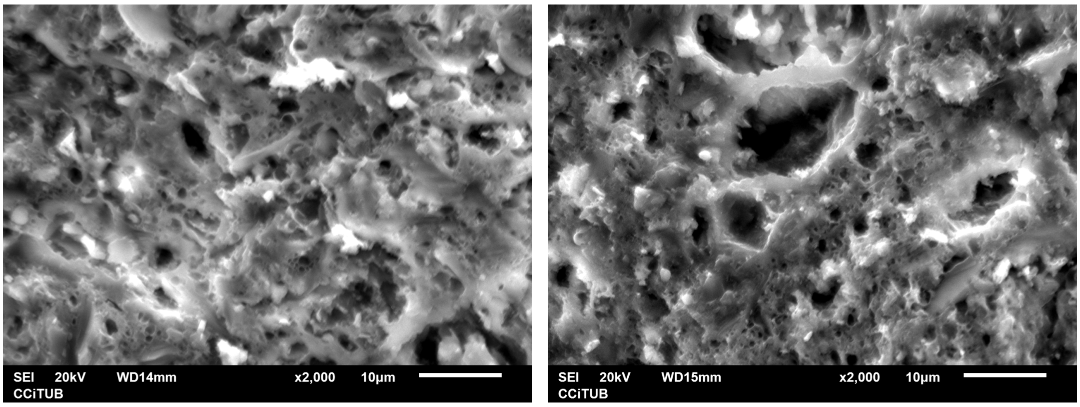


Figure 5.65: SEM photomicrographs of microstructure: Kon18/42 (left) and Kon18/84 (right), showing incomplete vitrification (Vc-).

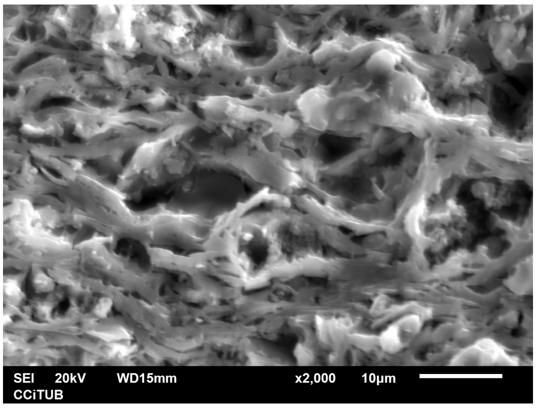


Figure 5.66: SEM photomicrograph of Kon18/191 showing extensive vitrification (Vc) microstructure.

The samples examined by XRD attest to the higher range of firing temperature in this fabric. The formation of high temperature minerals such as gehlenite in Kon18/42, 44, 84 and 177 and pyroxene in Kon18/84, 101 and 177, together with the near absence of illite-muscovite, characterises a range of firing temperatures 800/850-950/1000°C (Figure 5.67-8).

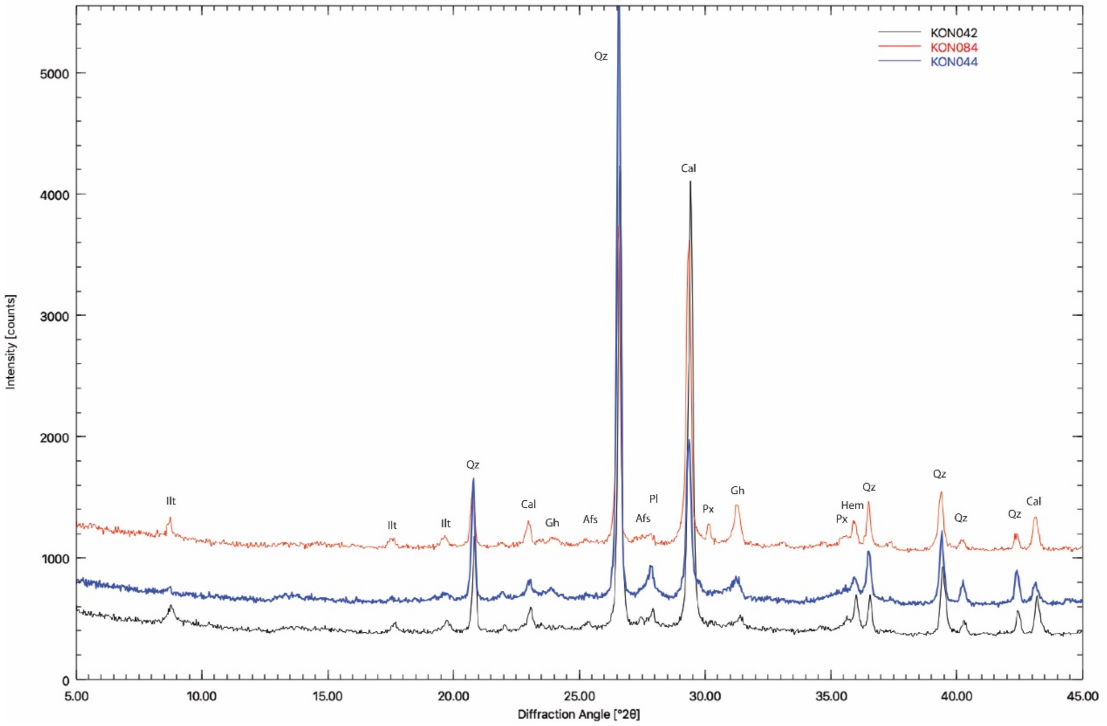


Figure 5.67: XRD diffractograms of Kon18/42, 44 and 84. Afs: alkali feldspar, Cal: calcite, Gh: gehlenite, Hem: hematite, Ilt: illite-muscovite, Pl: plagioclase feldspar, Px: pyroxene, Qz: quartz.

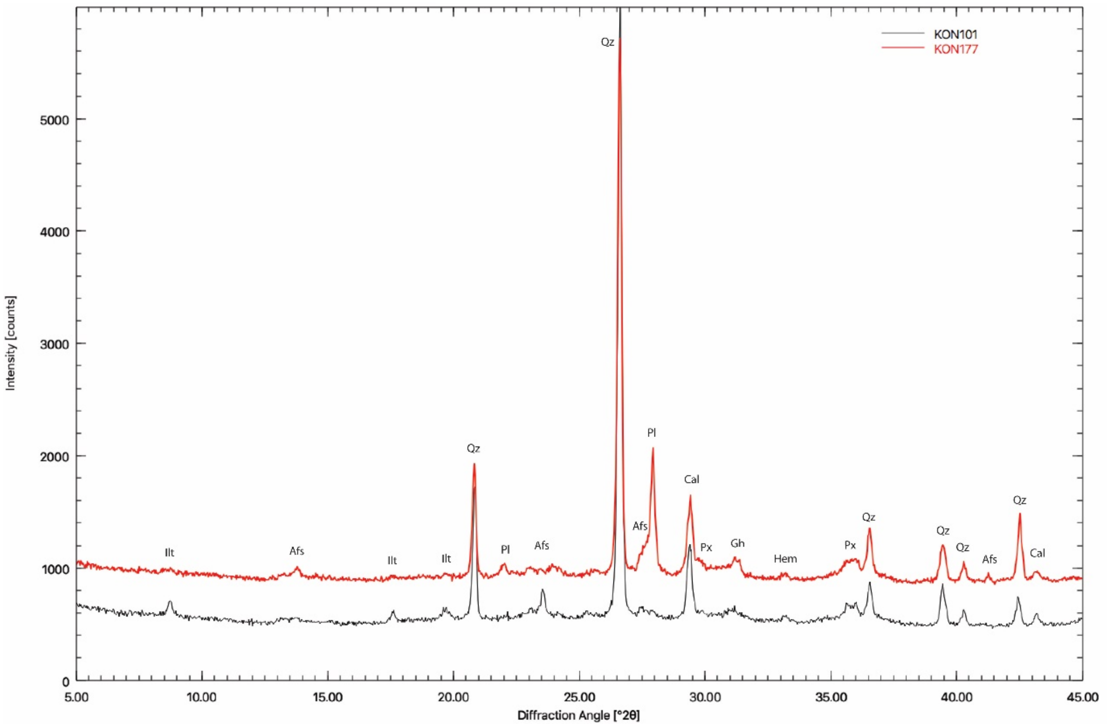


Figure 5.68: XRD diffractograms of Kon18/101 and 177. Afs: alkali feldspar, Cal: calcite, Gh: gehlenite, Hem: hematite, Ilt: illite-muscovite, Pl: plagioclase feldspar, Px: pyroxene, Qz: quartz.

Macroscopic observation shows that the cross section of most samples in this group have a buff to orange body, suggesting that this group is generally fired in an oxidising atmosphere. Two samples (Kon18/101 and 191) show grey cores (Figure 5.69). However, the sandwich structure in Kon18/191 is more likely to be associated with firing in a mainly oxidising and partly a reducing or neutral atmosphere (Kilikoglou pers. comm.).

Figure 5.69: An image of the macroscopic fabric of red slipped and burnished bowl (Kon18/191).

5.3.7 FG7 (Dark brown micrite and metamorphic coarse fabric)

Three samples from FG7 were examined by XRD and two by SEM. Bulk chemical analysis by SEM-EDX shows low to very high calcareous in this fabric.

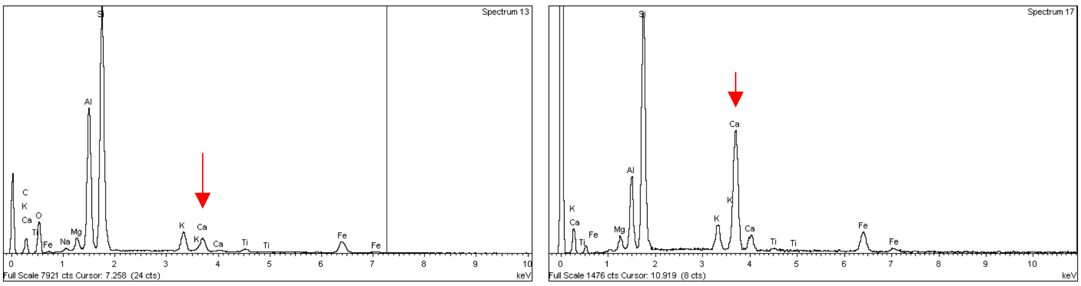


Figure 5.70: The EDX spectrum of Kon18/85 (left) with a low Ca content and Kon18/98 (right) with a very high Ca content.

The XRD pattern detects the main peaks of quartz, calcite, illite-muscovite, plagioclase, alkali feldspar, gehlenite and/or pyroxene. The formation of gehlenite in Kon18/40 and 86 and the beginning of the formation of pyroxene in Kon18/40 suggests an EFT in a wide range of 800/850-950/1000°C (Figure 5.71).

Kon18/85 has no clear firing phase, however, the small fluctuation may suggest the beginning of gehlenite and traces of pyroxene (Figure 5.72), indicating a slightly lower firing temperature. Nevertheless, its microstructure displays a sintering stage of advanced vitrification (Vc+) suggesting an estimated firing temperature around 1000°C (Maniatis and Tite 1978/9: 128) (Figure 5.73). The disagreement between SEM and XRD results may be regarded as the consequence of a shorter firing duration which did not allow the formation of high temperature phases. Kon18/98 shows the same picture.

This firing assessment of this fabric shows that, in this fabric, EH I plain pottery (Kon18/40 and 86) is fired differently from the EH II coarse grey/white slipped vessels (Kon18/85 and 98).

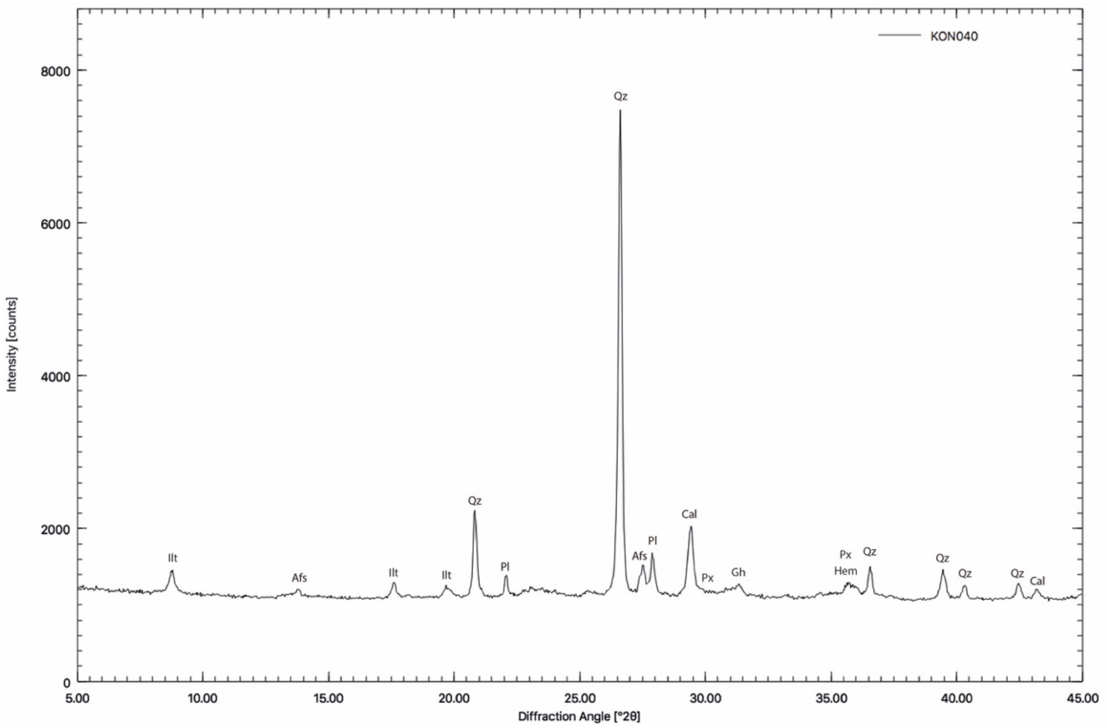


Figure 5.71: XRD diffractogram of Kon18/40. Afs: alkali feldspar, Cal: calcite, Gh: gehlenite, Hem: hematite, Ilt: illite-muscovite, Pl: plagioclase feldspar, Px: pyroxene, Qz: quartz.

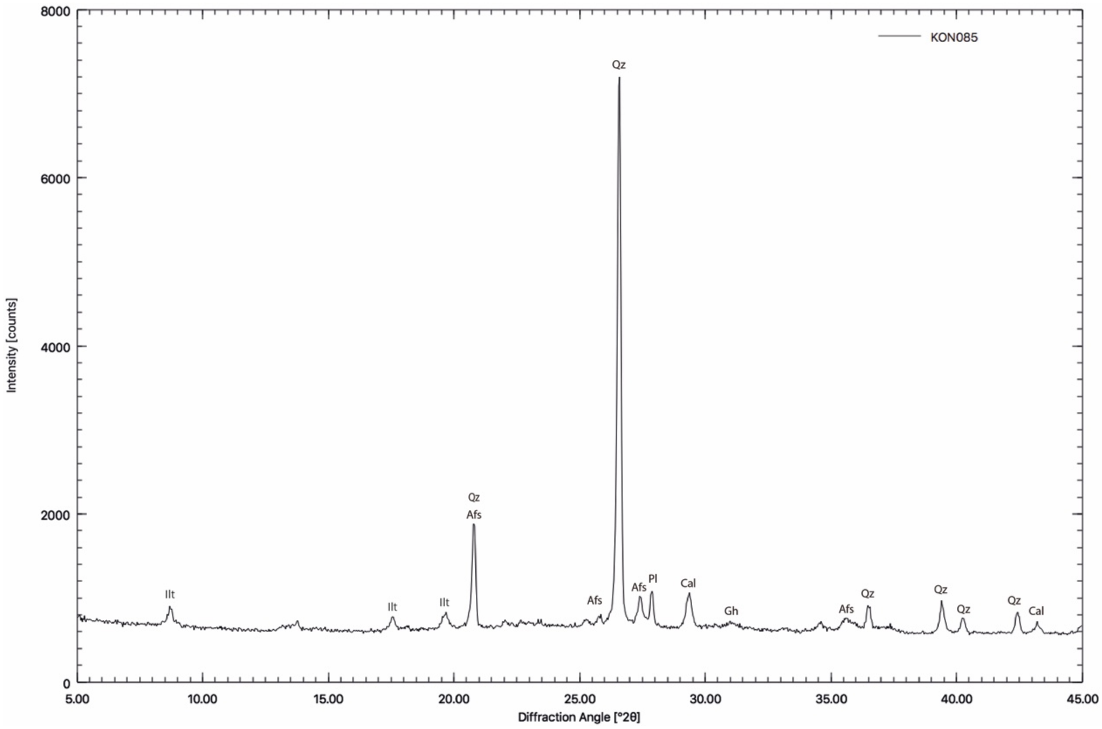


Figure 5.72: XRD diffractogram of Kon18/85. Afs: alkali feldspar, Cal: calcite, Gh: gehlenite, Ilt: illite-muscovite, Pl: plagioclase feldspar, Qz: quartz.

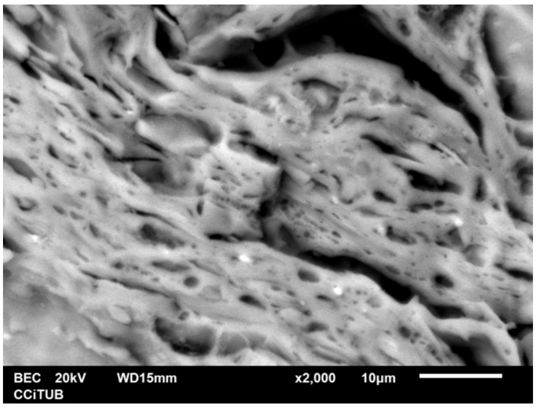


Figure 5.73: SEM photomicrograph of a white/grey slipped straight-sided ware (Kon18/85) with advanced vitrification (Vc+) in the core.

Macroscopically, the surface and cross section colour are commonly mottled and uneven, ranging from orange to grey with diffused boundary, suggesting a mixed and less controlled firing atmosphere. Both samples Kon18/40 and 85 exhibit a grey surface colour which, however, may be considered to be due to different causes (Figure 5.74). The former is the result of the incomplete oxidisation whereas the latter has grey/white slips on the exterior surface.

Figure 5.74: Kon18/40 rim sherd (upper left) and cross section (bottom left) with the grey mottled exterior surface; Kon18/85 body sherd (upper right) and cross section (bottom right) with the grey/white slip on the exterior surface on the right.

5.3.8 FG8 (Medium calcareous and metamorphic with opaque)

Seven samples were examined using XRD and four of them by SEM. Bulk chemical analysis by SEM-XRD shows this group ranges from low to high calcareous (Figure 5.75).

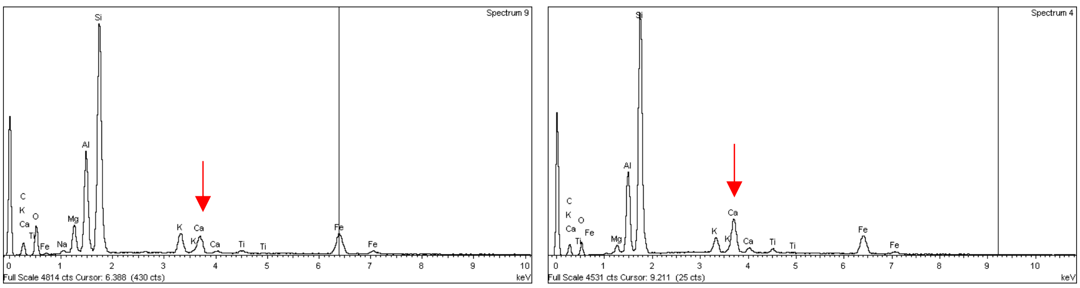


Figure 5.75: EDX spectra for Kon18/94 with a low Ca content (left) and Kon18/164 with a high Ca content (right).

XRD analysis of the EH I samples (Kon18/9, 47 and 59) reveals the main minerals as quartz, calcite, illite-muscovite, plagioclase, alkali feldspar, hematite and sometimes gehlenite (Figure 5.76). The well-preserved main peaks of illite-muscovite and the high intensity peak of plagioclase, as well as the early signs of the formation of gehlenite, suggest an EFT range of <850°C to ≃800-850°C.

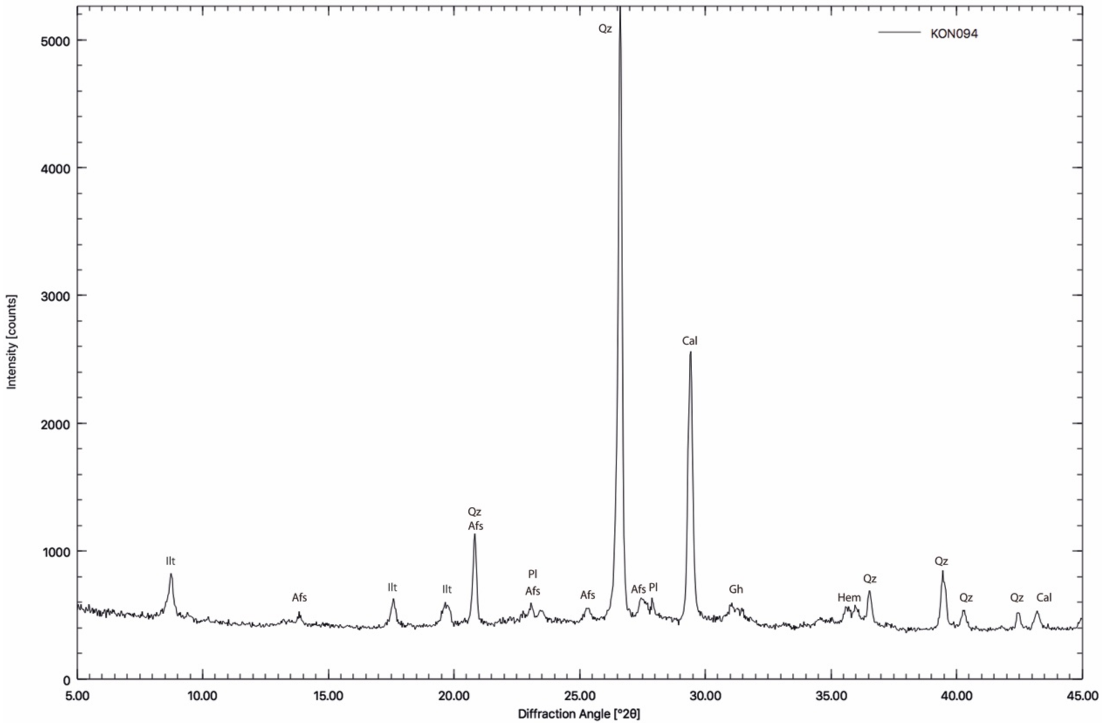


Figure 5.76: XRD diffractogram of Kon18/94. Afs: alkali feldspar, Cal: calcite, Gh: gehlenite, Hem: hematite, Ilt: illite-muscovite, Pl: plagioclase feldspar, Qz: quartz.

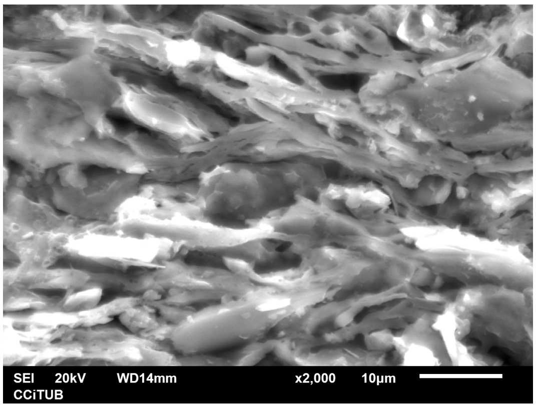


Figure 5.77: SEM photomicrograph of Kon18/94 with IV microstructure in the core.

In terms of the EH II samples, the microstructure of a black slipped shallow bowl (Kon18/164) exhibits a stage approaching extensive vitrification (Vc) which suggests an EFT of c. 800-950°C. The brown slipped and burnished jar (Kon18/94) shows an initial vitrification (IV) stage in the core and extensive vitrification (V) microstructure close to the vessel wall which enables us to specify an EFT of c. 800°C, with some variation of 20-30°C across the vessel (Figure 5.77). The microstructure of red slipped and burnished basin (Kon18/190) is not vitrified, suggesting an EFT <800°C in an oxidising atmosphere (Figure 5.78).

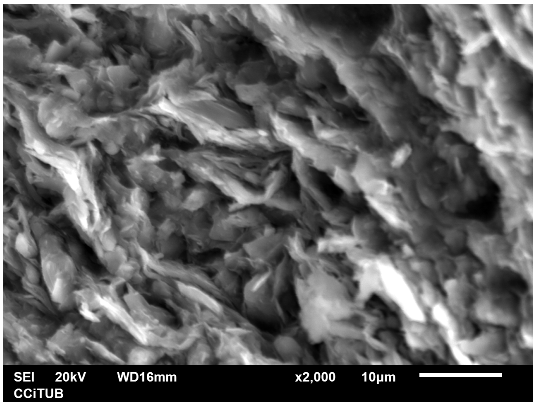


Figure 5.78: SEM photomicrograph of Kon18/190 with NV microstructure.

The absence of illite-muscovite peaks and the concomitant appearance of the characteristic peaks of gehlenite and newly-formed pyroxene clearly suggest a well-developed firing phase, indicating that Kon18/157 is high-fired over 950/1000°C. In contrast, Kon18/190 reveals the main peaks of illite-muscovite and quartz, as well as the intense calcite peak with traces of hematite, indicating an EFT of <750/800°C.

It is important to note that the XRD spectrum of Kon18/190 is very similar to that of Kon18/178 in FG5 (Figure 5.79), suggesting similar firing conditions. As a consequence, the close relations between FG5 and FG8 in terms of similar paste recipes and the same firing strategy may suggest that they are products of the same production sequence and location.

Macroscopically, Kon18/9, 47 and 59, all EH I plain closed vessels, display a heterogeneous colour ranging from buff to light brown, commonly with a diffused darker grey core, suggestive of incomplete oxidation due to the short firing duration. The EH II black slipped shallow bowl (Kon18/164) displays a dark brown to grey core, suggesting it is fired in a reducing atmosphere, most likely for producing reduced black slips on the surface. The EH II red to brown slipped and burnished basin (Kon18/190) has a sandwich structure of a grey core with buff to orange margins.

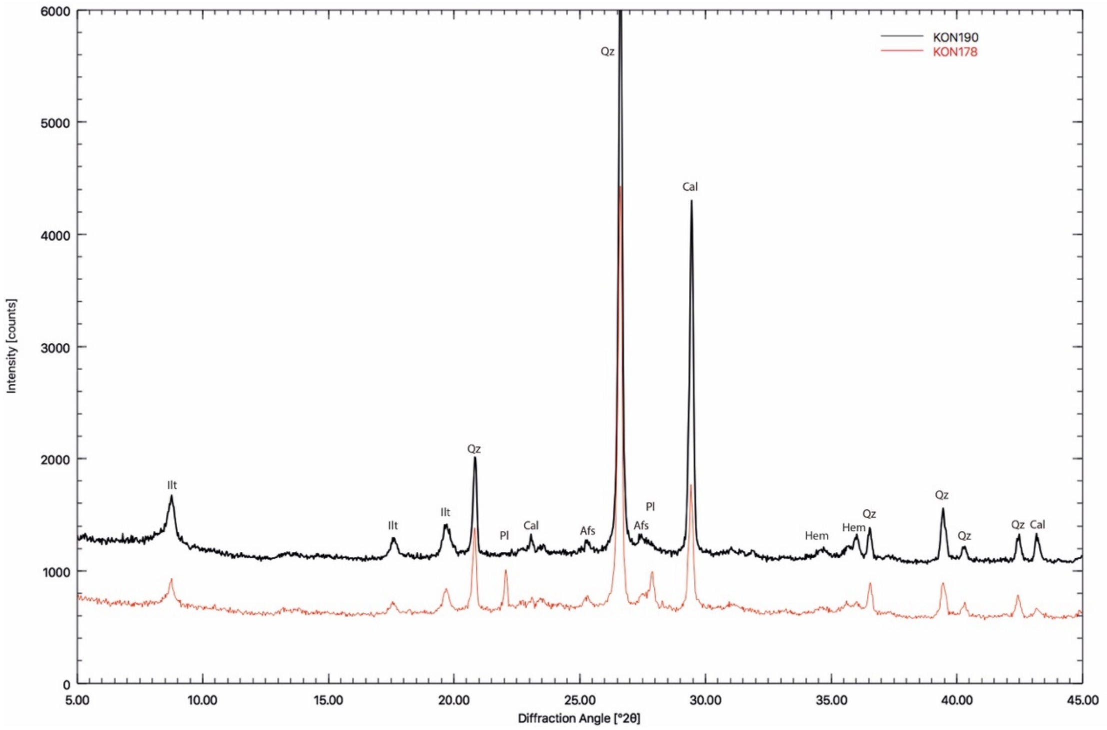


Figure 5.79: XRD diffractograms of Kon18/190 (black) and its similarity to Kon18/178 (red). Afs: alkali feldspar, Cal: calcite, Hem: hematite, Ilt: illite-muscovite, Pl: plagioclase feldspar, Qz: quartz.

5.3.9 FG11 (Very fine mica and quartz fabric)

It is important to note that this fine fabric is a broad petrographic fabric with few distinguishing features and thus may not represent the products of one production centre. Its members have different surface finishes and it certainly shows a range of firing in this range of characteristics.

Eleven samples were examined by SEM and only one of them by XRD. As suggested by petrography, bulk chemical compositional analysis by SEM-EDX suggests this fabric group has variable (low to high) content of calcium oxide (CaO), which may result from the differing extent of $CaCO_3$ decomposition across varying temperature ranges (Figure 5.80), though the original Ca content may have varied substantially.

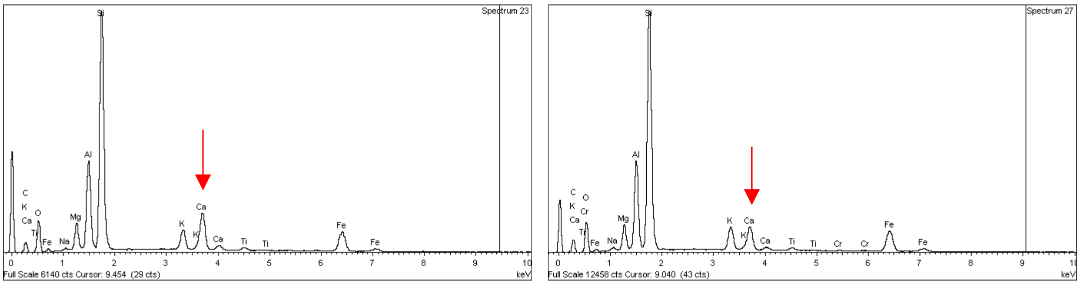


Figure 5.80: EDX spectra for Kon18/110 with a high Ca content (left) and Kon18/143 with a low Ca content (right).

In terms of microstructure, with two exceptions (Kon18/110 and 184) showing initial vitrification (IV), this group displays show extensive vitrification (V/Vc), suggesting EFTs in the range of 850-1050°C for more calcareous samples and >900°C for low calcareous samples respectively, which broadly agrees with the sole XRD analysis of Kon18/143.

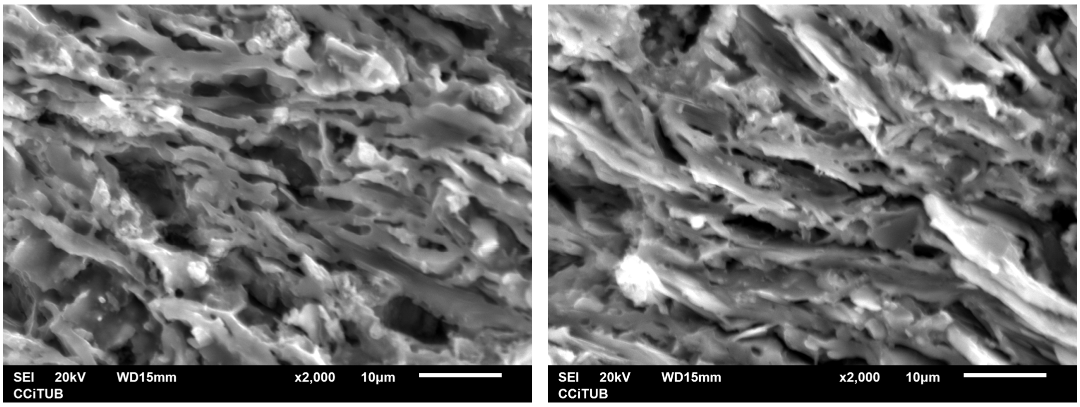


Figure 5.81: SEM photomicrographs of Kon18/106 showing extensive vitrification (Vc) microstructure (left) and Kon18/143 showing extensive vitrification (Vc) microstructure (right).

The characterisitic peaks of illite-musocvite and calcite are traditionally considered an important indication of the lower firing temperature. However, the fabric of Kon18/143 is more micaceous and contains more calcareous materials in the fine and coarse fraction shown in thin section. As a result, the intense peaks of illite-muscovite and calcite do not represent low firing temperature. The weak peaks of plagioclase feldspar and alkali feldspar, as well as the appearance of gehlenite and pyroxene, indicate an estimated firing temperature over 850°C (Figure 5.82). The integration of the XRD findings with the compositional and microstructural analysis, which reveals a low to high CaO content within Kon18/143 with its extensive vitrification (Vc) stage, suggests an EFT in a range of 850-1050°C (Figure 5.81).

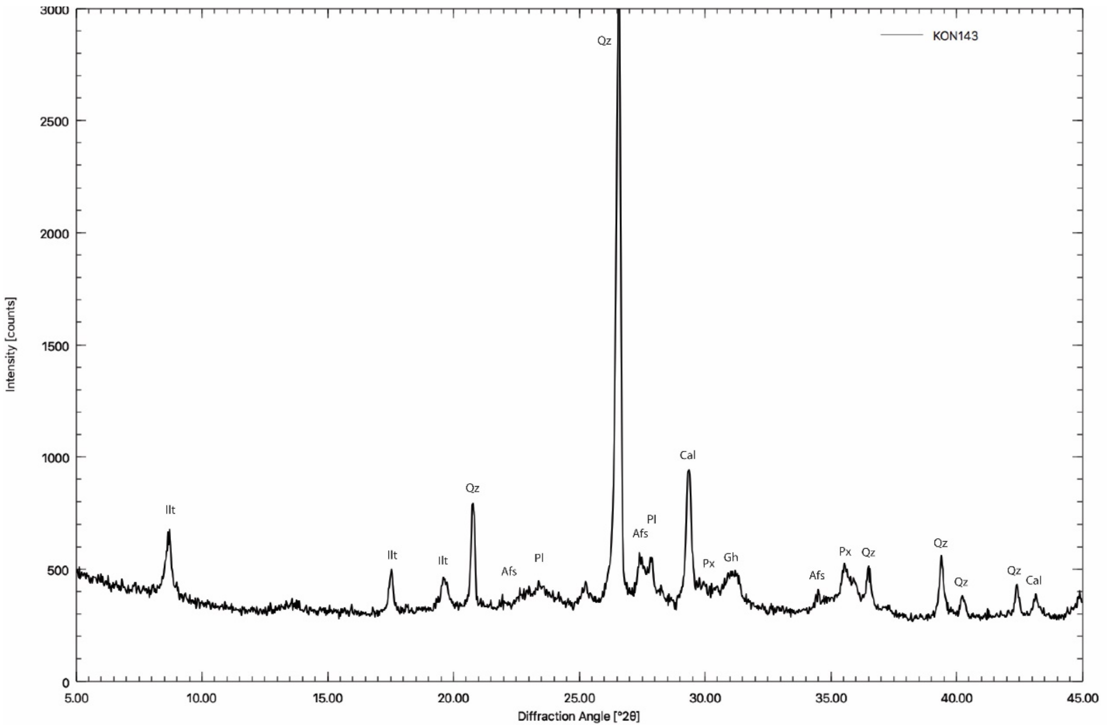


Figure 5.82: XRD diffractogram of Kon18/143. Afs: alkali feldspar, Cal: calcite, Gh: gehlenite, Hem: hematite, Ilt: illite-muscovite, Pl: plagioclase feldspar, Px: pyroxene, Qz: quartz.

A bowl with bluish grey to white slips on the exterior and red to brown slips on the interior (Kon18/168), a pink slipped and burnished goblet by (Kon18/184) and a small plain bowl (Kon18/195) display a homogeneous buff colour in cross sections, reflecting a well-controlled oxidising firing atmosphere.

Figure 5.83: Cross sections of Kon18/184 (left) and Kon18/195 (right).

Three bluish grey to white slipped sauceboats (Kon18/110, 143 and 156) and one black slipped saucer (Kon18/197) exhibit dark brown to grey which relates to the firing in a reducing atmosphere. The homogeneous vitrified microstructure and the homogenous grey core in the break as well as black slips on the surface of Kon18/197 suggest firing in a consistent reducing atmosphere and a longer soaking time. Such consistency of firing conditions and the longer firing duration presumably represents the characteristics of the use of kiln (Livingstone Smith 2001; Maritan *et al*. 2006).

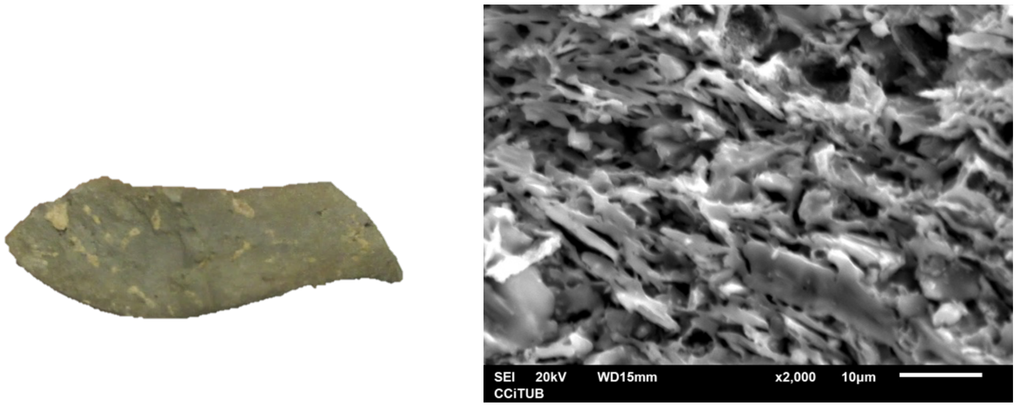


Figure 5.84: The macroscopic fabric of Kon18/197 exhibiting a reduced grey core (left) and SEM photomicrograph of Kon18/197 showing advanced vitrification (V+) microstructure (right).

The other three bluish grey to white slipped sauceboats (Kon18/106, 117 and 165) display a sandwich structure of pink to orange with a grey core. Kon18/106 has bluish grey slips on the exterior surface and white slips on the interior surface (Figure 5.85) (see section 5.4.3. for detailed examination of slips). It may relate to the position of vessels during firing and/or firing conditions (Kilikoglou pers. comm.).

Figure 5.85: An image of a sherd displays the bluish grey slips on the exterior surface (left) and white slips on the interior (right) of Kon18/106.

5.3.10 FG12 (Micrite and red mudstone in calcareous clay)

Four samples from FG12 were examined using SEM. Bulk chemical analysis by SEM-EDX shows this is a broadly calcareous fabric.

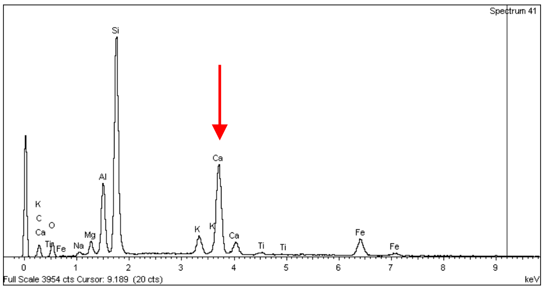


Figure 5.86: The EDX spectrum of Kon18/158 illustrates a high Ca content.

The SEM microstructure appears extensively vitrified (Vc) in Kon18/105, 158 and 159 with one exception of Kon18/175 (IV), suggesting EFTs in a range of 850-1050°C and 800-850°C respectively (Figure 5.87). The consistent vitrification in the microstructure may suggest a stable firing temperature, which is often characteristic of kiln products (Thér *et al*. 2019).

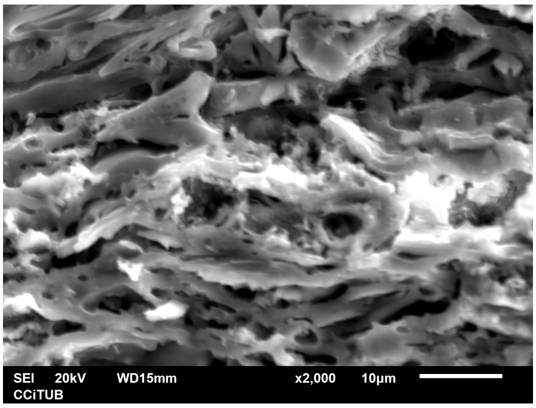


Figure 5.87: SEM photomicrograph of Kon18/159 showing extensive vitrification (Vc) microstructure.

Macroscopically, most of the samples in this fabric display a grey core with buff to red margins (Figure 5.88). Changes in the firing atmosphere during firing are associated with producing bluish grey to white slips or reduced black slips on the surface and is related to the use of kiln structure.

Figure 5.88: Cross section of a black slipped jar (Kon18/105).

5.3.11 FG19 (Intermediate volcanic fabric)

Eight samples were analysed using SEM and two of them by XRD. Bulk chemical analysis by SEM-EDX indicates this group is low calcareous, which is consistent with the petrographic fabric.

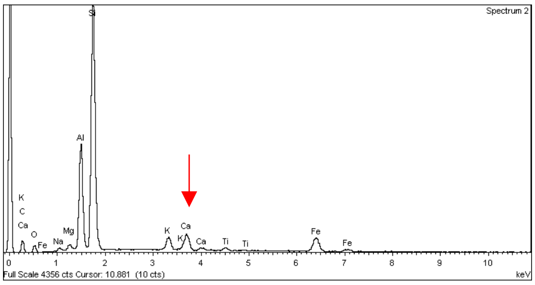


Figure 5.89: EDX spectrum of Kon18/1 with a low Ca content.

Six samples characterise the general pattern of NV microstructure (EFT <800˚C) in this fabric with two exceptions (Kon18/4 and 13) showing a range from no vitrification (NV) to extensive vitrification (V) microstructure with fine bloating pores, a sign of fast firing.

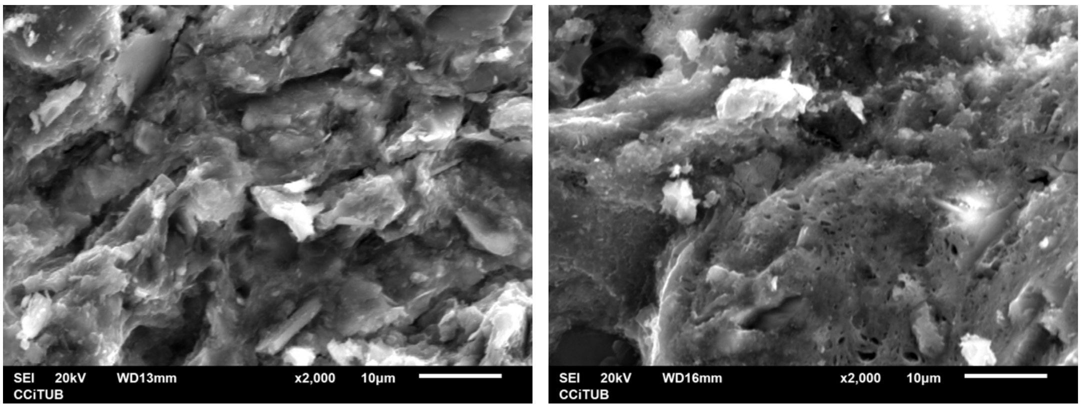


Figure 5.90: SEM photomicrographs of Kon18/1 showing NV microstructure (left); of Kon18/4 showing NV (top left) to V microstructure with fine bloating pores (centre to lower right) (right).

The XRD spectra of Kon18/1 and 56 show quartz, plagioclase, illite-muscovite and amphibole as the main intensity peaks. Combining the high intensity of illite-muscovite peaks with the presence of amphibole, the EFT is plausibly under 800°C, which is in agreement with the SEM examination.

There is a marked difference within this fabric group. It appears that most red to black slipped vessels are low-fired while two plain vessels (Kon18/4 and 13) are fast fired and possibly fired in open or ‘bonfire’ firing.

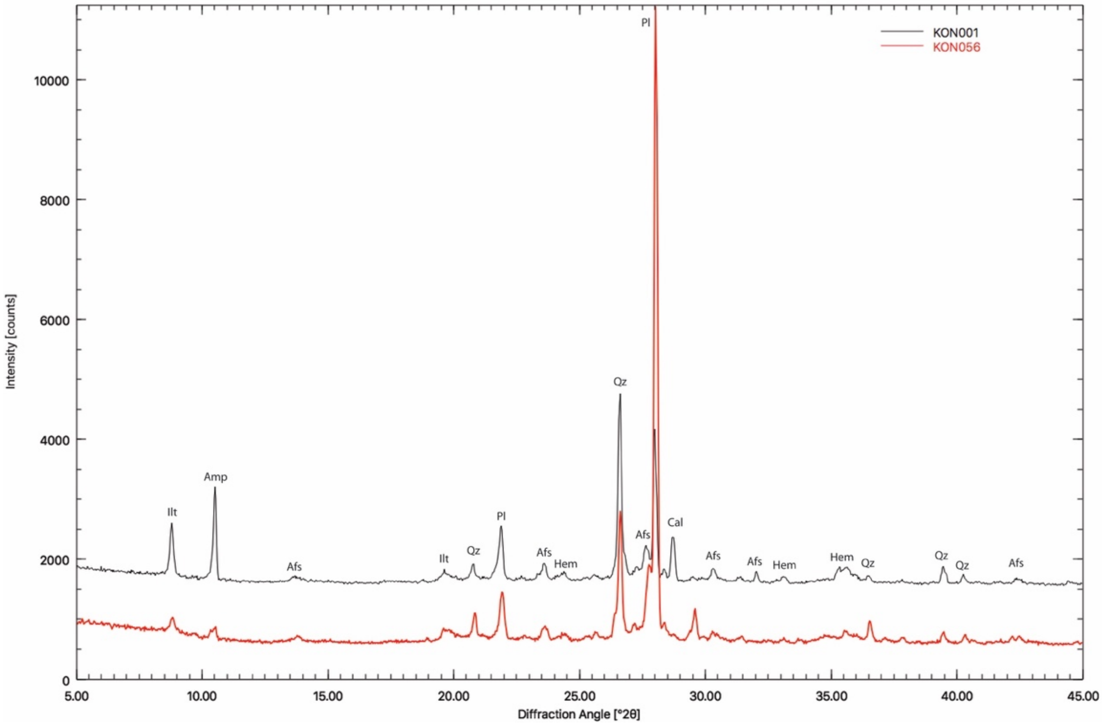


Figure 5.91: XRD diffractogram of Kon18/1 and Kon18/56. Afs: alkali feldspar, Amp: amphibole, Cal: calcite, Hem: hematite, Ilt: illite-muscovite, Pl: plagioclase feldspar, Qz: quartz.

5.3.12 Comments on firing conditions

To summarise the examination of firing practices, a distinction can be drawn between samples in low calcareous fabrics, such as FG1, FG5, and the more calcareous fabrics (i.e. FG6, FG7, FG8, FG12) in the context of a production broadly local to Kontopigado. Low calcareous fabrics exhibit a wide range of sintering and vitrification stages, reflecting EFTs from <750° C to 1000-1080°C. The medium to high calcareous fabrics, with few examples of IV, exhibit Vc to Vc+ microstructure, suggesting an EFT in a range of 850-1080°C.

Although there is no absolute dichotomy of firing temperature range according to the earlier or later chronological phase, the EH II samples tend not only to have higher EFTs, but also show increased consistency or standardisation of firing technology in association with specific ware types.

Coarse ware is fired at both low and high firing temperatures, but the latter is usually associated with fast firing. The small- and medium-sized red to dark brown slipped and white and pink slipped ware as well as the burnished vessels are fired with low to medium range of firing temperature, perhaps to maintain the surface effect. It seems that the red slipped pottery in EH II is slightly higher fired than those in EH I.

The medium-size slipped vessels (excluding the black slipped and bluish grey to white slipped categories), together with the polished or plain small- to medium-sized vessels such as cups and dishes, show a homogeneous firing pattern indicative of products from the same or related production centres with a standard firing practice. The black slipped vessels, mostly occurring in EH II, are generally higher fired in a reducing atmosphere.

The fine to very fine tableware of EH II, dominantly bluish grey to white slipped sauceboats and saucers, is consistently fired at higher temperatures. The absence of cores and the homogenously well-vitrified microstructure suggest the homogenous distribution of heating and atmosphere, which required a stable firing environment such as a kiln structure.

In terms of the firing atmosphere, the orange to red and the mixed colour suggest the oxidised firing is prevalent in the EH I period and the less control of firing variables leading to the incomplete oxidisation and mottling. On the other hand, EH II firing practice developed standardised procedures which are consistent with the fabric colour and the desired colour of surface finishes. It is noted that a common presence of core-margins sandwich structure indicates the changes in firing atmospheres during the firing process which usually are achieved by manipulation of an enclosed firing structure. Moreover, the reduced grey core, frequently consistent with the bluish grey to white slipped vessels, suggests the very competent control of consistent reducing atmospheres during the firing of these vessels in EH II Kontopigado.

To conclude, the general firing practices display marked diachronic change in terms of firing temperature, homogeneity of firing conditions, especially in terms of the skillful manipulation of neutral and reducing atmospheres at very high firing temperatures. These require not only specialist skills, but also built structure that can be controlled to manipulate the different conditions in close combination with temperature control. Finally, the integrated study comprising macroscopic, petrographic, microstructural, mineralogical and chemical analyses highlights the value of an integrated analytical programme in the investigation of firing technology.

5.4 Surface finishes

As we have seen, the most striking difference between the assemblages in the earlier and later phase lies in their surface finishes which are related to the raw materials and firing condition. In the following sections, SEM and XRD are employed to understand the technology of surface modification of the ceramics of EH I and EH II at Kontopigado. Microstructural images examined on the SEM of fresh break and polished sections of the surface layers of vessels allow the assessment of homogeneity of the sintered and vitreous slips, as well as the thickness and compaction of slip layers, together with the degree of adhesiveness of the slip layer to the ceramic body. SEM-EDS bulk chemical analysis provides a semi-quantitative characterisation of these layers' elemental compositions, in order to distinguish the nature of raw materials used for the ceramic bodies in comparison to the slips on surfaces. This reveals choices, especially regarding the calcium and iron content in order to achieve desired colours. It can also suggest insights into the nature of the slips, their application, and any smoothing or burnishing of these surfaces.

5.4.1 Red to brown slipped and/or burnished (RSB) ware

The majority of the red slipped and burnished pottery in both phases have been linked to fabrics that seem to be local to Kontopigado, but there are some possible imports, in particular in EH I, that have comparable surface finishes.

Most samples (Kon18/7, 22, 36, 42, 66, 69, 84, 94, 126, 138, 151, 159, 172, 188, 190, 191 and 198) illustrate a characteristically thick (up to 60μm), well-vitrified fine slip layer, with a higher concentration of iron (Fe), aluminium (Al) and potassium (K) as well as lower content of calcium (Ca), clearly differentiated from the calcareous clay body (Figure 5.92). Therefore, it seems to suggest the use of a suspension of the Fe-rich clay as a slip (Noll *et al.* 1975: 602). For example, Kon18/36 reveals a clear vitrified slip layer containing very fine bubbles, with no coarse inclusions and that exhibits strong adhesion to the ceramic body (Figure 5.93). The very compact slip layer is the result of the compaction and alignment of clay particles which contributes to the higher content of K.

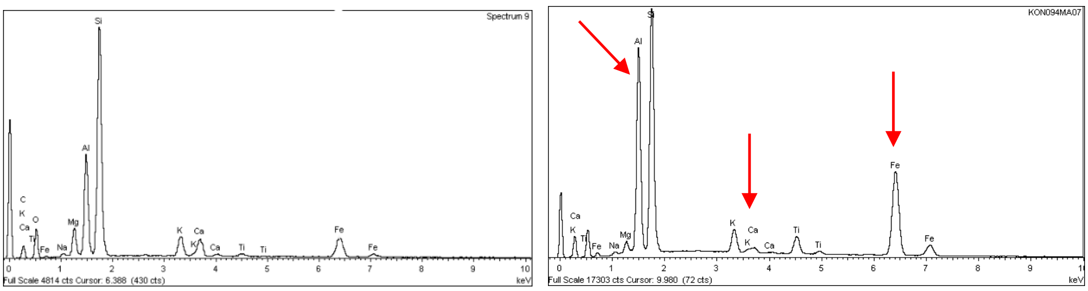


Figure 5.92: SEM-EDX spectra of Kon18/94, showing the very different composition between the matrix (left) and the slip with considerably higher Al and Fe and low Ca content (right).

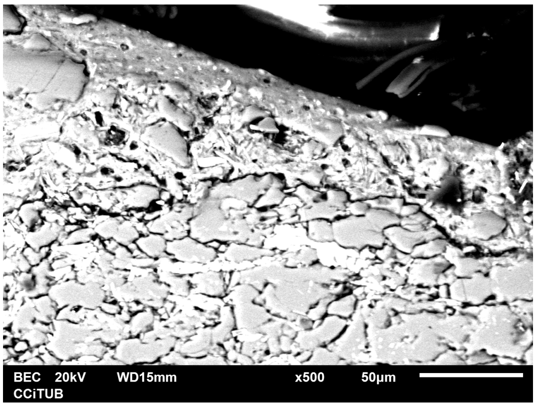


Figure 5.93: SEM photomicrograph of Kon18/36 (BEC, polished section) showing a clear slip layer strongly adhered to the clay body.

In a similar fashion, a shallow bowl (Kon18/69) is slipped and burnished, the slip on the area around the rim is darker than the mainly brown body on the exterior. The slip composition is similar to the clay body, but with a much higher Fe content (FeO: ≃33-54 wt%) than the matrix (FeO: 14 wt%). Besides, the micrograph of Kon18/84 not only displays a clear boundary and different microstructures between the clay body and the surface layer, but also reveals the presence of the second layer underneath the slip layer as a result of smoothing intended to promote the homogeneous application of slips (Figure 5.94). In addition, both red slips and brown slips from the single sample and different samples were examined by SEM-EDX. The result shows there are no marked differences between them, suggesting they are both Fe-based slips and the variation of colour may relate to firing conditions.

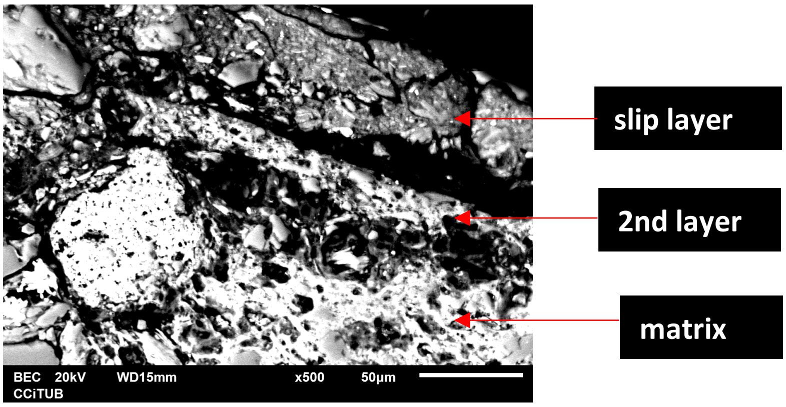


Figure 5.94: SEM photomicrograph of Kon18/84 (BEC, polished section). Showing different microstructures of the surface layer and the matrix, as well as a presence of a second layer as a result of smoothing.

On some vessels with red to brown surfaces, there is a different surface layer which may be due to self-slipping rather than the application of another slip, being similar chemically to the ceramic body. Under SEM, two samples (Kon18/37 and 90) have a surface layer, which does not appear to comprise the application of a different slip (Figure 5.95).

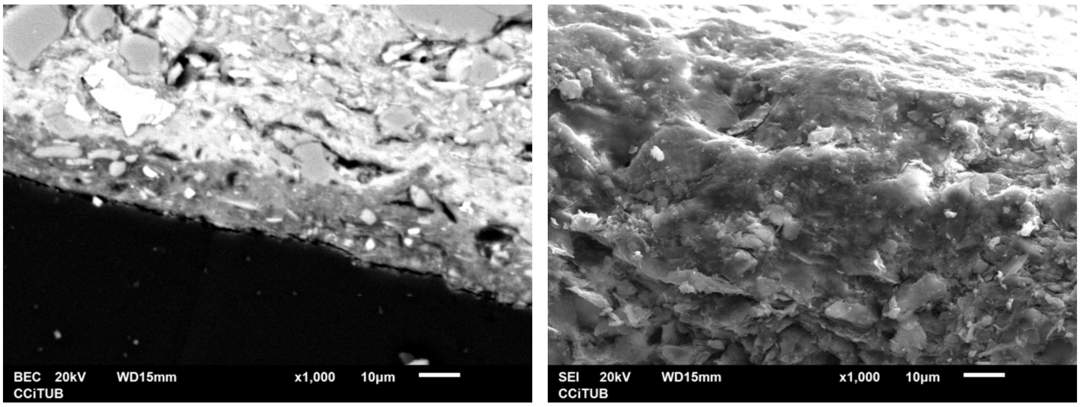


Figure 5.95: SEM photomicrographs of Kon18/37 (BEC, polished section) showing a clear slip layer strongly adhered to the clay body (left); and Kon18/90 (SEI, fresh break) showing a surface layer with a similar microstructure to the ceramic body (right).

Kon18/37 has a surface layer with inclusions (Figure 5.95). The slip composition is similar to the clay body with a higher content of Al, K and lower Ca (Figure 5.96). The slight increase in Al and K, as well as the decrease in Ca are characteristic of the refinement of the clay paste used for the ceramic body.

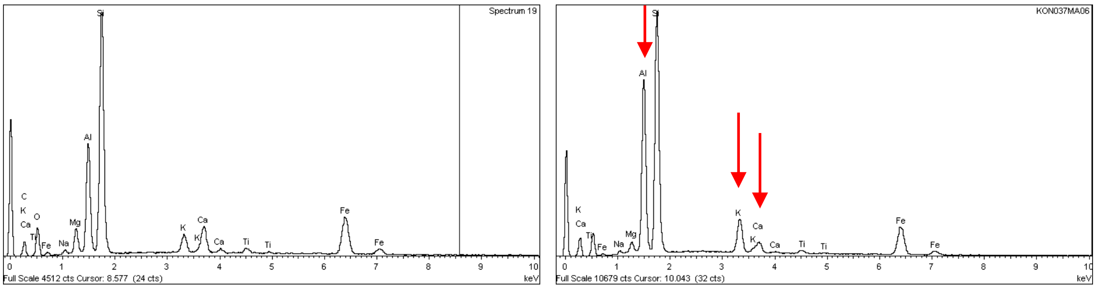


Figure 5.96: Kon18/37, matrix spectrum (left), surface layer spectrum (right). Showing a lower Ca and higher amount of Al and K, characteristic of refinement of a similar material.

Kon18/90 has a surface layer with a similar microstructure to the clay body (Figure 5.95). The chemical composition of the surface layer is similar to the matrix (Figure 5.97). Therefore, it suggests a layer formed through the compaction of burnishing.

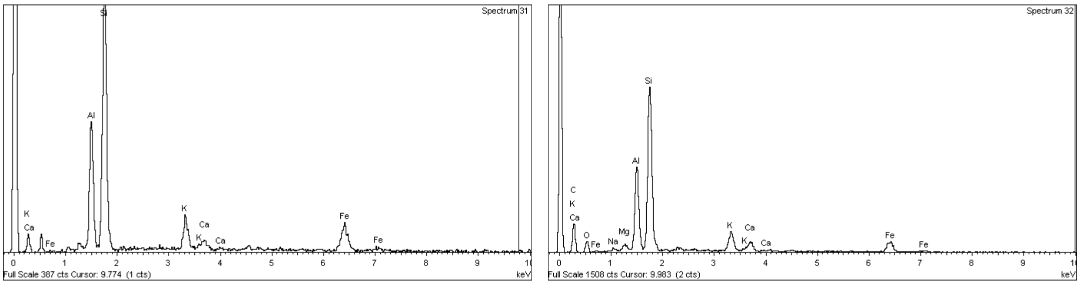


Figure 5.97: EDX spectra of Kon18/90, showing the similar chemical composition of clay body (left) and surface layer (right).

It seems that in the category of red to brown slipped pottery, there are different ways to produce a similar surface effect, in particular during the EH I period. Those vessels with red to brown surfaces can also be produced either through self-slipping or a layer formed through the compaction of burnishing. The use of Fe-rich slips for red to brown surfaces is the dominant technique in both EH I and EH II. It is important to note that there are no marked differences in thickness and in the content of Fe between the iron-based slips in EH I and EH II. The high-quality, more homogenous and solid red slips in EH II stand in contrast to the mottled, red to brown slips, which are sometimes brittle, on the surfaces of EH I pottery. These differences are likely the result of a well-controlled firing atmosphere and the slightly higher firing temperature which has been discussed above.

5.4.2 Black slipped (DS) ware

Somewhat in contrast to the dominance of red slips in the EH I assemblage, black slips seem to be one of the main surface finishes in the EH II Kontopigado assemblage. The samples, apart from Kon18/197 (FG11), discussed in this section are linked to local fabrics in EH II with black slips.

The slip layers are evident and well adhered to the ceramic body (Figure 5.98). The thickness of slips varied both within and between samples from 7μm to 25μm. Bulk chemical analysis by SEM-EDX shows they are low calcareous with a high concentration of Fe, suggesting the use of Fe-rich for black slips. The higher amount of Al and K is related to the very fine texture of the slip, which probably indicates a process of refinement (Figure 5.99).

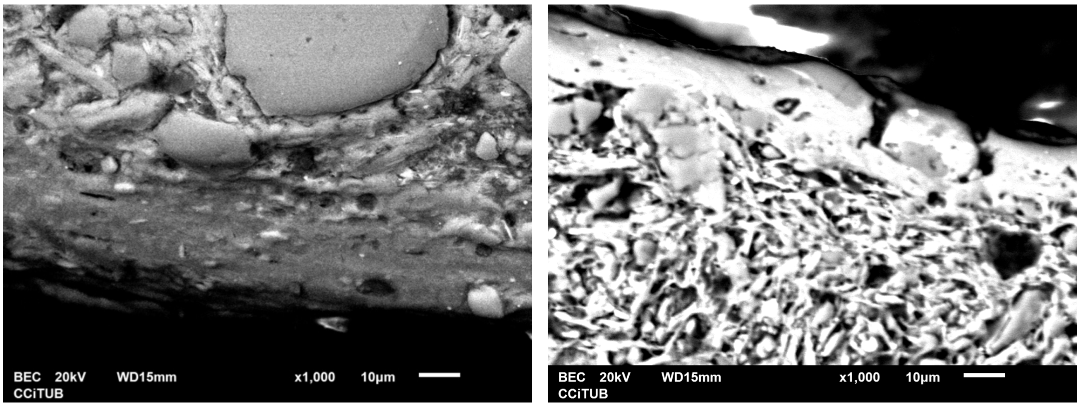


Figure 5.98: SEM photomicrographs of Kon18/164 (BEC, polished section) with a fine slip layer (left) and Kon18/197 (BEC, polished section) with a smoothed and sintered fine slip layer (right).

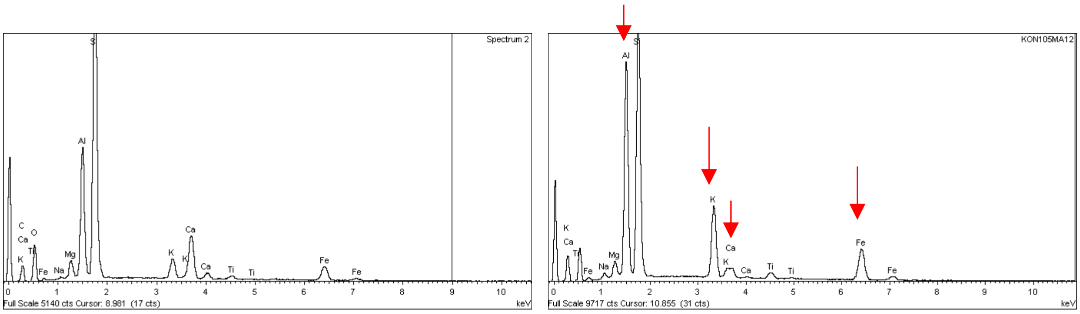


Figure 5.99: EDX spectra of Kon18/105, showing the composition of the matrix (left), and slips with increased Al, K and Fe (right).

As discussed above, most samples of DS ware are higher fired in reducing conditions. This indicates that the black slips are produced by the use of Fe-rich slips in a more or less reducing atmosphere. During the reduction stage, hematite (Fe_2O_3) is fully transformed into magnetite (Fe_3O_4) and produces a black colour. Such a firing practice requires good control of both the firing atmospheres and temperatures.

Based on the macroscopic examination of these samples, the quality of black slips varied between vessels, some are matt and some have a shiny metallic effect, which may relate to refinement, and/or a longer firing duration and/or firing conditions, as the black slips on the surfaces of the same vessels display an even colour. This indicates that the firing conditions during some firing episodes are consistently maintained.

5.4.3 Bluish grey to white slipped (BGS) ware

The mottled bluish grey to white slipped pottery is the most characteristic category of the EB II period at Kontopigado and is common in Attica. The majority of bluish grey to white slipped vessels – mostly sauceboats, bowls and coarse closed vessels – are associated with fine fabrics (FG11 and FG12) and medium-fine to medium coarse fabrics (FG5, FG6 and FG7). Aside from FG11, whose very fine nature makes it difficult to discriminate provenance, FG5, FG6, FG7 and FG12 seem to be local.

There are different ways to produce white slips on pottery. Talc white and lime silicate white have both been used to produce white slips in the Bronze Age Aegean (e.g. in Crete, Betancourt and Swann 1989; Day *et al*. 2006: 54-6; Faber *et al*. 2002; Noll 1982: 191). However, bulk chemical analysis by SEM-EDX shows the slips of this Kontopigado group have a low content of Ca, Mg and Fe (Figure 5.100). The low Ca and Mg content excludes the possibility of talc white and Ca-rich materials for those samples examined by SEM-EDX (Kon18/85, 101, 106, 117, 110, 131, 140, 143, 156 and 163). The thickness of the slip layer between vessels is varied (19-50µm) as well as their adherence to ceramic body, but consistent within the same vessel (Figure 5.101).

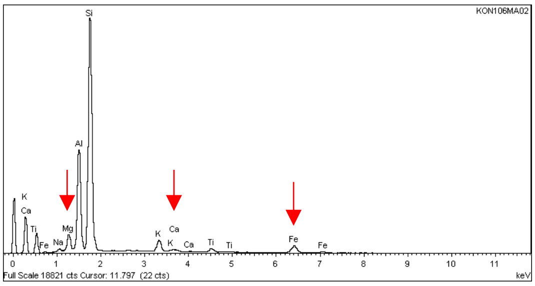


Figure 5.100: EDX spectrum of Kon18/106 with a low Mg, Ca and Fe content.

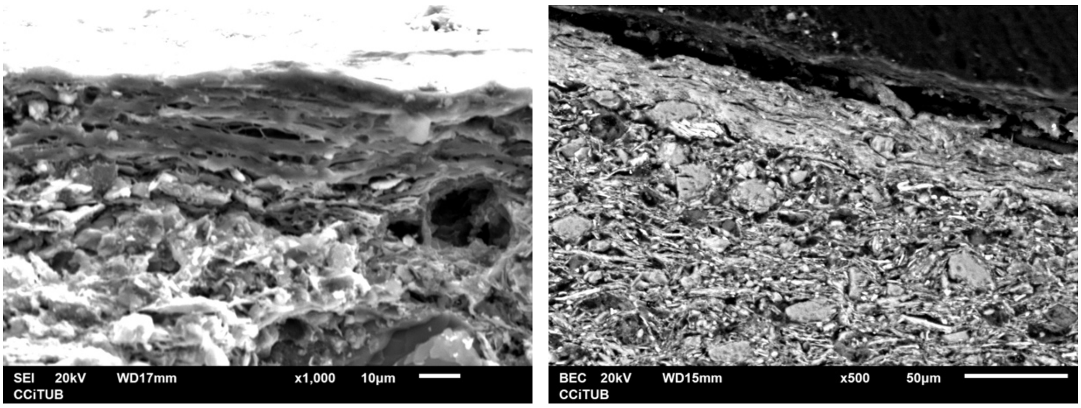


Figure 5.101: SEM photomicrographs of Kon18/110 showing a fine vitrified slip layer (left: SEI, fresh break; right: BEC, polished section).

The third case for producing white slips involves the use of kaolinite or kaolinite-rich clays. At temperatures over 850-900°C, kaolinite ($Al_2Si_2O_5(OH)_4$) transforms into matakaolinite which is practically the same mineral but without OH in the structure, due to the result of dehydroxylation and still produces a white colour (Varga 2007).

However, it is difficult to detect kaolinite, as mineralogically and chemically and matakaolinite has a diffraction pattern overlapping with many clay and accessory minerals. The only possible way is to detect some remains of the original kaolinitic peaks by XRD. Through analysis by XRD, traces of kaolinite are clear with its main peak at 12.3° which, however, overlaps with that of chlorite. Bearing in mind that all samples examined are high-fired at temperatures above 850°C and chlorite disappears at relatively low temperatures, the traces of diffraction at this angle are most likely to suggest kaolinite (Kilikoglou pers. comm.). Kon18/98, 106, 117, 143 and 156 all show these clear traces of kaolinite, possibly also Kon18/131 with a small fluctuation (Figure 5.102-3). Some of the bluish grey to white slips are not well preserved on the surfaces and some may be due to the total transformation to metakaolinite with high firing temperature and therefore, XRD diffractograms may have no kaolinite peaks detected, as is the case in Kon18/158, which, despite its similarities to Kon18/156 in structure and chemistry, does not show kaolinite peak (Figure 5.103).

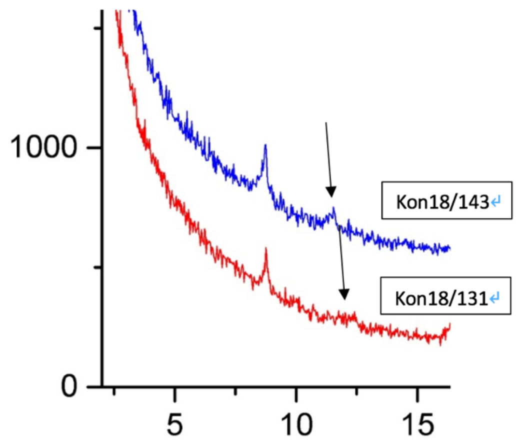


Figure 5.102: XRD diffractograms of Kon18/143 (blue) and Kon18/131 (red) to show the trace peaks of kaolinite.

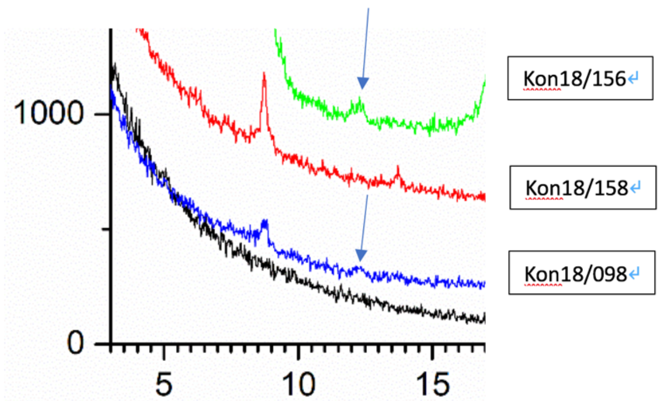


Figure 5.103: XRD diffractograms of Kon18/156 (green) and Kon18/98 (blue) to show the presence of kaolinite, in contrast to the absence of kaolinite in Kon18/158 (red).

The use of kaolinite for white slips is a rare phenomenon. A few Late Neolithic cases have identified the kaolin slip for the white background of the red-on-white ware from Sitagroi (Gardner 1978: 128) and for vessels with a cream-beige slip in eastern Macedonia (Yiouni 2000: 202, 2001:11). In Attica, the early use of kaolin for incised patterned ceramics is attested at the Neolithic settlement of Nea Makri during the sixth millennium BC (Pantelidou-Gofa 1995:140-143). Lumps of kaolinite clay together with obsidian flakes from Melos were identified from a Neolithic and Early Helladic settlement close to Eleusis in west Attica (Papangeli 1990: 57, 2019: 78). The kaolin deposits are very rare in the Aegean world and Melos is one of the best known as a source of kaolin (Aloupi *et al*. 2001, 2009: 197). During the volcanic geothermal processes, the volcanic glass produces a variety of clays and accessory minerals into kaolinite, bentonite, etc. (Shelford 1981:80). In addition, kaolinite also occurred as the product of weathering volcanic ashes and tuffs as sedimentary kaolin on Melos (Shelford 1981:81). The long history of exchange activities between Melos and Attica, including Kontopigado and Alimos for obsidian – volcanic glass, the most renowned materials on Melos – suggests the island of Melos is the most possible source of kaolin which was used for producing pottery with BGS slips at Kontopigado.

Macroscopically, the surface effect and colouration are varied both within and between vessels. By SEM-EDX, it shows a pattern that in some cases, a slightly higher iron content seems to be corresponded to the more bluish grey tone on some of the vessels. Frequently, some examined area shows a higher iron (Fe) and titanium (Ti) content. For example, Kon18/110 contains no to low content of titanium oxide (TiO_2) with a lower iron content, whereas some areas show a higher amount of TiO_2 (up to 3.72 wt%) with a higher iron content. Bearing in mind the even thickness of the slip layer (Figure 5.101), such heterogeneity of chemical composition in the slip layer may suggest an inhomogeneous nature of the slip. In addition, it also suggests the shiny metallic, in particular, bluish metallic effect on the surfaces may relate to the specific application of slips in a high-fired reduction phase.

5.4.4 White slipped (WS) ware

The white slipped ware occupied a smaller proportion in the EH II Kontopigado assemblage and was mostly associated with the medium ware in a limited range of shape repertoire such as shallow bowls, bowls, basins and jars. The slip colour ranges from creamy white to white, sometimes with lustre. Both examined samples (Kon18/161 and 170) made in the local fabric FG5.

The thickness of the slips varies from 13 to 50µm both within and between samples. Bulk chemical compositional analysis by SEM-EDX shows slip is composed of a non-calcareous, low Fe, Mg and high Al in contrast to the calcareous clay body (Figure 5.104).

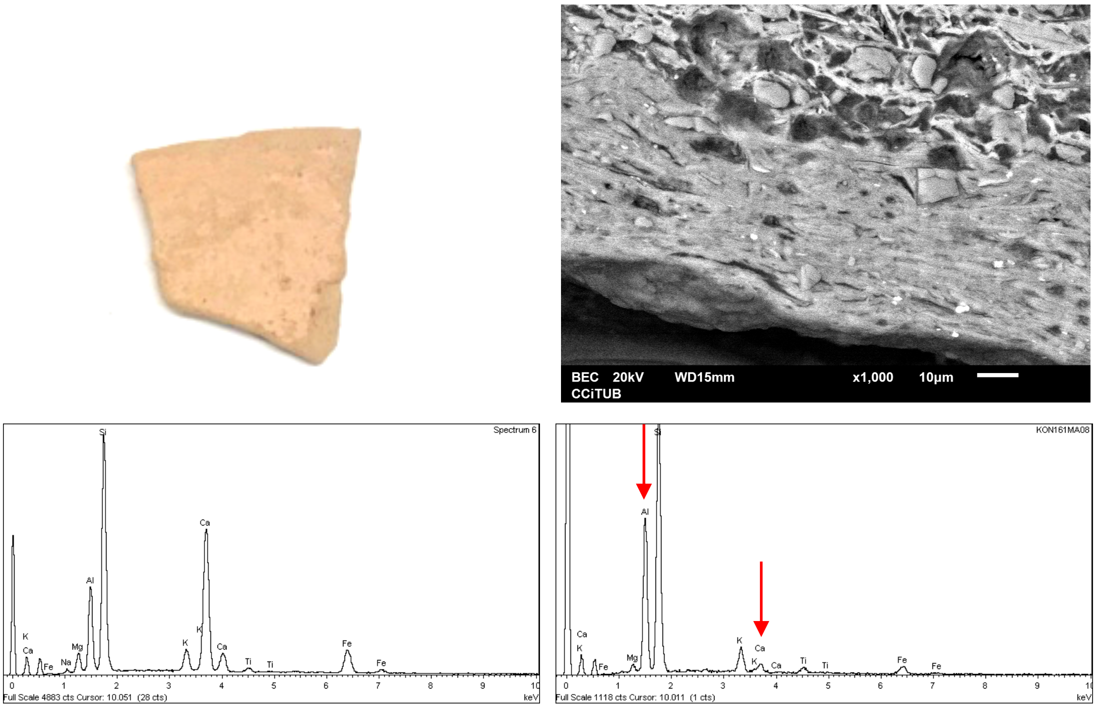


Figure 5.104: White slipped shallow bowl rim sherd. Kon18/161 (top left); BEC image of the surface layer and clay matrix from the polished section of the sample (top right); EDX spectra of the matrix (bottom left) and the slip layer (bottom right) showing different chemical compositions.

Comparing to the BGS slips by XRD, there is no clear trace of kaolinite detected in Kon18/161 (Figure 5.105). It suggests the recipes for the creamy white slips in WS ware are made differently from those white slips in the BGS ware.

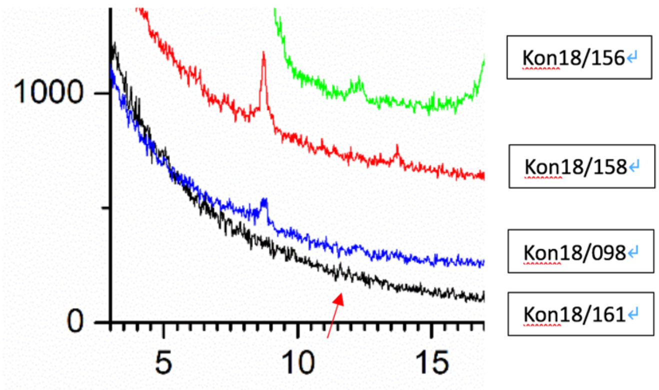


Figure 5.105: XRD diffractograms, Kon18/161 (black) show the absence of kaolinite.

Macroscopically, even though there is a slight variation in colouration of white slips between vessels, the homogenous white colour on the surface of the same vessel reflects well-controlled firing conditions.

In a nutshell, the chemical differences, the different range of shape repertoire as well as the different firing conditions and fabrics between BGS and WS wares suggest two different production processes for these two distinctive products. Compare to its major presence at Koropi, the creamy white slipped ware is less common at Kontopigado in proportion and shape repertoire. The WS ware from both sites are made of the calcareous body in contrast to the low CaO slips. The future investigation and comparison of the WS pottery between two sites should reveal more intriguing aspects of the nature and technical process of the two production centres.

5.4.5 Pink slipped (PS) ware

A very small percentage of the pottery assemblage display pinkish white to pink slips on the surfaces in the EH II period. There are mostly associated with a small range of specific vessels, such as goblets and medium to large bowls. Two samples (Kon18/115 and 184) are associated with local fabrics (FG5 and FG11).

Both samples Kon18/115 and 184 have a small variation in the thickness of the surface layer (25-32.5μm and 14-20μm respectively) and are well-adhered to the clay body (Figure 5.106). The bulk chemical analysis by SEM-EDX of Kon18/115 and 184 show the slip is composed of a low concentration of Ca (CaO:<1.7 wt%) and a high content of Al and K, in contrast to the very high calcareous ceramic body (CaO: up to 10.5 wt%) (Figure 5.106).

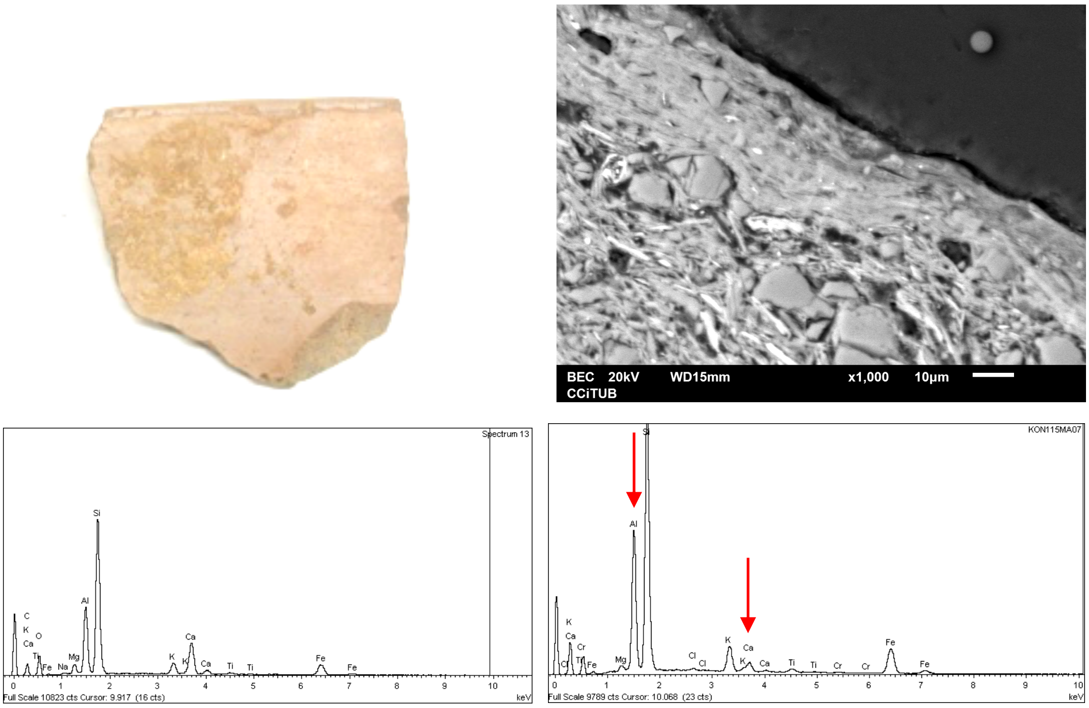


Figure 5.106: Pinkish white slipped incurving bowl (Kon18/115) (top left); BEC image of the dense texture of slip layer (top right); EDX spectra of the matrix (bottom left) and slip (bottom right) with a high Al and low Ca.

It shows that the pink slips are made of non-calcareous materials. The chemical composition of pink slips (Kon18/115, Figure 5.106) is slightly different from white slips (see Kon18/161, Figure 5.104) with slightly higher FeO (up to 8.09 wt%). As suggested above, both Kon18/115 and 184 are fired at low firing temperatures in an oxidising atmosphere. As a result, it may suggest the slip is produced by low CaO material with high FeO which oxidised to the pink finish in contrast to the buff calcareous body.

The different surface finishes and typological differences suggest slightly different production processes between PS ware and WS ware.

5.4.6 Summary

In summary, the microstructural and chemical SEM-EDX analysis in combination with XRD reveals the different manufacturing methods for various surface modifications and especially the application of slips.

In terms of red to brown slipped and/or burnished ware, there are no clear compositional differences over time between red and brown slips, their differences in colour and quality instead depending on refinement and a contrast between the often variable firing conditions of EH I and the more consistent materials and conditions in EH II.

Apart from the application of different Fe-rich slips, the analysis has revealed rather different techniques to produce similar effects by self-slip and heavy burnishing, suggesting the different technological traditions of this category, particularly in the EH I period. The compositional variability of the bodies is connected with these technological variations of EH I red to brown slipped ware suggesting the existence of different production centres with slightly different chaînes opératoires, but all producing (and consuming) a similar vessel repertoire in this period.

In addition to the changes in red/brown slipped vessels between our two phases, EH II sees the introduction of dominant black slipped ware in the EH II as one of the main ware types at Kontopigado. As has been discussed for other areas, this study characterises the Fe reduction black slips, which are the general phenomenon across Aegean (e.g. Burke *et al.* 2018; Kilikoglou 1994; Noll *et al.* 1975), that are also present at Kontopigado. The black slipped vessels are fired with over varied temperatures, which are, however, generally higher than the red to brown slipped ware and lower than the bluish grey to white slipped ware. The degree of shades and lustre are affected by the firing conditions and manipulation of slip materials, indicating the different degrees of control within this category.

The light-coloured slipped vessels including, bluish grey to white (BGS), white (WS) and pink slips (PS), are mostly made in local fabrics with few exceptions. What is exceptional about these is the very specialised way that slips are prepared which we suggest are using kaolinite or very highly kaolinitic clays. This is a technology so far unknown in the EBA Aegean and the slip raw materials have their most likely source on the volcanic island of Melos (Aloupi *et al.* 2019: 197), the source of imported obsidian in west Attica. This reflects that this new surface finish, which characterises EH II at the site has been achieved not only by a radical shift in firing technology and structures (see below) but also by obtaining a completely different slipping material from rather far afield. The potters of Kontopigado not only introduced a radically different form of slipping technology, but used their wide ranging networks to obtain the raw materials for the desired effect.

The local light coloured, high-quality slipped finishes are very much standardised, very high fired and seem to be reliant on consistent temperatures and atmosphere to produce the light-coloured slipped surface. The standardised production as well as the higher quality of this ware type alludes to the increasing scale and intensity in the production in EH II Kontopigado.

5.5 General summary

The integrated analytical programme has produced a rich set of insights into the nature of the pottery assemblages of both the EH I and EH II phases at Kontopigado. While it is clear that there are some aspects of continuity within its locality and, in fact, strong evidence for production on site during the later phase, there are also radical transformations in pottery production processes in terms of raw material selection, paste manipulation and firing practices.

Macroscopic examination and its categorisation of nine main groups, reveals important changes in the proportions of different fabric groups, aiming the distinct diachronic changes between EH I and EH II Kontopigado evident even at this level of analysis. Such clear groups and visual contrasts, with clear morphological and decorative variability, enable an effective choice of samples for further analysis. The EH I material is dominated by red slipped and burnished ware in contrast to the very fine tableware with metallic surfaces in the EH II material. In addition, the different firing practices are highlighted through the examination of surface colour and the colour in the break. Generally, the EH I pottery shows uneven surface colour and mottling on the surfaces, whereas the EH II pottery has an even surface colour as well as slip colour except for specific surface finish on the surfaces such as bluish grey to white slips. This indicates poorly controlled firing atmospheres in EH I in contrast to the well-controlled and manipulated firing atmospheres in EH II.

Thin section petrography identifies a total of 19 primary fabric groups and 15 loners. This suggests a slightly more complex picture than previously assumed at a macroscopic level. The majority of petrographic fabric groups seem to reflect the Attic geology and several are compatible with local geology. The examination of production debris suggests some of the fabrics are made at the site during the EH II period. There are also several distinct fabrics presented in EH I, especially in red slipped ware and in EH II, suggesting the importation of vessels from different production centres around Attica. Many fabrics show strong links between surface finish, vessel type and fabric. This indicates the different production strategies in different production places, but essentially producing the same sort of vessels, both in terms of shape and their main aesthetics / colour scheme. Of particular importance are the radical changes in clay choices and paste manipulation between EH I and EH II periods. The use of calcareous clays becomes dominant in EH II, as it does in many areas of the Aegean.

However, radical transformations in production are evident not only in terms of the drastic change of the raw material used, but also in touch of the surface finishes, which are the product of very different firing sequences. The general pattern suggests the EH

I vessels are lower fired than the EH II pottery. They are characterised by variable redox conditions and particularly by steep thermal gradients in their firing, both characteristic of open fast firing. By EH II the dominant red-brown slipped and burnished surfaces are replaced by those which are characterised by pale white/blue mottled slipped surface finishes which feature not only a new and rather rare raw material as a slip, but also starkly different firing practices. In contrast to the marked variability of EH I, firing in the EH II period becomes standardised, with higher and consistent rates of sintering and the use of reduction phases as parts of the firing episodes. Vessels with specific surface finishes, for example, the bluish grey to white slipped ware requires not only very high firing temperature but also certain firing conditions to achieve the desired effect. It indicates the use of kiln structures in EH II in contrast to the open or bonfire firing in EH I. Even the red slips still used in some ceramics are more homogenous in EH II, which is an additional indication of the introduction of kiln structures.

EH II sees the introduction of the very fine fabrics for the drinking and dining vessels, which enter the repertoire across the Aegean at this time. Kontopigado seems to be producing large quantities especially of sauceboats and the fine white slips use a very novel material to produce these special metallising effects, a kaolinite or highly kaolinitic clay. The most feasible source of such material is the island of Melos and this suggests that the potters community at Kontopigado was importing this special clay for slipping from afar. This joins the other transformation in EH II in showing a radical transformation of production processes, the organisation of production, the products themselves, and perhaps the expectations of consumers in Attica and further afield.

Ultimately, the radical diachronic changes in terms of raw material selection, paste recipes and firing practices within the material examined in this assemblage reflect transformations in the organisation of pottery production and the place of pottery in society, and it is to the implications of these results that we turn in the next chapter.

Chapter 6 Pottery production and consumption in Early Bronze Age Aegean

The radical changes in pottery production – the introduction of technological and stylistic characteristics into the existing local tradition – in Early Helladic II Kontopigado involved a series of changes in the selection of raw materials, clay preparation, vessel shapes, surface treatment and firing strategies. These transformative changes bring a new method of manufacturing pottery and enrich the spectrum of the pottery repertoire. The technological and stylistic change in pottery production between the EH I and EH II is understood by comparing the manufacturing practices in particular paste recipes and firing techniques. With respect to these two aspects of pottery manufacture, it enables the transmission and changes of knowledge and technology in pottery production to be observed through an analytical viewpoint from macroscopic, petrographic, mineralogical, textural and chemical analyses applied in this work. In the meantime, the technological choices and practices are closely associated with the typological and stylistic characteristics, and indeed origins of pottery vessels which provide a clearer picture of ceramic consumption in EH Kontopigado.

It is argued here that these transformations in the production of pottery have much to tell us about the wider changes in society and economy during EB II in the Aegean, around which much discussion of emerging inequality and early polities has centred.

6.1 Pottery production and consumption in EH Kontopigado

This section integrates the analytical work to demonstrate the different technological traditions for the major shape categories, from paste recipes and firing strategies in pottery manufacture and potentially how these ceramics are consumed at this site.

6.1.1 Pans

A large number of pans are present in EH I Kontopigado, with very few in EH II (only the EH I pans are examined in this thesis). Two types of pans are present in EH I Kontopigado assemblage: one perforated with imprints on the base, one not perforated and with no imprint. Almost all pans are locally made, mainly in FG1 (Dominant schist fabric) with a clear sign of organic temper, with very few examples in FG17 (Coarse sedimentary and metamorphic fabric) and FG19 (Intermediate volcanic fabric), the latter two being incompatible with the local geological environment, and imported to Kontopigado (FG19 from the nearby island of Aegina). Apart from the imported examples, most pans are made of materials which are closely linked to the red slipped or red burnished pottery and others. However, pans stand out with their abundant organic temper, which is not common on other pottery. The substantial presence of pans in EH I fills clearly indicates very specific activities. Their very different method of production (partly moulding or slab building) and the clay paste (organically tempered) may support the likelihood of such a distinctive use.

6.1.2 Shallow bowls and bowls

Shallow bowls and bowls are mainly an EH I phenomenon at Kontopigado, but there are occasional examples in EH II whose shape and more homogenous surface colour attest that they are not intrusive in EH II contexts but instead are EH II versions of the ware. As such they are one of the few types whose development can be seen between the two phases. Most shallow bowls have red to brown or brown to dark slips with frequently burnished finishes. It is assumed that they are used as containers or serving vessels for food and their frequency may be suggestive of a role as major protagonists in the dining set of most households. Bowls with incurved rims are frequently treated with the same surface finishes and may serve a secondary role in the dining set with the same function.

The petrographic analysis shows that red slipped and burnished wares are manufactured in a variety of fabrics. The majority are made with the main schist fabric (FG1), a calcareous matrix tempered with micrite limestone and a spectrum of metamorphic rock fragments (FG6 and FG8), compatible with the local geology. The other two common fabrics of red slipped ware are the non-calcareous FG3 (Micrite and Serpentine) and the FG4 (Ultrabasic and Marble); both seem incompatible with the local geology and thus the places of production remain open, though likely to be in Attica. Although all the above-mentioned are categorised as red slipped vessels, macroscopic observation suggests they may be sub-divided. According to the analytical criteria, it is still possible to observe in most of the red slipped and burnished wares a subtlety in the characteristic shades of red to brown and dark hues, according to the different places of production. The majority made in FG1, FG6 and FG8 are considered to be broadly locally produced with light brown, red to brown slipped and burnished ware. The relatively thicker red to dark brown slipped ware with frequently well-burnished and mottled surfaces are produced in FG4; deep orange to red slipped and/or burnished with substantial visible white rounded inclusions are manufactured in FG3. Therefore, while the analytical results suggest a common broad technology in red slipped and burnished ware, there is evidence of subtle differences in materials and perhaps methods according to the place of production, visible macroscopically that distinguish these different production centres.

The firing temperature of the red slipped vessels is mostly around 800-900/950°C, in order to maintain the gleaming surface produced by burnishing techniques. In addition, these vessels present a range of core colour of buff, grey or mixed red and brown/grey, indicating oxidising atmospheres and a short firing duration which results in incomplete oxidisation. The SEM microstructural examination shows that some of these wares exhibit varied vitrification between core and vessel walls, with fine bloating pores suggesting fast firing, possibly bonfire firing or pit firing in the EH I period.

Unfortunately, due to the lack of systematic analytical characterisation studies of other EH I sites, it is unclear whether the red slipped and burnished ware produced at Kontopigado was exported to other regions. However, it is clear from the variety of fabrics present at the site that red slipped ware circulated between sites, as Kontopigado seems to have consumed the products of a variety of production locations, even though it produces the same types within its own locality. The red slipped and burnished pottery has been argued to be inherited from the pottery tradition of the Final Neolithic, during which the organisation of ceramic production was often argued to be at the household or village level (e.g. Immerwahr 1971; Perlès 1992; Perlès and Vitelli 1999; Renfrew 1972: 163). While it is difficult to determine the level of production organisation, the fact that a certain degree of standardisation is present in red slipped pottery in EH I and the clearly large-scale production give the impression at least of some degree of community specialisation and production beyond the needs of household units. The fact that this study also shows their circulation from different production locations within Attica is clearly of importance.

The large quantity of broadly locally produced red slipped and burnished ware suggests that Kontopigado produced the shallow bowl and bowl forms as important ceramic components for acts of individual consumption, perhaps accentuating the act of sharing in the communities. Indeed, the overall vessel shape of the imported versions of the red slipped and burnished ware is almost identical to the local ones, suggesting that they are not imported on account of any functional differences. Instead, they represent the choice to consume the same sort of product from other production centres. Whether the external attributes of colour and surface finish allowed the recognition of the origins of different vessels by their consumers is uncertain, but they clearly show intensive interactions between different communities and the social importance of this sort of pottery. The exchange of red slipped ware, therefore, may even have significance in social terms, perhaps even groups or regional affiliation.

By EH II, the number of shallow bowls and bowls decreases markedly and they are dominated by the calcareous fabrics (FG5, FG8, FG12) which are compatible with the local geology as well as overfired wasters for FG5 and FG8 presented. In other words, the bowl and surface finish type are brought into the new dominant choice of calcareous raw materials (across the Aegean) and specifically the particular calcareous fabrics of Kontopigado. Therefore, it is possible to suggest that most shallow bowls and bowls are produced locally at Kontopigado during EH II. Most importantly, it reveals a major shift in the manufacture of the bowl range in terms of paste recipes, from two predominant EH I fabrics (non-calcareous FG1 Dominant schist fabric & calcareous FG6 and FG8) to the prominent calcareous fabrics in EH II (FG5, FG8, FG12). At the same time, there are also shallow bowls occurred in non-local fabrics, FG4 (Ultrabasic and Marble) and FG16 (Crushed calcite fabric) and thus considered to be imports during EH II. It shows the continued presence of FG4 and the disappearance of FG3, perhaps suggesting shifting community contacts.

The red slipped finishes themselves also develop in EH II, displaying a more homogenous slip layer of more consistent colour and increased lustre. This seems to be the result of refinement of raw materials, but especially a more consistent firing regime, with constant higher temperatures, and longer dwelling times, with indications of better control of firing. The improved finish is accompanied by typological development of thickened rims and new firing technology which indicates that they are in fact a continuation in that shape into the new period, though they form a much smaller proportion of the assemblage.

6.1.3 Tableware

It is important to point out that the EH II pottery is solely taken from domestic deposits which contain a large amount of material, dominated by tableware, including production debris in the EH II contexts at Kontopigado, so the radical differences between EH I and EH II assemblages are not only down to functional differences between the two assemblages. While there is still some red slipped ware and coarse ware, the assemblage is now dominated by radically new types of pottery: medium to fine white slipped ware, plain fine tableware with a wider range of shapes such as cups, dishes, and most importantly, the very fine bluish grey to white (BGS) and black slipped (DS) tableware (especially sauceboats and saucers) that clearly imitates the appearance of metals. At Kontopigado, beyond the morphological similarities to metal vessels, there are two main surface finishes by which metal is imitated: bluish grey to white slips, and black slipped finishes. The former has a mottled effect while the black slip finish tends to be solid and homogeneous.

The sauceboat is perhaps the most characteristic shape of the Early Bronze II period throughout the Aegean world. It is a key element in the serving vessels for pouring liquid, while the saucer is possibly the standard drinking cup. These two vessel types are well represented in the Kontopigado assemblage with bluish grey to white or black slips, sometimes accompanied by highly burnished surfaces, with rarer red or brown slips. Two closely related fabrics are identified – FG11 (Very fine mica and quartz fabric) and FG12 (Micrite and red mudstone in calcareous clay) – with a range of coarseness and variations. It suggests a range of slightly different fabrics within the local spectrum, seems to be used to produce a range of local tableware according to different shapes and sizes of vessels with different colours of surface finishes, including BGS and DS sauceboats and saucers, and plain cups.

The examination of bluish grey to white slips illustrates the new choices of slip materials and an indication of standardised procedures of slip preparations to produce this specific surface finish. The refined slip derives from a kaolinitic material, applied in a variegated fashion that, through specific firing condition leads to the mottled metallic effect on the surface. The examined samples are all extensively vitrified with a firing range of 850-1050°C, while in the break some samples exhibit a homogenous grey colour, some with lighter margins which indicates a mostly reducing atmosphere. It also attests to the use of an enclosed kiln and a close, rather skilful, control of firing conditions.

In addition to saucers, the rare presence of goblets and cups could be considered as variants of functionally equivalent drinking vessels. These two vessel types are also manufactured with very fine fabrics – FG11 and FG12 but fired at a lower temperature of 750-800/850°C in the oxidising atmosphere.

The dish is another new shape with a variety of surface finishes from bluish grey to white, creamy white to red slipped and occasionally plain. They are made in fine to medium fine fabrics – largely FG5 and very few FG6, both compatible with the local geology and wasters made in the spectrum of FG5 – and thus considered to be the local product at Kontopigado. The samples analysed are generally lower-fired, under 950°C. They occasionally have a grey core, indicative of a reduction phase or incomplete oxidation. The homogenous and solid slips on the surface and the changes of firing atmosphere to achieve the required colour of the slips suggest a good control of firing by the local potters.

Therefore, the study of tableware reveals a major change in paste recipe and firing technology. The EH II tableware produced at Kontopigado is dominated by the calcareous fabrics with a spectrum of closely related materials that were fired with different ranges of temperature and conditions according to the shape, size and surface finish of vessels.

The sudden appearance of individual-sized tableware (saucer, cup, goblet and dish) together with the pouring vessel (sauceboat) hints at a different role for tableware in EH II. The ubiquitous presence of bluish grey to white slipped and black slipped sauceboats in the Aegean and their substantial quantities at Kontopigado reflect a substantial demand for pouring vessels which stresses the importance of pouring in terms of action and social meaning (Day and Wilson 2004: 55). The sauceboat, with a range of surface slips and finishes is clearly loaded with different social meanings in contexts across an interconnected Aegean (see Theodorou-Mavrommatidi 2007 for more discussion). Sauceboats were perhaps used on specific occasions of drinking and certainly emphasise the role of hosting, social relations and status (see Day and Wilson 2004 in relation to Crete). As well as their own local products, comparative sites such as Koropi in the central Attica and Ayia Irini on Kea imported sauceboats from other production centres and possibly including Kontopigado. At Koropi, apart from its own production in the region which are different from Kontopigado, there are some of the most characteristic imports from Corinth including sauceboat and ladle which was used to mix and serve wine (Burke *et al*. 2017: 111). Similarly, some of the fragmentary vessels with black slips on the surface found at Kontopigado are considered to be imports from Corinth.

Similarly, it seems the characteristic bluish grey to white slipped sauceboats produced at Kontopigado may have exported beyond the local region. In general, it may infer that not only increased interaction, but also a shared cultural perception and iconography of the social value system across a wider area. The introduction of individual flat-based tableware sets for the consumption of food and drink is a feature of the EB II Aegean and stresses participation and performance in the acts of sharing food, with structure, hosting and etiquette beyond the everyday routine of subsistence (Day and Wilson 2002, 2004: 55-7). This may reinforce the role of individuals and their link to the community. Therefore, it assumes that one of the purposes of commensality is to re-affirm the social order and social relations and the burst of sauceboat and saucer may indicate such immediate demand.

Furthermore, the emergence of such thin-walled, fine slipped footed saucers as well as the pink slipped pedestalled goblet probably served more than simple food consumption and possibly for drinking in special occasions due to their high quality and the clear input of labour in their crafting. It seems that there is a whole repertoire of shapes in the bluish grey to white slipped ware for drinking, consisting of saucers for consuming, sauceboats for pouring and large bowls for mixing. Moreover, the appearance of the dish may strengthen the purpose of social display. The conception of being seen is manifested through the shallow profile of the dish which allows the contents to be seen. Therefore, the use of sauceboats and saucers, as well as dishes, can be used not only for structured commensality at a table (even in a domestic settling), but also for special occasions such as feasting and drinking and their association with a purpose of display. The very fine tableware found in the domestic contexts of EH II Kontopigado may indicate the use of the sorts of fine ware in the domestic structure with people sitting at a table which may stress the social side of construction of social relationship, the importance of family and the importance of hosting. Lastly, the sauceboats with their finishes reference different kinds of metal – in particular, silver and gold sauceboats (Childe 1924; Weinberg 1969: fig.1, 2, pls. 1, 2; see Nakou 1999: 292-3) – and the people who used those rarer vessels of higher value.

6.1.4 Deep bowls and basins

Apart from the shallow bowls and bowls, a large proportion of material from the EH I pit consists of medium to semi-coarse ware such as deep bowls and basins. Almost half of the coarse wares of this category are red slipped or red burnished (only heavily burnished) and approximately half are plain. Nearly all the medium to medium coarse bowls and basins are made in the major fabrics – FG1 Dominant muscovite schist fabric and FG6 Micrite and quartz sand in the calcareous matrix – with a minor fabric (FG9 Marble, schist and sand fabric) and considered to be broadly local. Mostly are low-fired under 850°C in an oxidising atmosphere.

A small group of deep bowls and basins are macroscopically characterised with remarkable heavy burnished and/or red to brown slipped surfaces as well as the microscopically diagnostic FG19 (Intermediate volcanic fabric) which led to the assignment of an Aeginetan provenance. Most of the vessels are low-fired and few with the sign of fast firing. In addition, a few examples belong to the non-local fabric groups (i.e. FG3 Micrite and serpentine fabric and FG4 Ultrabasic and marble fabric) or unique fabrics of coarse-grained schist and micrite limestone in red firing matrix find no geological compatibility to the immediate area of Alimos, suggesting their non-local origin. This suggests deep bowls and basins make in different production centres are being consumed at Kontopigado.

In the subsequent EH II period, the vessel size and body profile are further developed and defined, which facilitates their classification into the medium fine to medium coarse medium- to large-sized bowls and the slightly coarser deep bowls and basins. Of particular importance are the medium to large bowls with a range of surface finishes including BGS, WS, polishing and smoothing are more common in the EH II Kontopigado assemblage and often associated with T-rims and spreading or incurving body profile.

Petrographic analysis shows that most EH II vessels in this category belong to FG5 (Calcite well-sorted sand fabric) and some to FG11 (Very fine mica and quartz fabric) and FG14 (Coarse subrounded calcite and sand fabric). Both FG5 and FG14 are represented by a spectrum of closely related calcareous clay with Neogene sands, sometimes with microfossils. Despite the coarseness of the aplastic inclusions, the inclusion types and the clay matrix are the same and both are compatible with the local geology. The closely related fabrics may suggest the same raw materials are derived from the adjacent areas or a clay deposit from the different levels. The firing temperature remains low at <750-800°C to ≃850°C, which ensures the retention of the polish and/or lustrous white slipped surfaces. The XRD analysis shows a homogeneous firing pattern of these bowls, suggesting good control of firing in a systematic production. Overall, it seems to be a standardisation in raw material selection and manipulation and firing strategy as well as vessel size and shape. The bluish grey slipped bowls (including overfired wasters) are manufactured in FG11 and highly fired, basically produced by the same process as the bluish grey to white slipped tableware. This suggests their local production and local consumption of the BGS bowls, perhaps for serving food or mixing liquid associate with specific social practices.

The slightly coarser medium ware in EH II, including deep bowls and basins in the basic forms in EH I, are mostly plain and some examples with a variety of surface finishes from RSB, DS and BGS. While there are still some made of FG1, most of the vessels are produced in FG5 and few FG7 and FG8. In a similar fashion to the medium to large bowls, the calcareous fabrics with Neogene sands suggest not only that these fabrics originated from similar clay sources, but also have been manipulated in a similar way. In addition, it indicates a fundamental shift of raw material selection from non-calcareous metamorphic and calcareous sand fabrics in EH I to the ultimate domination of calcareous fabrics in EH II. More importantly, this new technological choice is combined with the pre-existing tradition of red slips and burnishing. During this time, the red slipped and /or burnished ware with a more consistent, the better quality of its red slips, reflect the radical changes in paste recipes and firing procedures (calcareous fabrics with clay mixing and sand tempering with good control of firing condition, possibly fired in the enclosed kiln). Together with those red slipped and burnished medium ware using the pre-existing fabrics (FG7 and FG8), some coarser vessels continued to be produced in the metamorphic fabrics and fired to a relatively high temperature over 950°C for an only short duration, just as EH I period. As a result, it demonstrates the co-existence locally of different ways of producing pottery, perhaps two parallel potting practices for a variety of size and shapes within a broadly local area.

The diachronic pattern is clear in this category. Compared to the EH I period, when the local red slipped and burnished ware as well as the medium to coarse ware are made from a range of different fabrics, from calcareous to non-calcareous, in EH II, such variability in fabrics almost disappears. Instead, most medium wares including plain and red slipped and burnished are broadly calcareous with more manipulations (sorting or tempering) with only limited overlap in the fabrics common in EH I. This suggests more complex, perhaps larger-scale pottery production in EH II within a more standardised system.

6.1.5 Jars

Jars with a variety of profiles and features make up a small proportion of the EH I and EH II ceramic assemblages at Kontopigado. Most are fragmentary and represented by the neck and handle fragments and some sherds may be from jugs. Even with the absence of body profile, a reasonable quantity of button lugs, indicative of pithoi, are included in the analytical study. There are four main types of jars: jars with two-stage neck, flaring jars, collared jars and storage jars (pithoi) with very thick vessel walls. Most EH I jars are plain reddish orange and very rarely red to brown slipped and burnished and black burnished. Macroscopically, the medium to large jars along with storage jars (pithoi) made in the non-calcareous schist fabric MG1 and calcareous sand fabrics MG2 and MG5 have almost equal proportions in the assemblage.

Petrographic analysis shows that these jars are broadly locally produced in non-calcareous schist fabrics FG1 for the plain and the variations of calcareous fabrics – FG7, FG8 and FG10 – for the red slipped or black burnished. A clear picture of the different firing strategies can be observed. The plain jars are fired at a comparatively high temperature >900/950°C with a very steep heating gradient, in a short open or bonfire firing. On the contrary, the red to brown slipped and burnished jars are fired around 800°C with incomplete oxidation. In summary, it shows two different ways of producing jars in EH I.

In EH II, jars have a broader range of surface finishes and typological details added to the pre-existing shapes. There are RSB, DS, BGS, polished and plain. Most are made in calcareous fabrics – FG5, FG6 and FG8 – which match the wasters from jars and/or jugs, indicating the local production for most jars. A unique fabric, FG13 (Medium quartz and polycrystalline quartz fabric), used exclusively for grey to dark slipped jars, is closely related to the very fine fabric FG11.

The RSB jars are low-fired, generally below 800°C. Two types of firing strategies are shown. One with mottled red to brown slips is fired in bonfire firing or pit firing, the same with the thick-walled storage jars and the other one with even and solid red slips on the surface and the homogenously vitrified matrix suggests a consistent firing pattern, suggesting a good control of firing. Therefore, it seems that, similarly to the EH II medium ware, a proportion of red slipped jars is produced combining the new clay choices and firing strategy during the EH II period.

Jars with other finishes such as grey/white to black slipped, polished and plain surfaces are higher-fired around 950/1000°C. There are very rare coarse jars with developed forms attested to the EH II version of jars which are made in FG2 (Biotite schist and shimmering phyllite fabric) and fired to a higher range of temperatures. Such a practice is similar to that in EH I involving raw materials of metamorphic origin and the employment of high firing temperatures over a shorter duration, suggesting a constant technological tradition in the closely related production centres.

In general, most of the EH II jars are locally made with the same calcareous materials but with different firing strategies according to surface finish, suggesting that Kontopigado is producing different styles of jar. It is interesting that this study shows that even though Kontopigado produced both the red-brown and the well-known white slipped jars, until now, the red-brown examples are rarely found outside Kontopigado. The picture with the white-slipped jars is, however, rather different.

Broodbank (2000: 279-87) has stressed the appearance of transport jar in the EB II Aegean, while Day and Wilson (2016) have detailed different sources of the jars around the Aegean and show their movement across a distance, mainly along maritime routes. They suggest that the jars most probably contained wine or some other prestige commodity. More importantly, the range of calcareous fabrics (FG5, FG7, FG8) from Kontopigado match the well-studied fabrics of white slipped collared jars (Wilson 1999), found not only at Koropi, but also at Ayia Irini on Kea, Phylakopi on Melos, Akrotiri on Thera and even as far as Crete at Poros-Katsambas and Knossos (Day and Wilson 2016). While Day and Wilson were able to show that these were products of one centre, they could not specify its location. This thesis is able to demonstrate that the production centre of these characteristic, widely distributed, white slipped jars is Kontopigado itself.

Wilson (2008) have demonstrated that these collared jars travel together with sauceboats (the main shapes imported from the mainland and Cyclades to Poros-Katsambas on Crete) and in many cases, the transport vessels and imported tableware have similar surface finishes according to their origin. Perhaps the best known of these are the net patterned footed goblets and broad-streak painted collared jars from Melos (Wilson 1999: 82). To these now are added the white slipped collared jars and their partnering bluish grey to white mottled sauceboats from Kontopigado which has taken part in this transformation of drinking practice across the Aegean in EB II.

6.1.6 Summary

To summarise, the very similar raw material selection, paste manipulation and consistent firing strategy suggest standardised pottery production at Kontopigado during EH II. We have proven on-site pottery production at the site and this is very rare in the Early Bronze Age Aegean. The sheer quantity of such homogeneous EH II pottery at Kontopigado, which could not all form part of this doctoral thesis, suggests large-scale production. The wasters appear in the very fine fabrics for the finest tableware and a spectrum of closely related, medium fine to medium coarse fabrics using calcareous materials tempered with metamorphic and limestone sands were used to manufacture a range of vessel shapes and surface finishes in the local workshop. Meanwhile, to a lesser extent, a broadly local pre-existing ceramic tradition (there is no evidence of production at Kontopigado itself during EH I) continues into EH II, in some ways integrating aspects of the new EH II technology. While we may not have wasters during EH I, some of the clear fabric links between the EH I pottery at the site and the later phase indicate that the characteristic EH I pottery, dominated by red slipped and/or burnished and plain ware, is also produced in the local area.

In short, a comparison of pottery production in the two phases shows radical changes in terms of clay choice, with a clear shift to the use of calcareous clays and the development of a range of consistent paste recipes from fine through coarse ware. The fast firing in bonfires or open firing in EH I is replaced by the homogeneity of firing pattern that suggests enclosed, controlled firing and the possible use of the kiln, which would not only enhance control of steady firing temperatures and longer soaking times, but also enable the neutral and reducing firing atmosphere necessary to produce the distinctive surface finishes of bluish grey to white slip. It is these that enhance the morphological imitation of the lustrous surface of metal vessels. The reconstruction of manufacturing techniques of the main vessel types reveals the significant technological change in pottery production. The 'new' technology consisting of new technological choices and practices is perhaps based on the demands for technical development and changes in consumption pattern, which are explored further in the next section.

6.2 The 'New' Technology: clay choices and firing

At Kontopigado, the EH I fabrics are dominated by coarse metamorphic fabrics and a broad range of calcareous clays, with varied petrology and textures, suggesting several different, yet related, clay sources were exploited. In EH II Kontopigado, a spectrum of closely related calcareous pastes becomes the main focus in pottery manufacture and in particular, the new very fine fabrics (FG11 and FG12). These were used in the production of very fine thin-walled, skeuomorphic tableware with the bluish grey to white slips whose imitation of metal requires a radical change in firing technology and highly skilled craftsmanship.

It is important to consider the major transition to highly calcareous, often fine fabrics as an Aegean-wide phenomenon, with similar contemporaneous changes elsewhere on the mainland, the islands and Crete. The highly calcareous clays fire to light colours that produce a light background as an advantage for surface modification (Maniatis *et al*. 1981). Equally important is that calcareous clays produce homogeneously extensive vitrification, a stable microstructural development within a broad range of firing temperature 850-1050°C (Manitias and Tite 1981). As a result, the temperature during firing is not as critical as with low-calcareous clays, which is advantageous for potters with a low risk of over-firing and collapse. At Kontopigado, there are a range of calcareous fabrics from fine, through medium, to coarse according to the size of the vessels. Across this range it is the controlled application and firing of surface materials and the generally high-fired nature that stands out. Indeed, vessels such as black slipped jars, require not only the manipulation of raw materials and atmosphere, but also a higher firing temperature. Furthermore, the stability of the calcareous pastes and kiln firing provide potentials for stable production output and leads to the standardisation and possibilities for mass production.

At Kontopigado, it seems that the firing atmosphere was crucial to the formation of colours in the manufacturing process and was closely associated with the new way of firing. During EH II, the most characteristic bluish grey to white mottled slips on surface of the same vessel (sometimes bluish grey exterior and white interior or vice versa) requires kaolinite-derived slip materials and was fired in a reducing atmosphere. The metallic bluish grey effect is resulted from high firing in reducing atmosphere. In addition, the careful treatment of very fine drinking vessels with black slips is the result of firing in an intense reducing atmosphere. The complexity of the production of these slightly mottled, sometimes lustrous surfaces involved labour investment and substantial skill which can seem in these two classes of very fine tableware produced at Kontopigado. More importantly, the consistency of firing, the ability to produce a constant high temperature, with fine control of atmosphere, all argue for the investment of some forms of firing structure perhaps kilns. Hence, the combination of calcareous paste recipes and the use of specific slip materials obtained from far away – in particular the kaolinite slipping materials possibly imported from Melos – with a real skill in the manipulation of the firing conditions and high firing temperature enables the flat-based tableware, fashioned with very thin walls, to produce a metallic finish.

To summarise, the technological changes in pottery production can be summarised as firstly the move towards using the calcareous raw materials in paste recipes, and secondly the homogenous firing due to the possible development of kiln structure and the close control of atmosphere to achieve the desired effects. To reach homogeneity and reproducibility, the two-abovementioned changes are necessary and therefore related to the social practices, that is, the importance of metal and contemporaneous use of sophisticated tableware in the pervasiveness of feasting and drinking behaviours in the wider Aegean context. This new and standardised way of making pottery in EH II suggests an increasing organisation and the expertise of the potters with the immense energy invested in pottery production distinguishes a degree of specialisation at Kontopigado.

6.3 Organisation of pottery production

In assessing the organisation of pottery production, we touch on both the mode of production and the related issues such as specialisation and standardisation, and their clear link to hypothesised increases in socio-political complexity. As discussed in Chapter 2, specialisation is a topic which has generated a range of views and systems of classification in critiques since the works by Rice (1981, 1991) and Costin (1981). Some of these concepts such as scale and intensity (Costin 1981), resource management/specialisation (Rice 1991), are useful to think about to the study of pottery production organisation.

At Kontopigado, unfortunately, there is no direct production evidence (debris) in the EH I deposit, but there are points of continuity into the later phase, when we do have evidence of actual onsite production. In contrast, the frequent presence of wasters in the EH II deposits suggest large scale production of a very homogeneous material in one place. Additionally, in EH II our analysis of firing suggests the presence of built firing structures, and very specific clay recipes according to the size of vessel, all of which argue for a greater scale and increased intensification in production. This stands in contrast to EH I when we have no evidence of firing structures beyond open firing and the fabric types are more generally applied to the varying size of vessels. Therefore, it can be argued that the scale and intensity are lower than the EH II period.

An increased level of standardisation can also be observed between the ceramic assemblage in two phases. Except for the red slipped shallow bowls and bowls, the EH I pottery repertoire contains a broad spectrum of vessel sizes. Conversely, the EH II pottery repertoire presents a clear division of vessel size relating to coarseness from individual-sized vessels with very fine fabric, small very fine, medium-sized medium-fine fabric, to medium-coarse and coarse fabrics for large vessels, establishing clear size categories in ware types. The detailed analysis of standardisation usually involves measurements and metric variability based on size, dimension, consistency of shape (e.g. Berg 2004; Roux 2003), which is beyond the scope of this thesis. However, it is still important to point out such diachronic distinction in vessel size in Kontopigado assemblages.

The degree of resource specialisation can be seen through the fabric types and the associated ware types. During late EH I, the resource management is weakly defined. FG1 is the prominent fabric in that phase and is utilised to manufacture a range of wares from fine to coarse, slipped and/or burnished to plain vessels. Only a small proportion of ceramics show a more or less explicit tendency of specific recipes for specific vessels. In particular, baking pans show the radical differences in FG1, with a clear indication of abundant organic temper and a specific way of shaping. The minor sand-tempered fabrics (FG6, FG7 and FG8) are more associated with red to brown slipped and burnished pottery, especially shallow bowls and bowls. Therefore, only a few specific ware types such as the red slipped wares and pans, potentially culturally and/or functionally important, are manufactured in specific, tailored fabrics in the EH I period.

In contrast, the EH II pottery production features a distinct degree of resource specialisation according to vessel type. By EH II, the calcareous pastes, sometimes sand-tempered, become more prominent. The spectrum of coarseness within the sand-tempered fabrics are generally correlated with vessel size and frequently match a specific range of pottery. For example, the finer range of fewer inclusions in the coarse fraction within FG5 is associated with smaller vessels such as shallow bowls, bowls and dishes while the slightly coarser range is largely represented by larger incurving bowls, basins and jars. Thus, it seems the recipe is adjusted to the size and function of vessels in this group. Furthermore, the medium fabric FG8 is used to manufacture the medium-sized red to brown slipped saucers and slipped or plain jars/jugs. The medium-coarse fabric FG14 is closely correlated with plain bowls with thickened rims. Most significantly, the very fine fabrics are used to produce very fine tableware. The finest fabric FG11 is mostly associated with bluish grey to white slipped sauceboats, saucers, bowls and a dark slipped saucer as well as a pink slipped goblet, all of which belongs to the most exquisite products of the assemblage. The very fine fabric FG12 is used to manufacture slipped sauceboats and small plain shallow bowls, cups as well as a small well-made dark slipped jar. Additionally, a medium-fine fabric FG13 is exclusively associated with grey to dark slipped jars. As a result, it can be seen that there is a clear range of calcareous fabrics of variation in coarseness and these tend to match vessels of differing size and function.

Moreover, in terms of resource procurement for surface finishes, changes also occurred from EH I to EH II. The practices of applying surface slip continued into EH II with more range of colours and most importantly, white slips produced by firing of kaolinite-derived material, a specific raw material brought from a relatively long distance by sea. As a result, in terms of paste recipes, it demonstrates a clearly defined resource specialisation in the EH II pottery production at Kontopigado.

In addition, the major transformation in firing strategy contributes to the increasingly intensified and standardised production that can provide insight on production organisation during EH II on site. Although there are no actual remains of kilns yet recovered from EH II Kontopigado, the frequent overfired wasters attest to pottery production on site and the advanced and consistent control of firing atmosphere and temperature suggests the use of built firing structures. Firing structures allow a better control of firing conditions such as changing firing atmosphere, the degree of intensity in reducing atmosphere, and steady heating rate and longer firing duration and soaking time. Therefore, the investment in facilities for a stable firing environment is crucial in the shifting firing strategy in EH II, after what appears to be open firing or bonfire firing in EH I, attested by the signs of fast-firing discussed earlier.

The different firing schemes are applied to associated vessels with different surface finishes and functions in order to achieve the desired effect. The specific firing scheme to desired slip colour would benefit from built structures, but certainly requires skills to manipulate atmosphere and temperature and the changes in specific parts in firing duration. For example, the most well-executed metallic ware such as bluish grey to white slipped sauceboats, saucers, and black slipped saucers exhibit a highly homogeneous firing with extensive vitrification of microstructure, together with a metallic effect on the surface, indicating a very high firing temperature and good control of firing conditions. The very specific bluish grey to white slip is mostly associated with the sauceboats made in specific fabrics and the slip materials are procured from a distant place. The combination of particular surface finish, the vessel type and the fine fabrics is crucial to understand the close relationship of the paste recipes and physical appearance in the manufacturing sequence and its close association between the vessel type and aesthetic appealing to the wider market and the customers in the Aegean context.

The fine saucers are produced with real sophistication. Most very fine small saucers are standardised with clear variants of forms and colours of slip. In contrast to the sauceboats, the slips on the saucers are mostly homogeneously applied with refined slip materials and very close control of firing conditions. Such well-controlled mixed firing atmospheres, the capability to reach very high temperature and the use of firing structure combined with the preparation of specific slip materials to manufacture the very specific metallic surface finishes reflect technical competence which may require a long-term learning process. At the same time, the large quantity of such high-quality vessels reflects the high level of craftsmanship which is required for a large-scale pottery production.

Apart from the very fine metallising tableware, the white slipped and plain medium-fine ware also demonstrates the striking homogenous firing pattern with medium firing temperature range. Besides, in contrast to EH I with the poor-controlled oxidised firing, a large proportion of red slipped pottery is fired with a longer firing duration for a more steady heating rate to achieve the homogeneous solid red slips on surfaces. Consequently, it is evident that there are different ways of firing techniques and different levels of control in firing to manufacture a range of products in EH II Kontopigado.

As a result, additional effort is put into manipulating raw materials for producing specific paste recipes and surface slips for making vessels with different types of finishes and functions and fired them in the relevant firing conditions, all of which involved a large amount of skill, testifying to the expertise and experience of potters. This evidence suggests an investment of permanent facilities further suggests a higher extent of organised structure in pottery production during EH II.

To conclude, the EH I and EH II fills provide a great opportunity to evaluate the technological standardisation and variability in ceramic production in a very focused chronology. From the technological perspective, it displays a higher degree of standardisation in vessel shape but a higher variability in the paste recipes in the EH I period. A broad range of clay sources is exploited to produce pottery in the local area.

In contrast, pottery production at EH II Kontopigado becomes more organised, with large scale production. It is manufactured with more standardised paste recipes and firing procedures with a restricted variability of clay sources and vessel forms. The relationship between particular fabrics and ware types becomes very pronounced, which is particularly true for the medium to large bowls and small to medium dishes, which are mostly made in the same or similar medium-coarse fabric(s). The fine tableware such as sauceboats, saucers, cups and goblets, on other hand, are nearly always manufactured in very fine fabrics and fired in controlled firing conditions. The medium to large bowls and basins demonstrate a higher degree of variations in vessel forms and surface modifications while using very closely related fabrics and fired in the uniform firing pattern. The decline of variability is also reflected in the pre-existing tradition of red slipped and burnished ware which the same spectrum of closely related calcareous fabrics and the same standardised firing strategies are used to produce such RSB ware in EH II. That is, the pre-existing tradition of red slip and burnish was not abandoned, but modified to adapt the new typology and paste manipulation and adopt the new firing technology. As a consequence, with respect to clay choices, paste manipulation, surface treatment, firing strategies as well as typologically and stylistically, a clear tendency of intensification in pottery production is shown from EH I to EH II at Kontopigado.

6.4 Exchange and consumption of pottery

Modes of consumption and their social implications have been widely discussed (cf. Costin and Earle 1989). It is undeniable that the dramatic changes in pottery production in EB II reflect the transformation of consumption patterns and thus the social formation of the Aegean at this time. Based on the analytical results and comparison with previously studied ceramic assemblage in other contemporary sites in the previous Chapter 5, it is possible to assess the interaction between the population at Kontopigado in west Attica and its external environment in terms of consumption habits and exchange of ceramic vessels.

In the first phase, raw materials from Kontopigado show a majority of pottery are probably broadly local and some of them, in particular, the red slipped shallow bowls which have the same function and are similar to the local ones in terms of their appearance may come from other production centres across the region (see section 6.1.2 in this chapter), suggesting that this specific ware is widely circulated during the EH I period, despite its similarity in shape and surface finish to the local ware.

Furthermore, a high number of distinct fabrics and loners suggests several distinct origins of the EH I vessels. Pyxides with the Cycladic decorations that one sample examined suggests a possible island origin that characterises the typical EB I late Kampos Group materials at Kontopigado to indicate the Cycladic links. There is also a range of small to large plain coarse pottery made in the coarse sedimentary and metamorphic fabric (FG17) which has similarities elsewhere in east Attica. It indicates there are the same sorts of products produced by different places and the repertoire of imported pottery in Kontopigado assemblage reflects the choices in consumption pattern. It elucidates a shared knowledge and practice with local variations in the pottery production and additionally, the complexity of consumption as well the exchange network in this region.

A substantial proportion of pottery in the Kontopigado assemblage, in particular heavily burnished/polished ware and red to black slipped and burnished pottery are made in volcanic fabric suggestive of the Aeginetan provenance. It is clear that the nearby centre in Aegina has a higher level of labour investment in the finishes compared to Attic comparatives in the same sorts of shapes not only in EH but also FN with examples from Asteria at Glyfada (Kaza-Papageorgiou 2019: 102, fig. 12.18 and pers. comm.). Such sophistication in the surface finish constitutes the most characteristic island tradition in Aegina which continued prominently into the Middle Bronze Age.

The grooved rim and dimpled base represented commonly in Aeginetan fabrics have also been found on a few local vessels, and additionally, the local variant of the shallowly grooved rim also has been expressed in some examples from Aegina. It confirms the high level of connectivity in terms of production and consumption of pottery in the Saronic Gulf.

Within the specific range of Aeginetan products, Kontopigado contains two main types: large heavily burnished/polished deep bowls/basins, possibly used as cooking pots and red slipped and burnished bowl shapes for consuming food or drinks. Their fabrics are slightly different in terms of the mineralogical composition of intermediate volcanic rocks. Such a division of vessel types is even more clear in the detailed study of EH I pits at Kontopigado (Vasco Hachtmann pers. comm.; Kaza-Papageorgiou *et al.* forthcoming).

By EH II, the imported Aeginetan ware remains more frequent compared to imports from other regions, yet forms a smaller proportion in the assemblage than the previous phase. The vessel shapes and surface finishes remain more or less the same as the EH I Aeginetan examples. What is striking, however, is the reduced range of products, dominated by deep bowls/basins in EH II. The presence of imported cooking pots from Aegina when there are local cooking pots existed reflects the consumption choices at Kontopigado.

Calcite-tempered coarse ware is rare on the site in both the EH I and EH II period, but like in the case of other sites and regions (e.g. Koropi: Day pers. comm., Argolo-Korinthia: Burke 2017: 256-7), forms only a small proportion of the assemblage. The petrographic analysis shows there are made in technologically similar fabrics of different origins. This suggests that tempering with crushed calcite is a shared technological knowledge and has been practiced in different communities, beyond the well-known cases in the late EB I Kampos group (Karantzali 2006; Papadatos and Tomkins 2014: 334; Nodarou 2013: 155-6; Wilson *et al.* 2008).

The radical differences in the repertoire of exchanged pottery in the subsequent EH II period reveal a very different picture. The coarse slipped ware made in local calcareous sand-tempered fabrics of Kontopigado is one of the main groups present at Koropi. In particular, the coarse white slipped collared jars – which are the first amphora in the Aegean – have been found not only in other parts of Attica such as Koropi, but also at sites along the trading routes of the Western String such as Ayia Irini on Kea, Akrotiri on Thera, reaching as far as to Crete at Poros-Katsambas and Knossos (see Day and Wilson 2016; Douni 2015: 422-4; Wilson *et al.* 2008: 265). It therefore explicitly reveals this well-studied fabric of the widely distributed coarse collared jars has been one of the main products that Kontopigado has supplied for regional and wider Aegean consumption in EB II.

Furthermore, Day and Wilson (2016) have linked the sauceboats to collared jars – containers for valuable commodities such as wine – as a drinking set which widely distributed in the EH II mainland and the EC II Cycladic islands. It marks a series of perceptible changes in ceramic consumption patterns in the Aegean context. The invention of sauceboats may signify the social and economic significance of liquid products, most probably wine, and the feature of the spout highlights the performance of pouring and the act of sharing. The new social practice using the drinking equipment and the appreciation of the liquid imports composes a picture of formalised settings of commensality, a common phenomenon in the EB II Aegean. Some of the bluish grey to white slipped BGS sauceboats and fine wares found elsewhere such as Ayia Irini on Kea with a fabric that petrographically appears the same as the very fine fabric at Kontopigado and in terms of their shape, morpho-stylistic features, etc., seem to be the same as those found largely at Kontopigado. As a result, it seems reasonable to presume the consumption of these very fine BGS tableware which may have travelled with the coarse transport jars (with their contents) that are found on the same sites between Kontopigado and other key centres in the Aegean and as a part of the phenomenon of a broader and wider distribution of pottery and exchange of various commodities.

The expansion of trading networks is further attested by the links to a wider region through the movement of pottery in EH II. As at Koropi which has a low level of very distinctive highly lustrous black Corinthian vessels such as sauceboats and ladles, the two black slipped vessels made in very fine high-fired greenish calcareous fabric with unidentified shapes in the Kontopigado assemblage, but known at Koropi, may suggest vessels as a part of drinking set. Furthermore, it may indicate the intentional choice and behaviour of consuming this specialised product associated with the well-recognised place of production at Corinth. On the contrary, there seems to be very little evidence of pottery exchange between this area and Kontopigado in EH I. The characteristic EH I fruitstand produced at Talioti have been found commonly across the Argolid and also in Tsoungiza, Nemea in Corinthia (Burke *et al*. 2017, 2018; Dousougli 1987; Pullen 2011). However, there is only one example of a fruitstand presented at Kontopigado and it is made in the gold mica fabric and the typical Aeginetan heavy burnished surface. As a result, considering there is no clear direct evidence from this study of contacts in the preceding period, it may attest an extended network from west Attica to the northeast Peloponnese in EH II period.

Some very fine vessels including the one sampled from possibly a jug, which is very distinctive, have a pinkish buff core and whitish slip and the fabric is comparable to those found in Ayia Irini (Wilson 1999: 94, 99) and on the Greek mainland (Choleva

2018, 2020) for which Wilson (1999: 94, 99, 141-3; 2013: 408; see also Charalambidou *et al*. 2016) proposed the Euboean provenance. The white slipped collared jars with the compatible fabric made at Kontopigado have also been found at Ayia Triadha cave in southern Euboea (Mavridis and Tankosić 2009: 54, fig. 5, no.4, 2016). Therefore, it further demonstrates direct evidence of contacts between Attica and Euboea suggested by Nazou (2017). It further outlines a distinct regional network of contacts and exchanges that developed amongst the communities producing and consuming pottery at Kontopigado and on Euboea.

Talc ware is also found at Kontopigado and is characterised by its soapy texture and coarse talc schist rock fragments. It is generally considered that it has its origin in Siphnos, but is clearly in both stylistic and petrological terms a product of the western Cyclades (Vaughan and Wilson 1993; Wilson *et al*. 2008: 265). Considering the wide distribution of the talc ware, and its exclusive jar shape in this talc fabric found at Kontopigado, it is perhaps possible to suggest the wide circulation and consumption of its contents. In addition, it is also suggested that talc ware is the by-product of the exchange and trading activities of metal ores and metals (Vaughan and Wilson 1993: 182-183). Therefore, it may argue for the movement of a range of products accompanying the exchange of metals.

It seems that in the EH II period, Kontopigado imported a wide range of pottery including the products of well-known production centres, heavily burnished and red to black slipped deep bowls from Aegina, black slipped vessels from Corinth and talc ware of west Cycladic origin. Together with the specialised bluish grey to white slipped tableware and transport jars of Kontopigado, it shows a common investment of what might be seen as commercialised branding which trademark each production centre and their products in the Early Bronze Age. It is suggested that Kontopigado clearly shows the flow of ideology and technology with the movement of people and goods in conjunction with the standardised material culture and the prevailing social practice in the Aegean-wide trading networks in this specific time, providing an important indication of the EB II 'International Spirit' which Renfrew (1972) proposed.

6.5 Kontopigado in its EBA Aegean context

This detailed study of pottery production and consumption in EH I and EH II Kontopigado provides insight into the transmission of various aspects of technological practice, and sociocultural traits. The transformation in production at the site in terms of intensity and scale of production and the differences in consumption choices seem to demonstrate social and economic differences between the two periods. This may affect or be affected by the transmission of knowledge and, therefore, access to expertise and branding tradition, etc within the Aegean-wide transformation in practice.

It seems that the revolutionary changes in pottery occurred around the same time in a similar manner in the Aegean from EB I-II, which generally revolve around the move to calcareous paste recipes and high temperature firing. This common phenomenon of pottery production in the EB II Aegean suggests we rethink the level of connectivity and the flow of information and techniques both within and outside communities of practice.

Furthermore, within the broad pattern of changes in EB II in terms of the introduction of new vessel types, the scale of production, and the exchange of pottery, etc., there are differences in the ways of making pottery. A particular pottery manufacturing process, not only produces the particular style of final products but also reflects different potting traditions. Therefore, while many aspects may be shared across the region, there are still distinct differences that characterise different potting traditions, which have the potential to be developed further in 'branding', such as specific surface finishes in Corinthia, Aegina and Attica.

For comparison, the majority of pottery in Koropi – a major centre only a few kilometres in central Attica from Kontopigado – presents a subtly different ceramic repertoire from Kontopigado, with rather different surface finishes, differences in raw material manipulation, etc. to manufacture a range of products (Douni 2015). For example, the well-sorted calcite fabric at Koropi (FG6: well sorted calcite and quartz) has some similarities to the local one FG5 at Kontopigado in terms of the raw material selections (calcareous sands) and the paste manipulation (well sorting and sand tempering). However, the textural differences between the two fabrics and the different surface finishes in a specific range of vessels may relate to chronological differences or the differences in production between the two production places.

In addition, it seems that both Kontopigado and Koropi have produced pottery to deal with the increased demand for specialised pottery, especially vessels with metallic appearance, usually associated with drinking practice. While the bluish grey to yellow mottled, urfirnis black, and light slipped ware are presented at Koropi, it seems that the potters invested more effort in making the light creamy white slipped ware. The very fine micaceous and calcareous clays used to form the paste, the sophisticated processing of slip materials, and their application of the slip are all combined with the high firing temperature to produce a metallic appearance, indicating the light slipped ware as the focus of specialised products in the local production centre(s) close to the site of Koropi (Douni 2015, 2020). The higher percentage of fine slipped ware in the Koropi assemblage also suggests different priorities in consumption choices (Douni 2020). Therefore, the different focuses between Kontopigado and Koropi in pottery production may indicate the existence of multiple production centres within such a close distance, supplying different specialist products with their own production techniques.

A parallel development of such a ceramic phenomenon is also present in the eastern part of Attica. Askitario, Raphina and Thorikos exhibit a great similarity of new surface finishes of fine slipped, yellow mottled and urfirnis (Douni 2015, 2020; Nazou 2014). However, the subtle differences in colour and thickness of the slip, the degree of polish/burnish effect, together with the varied proportion of pottery repertoire suggest a number of production centres across Attica, reflecting a regional variation in pottery production.

Likewise, the consistently high-quality black slipped vessels such as saucers, sauceboats and ladles are predominately produced at EH II Corinth using very fine greenish yellow calcareous clay (Alram-Stern 2018; Burke 2017; Burke *et al*. 2017; Burke *et al*. 2018; Burke *et al*. 2020). The greenish yellow core in contrast to the black slipped surface indicates the control of firing atmosphere for the reduced black slips which also represents the skeuomorphism of metal (Burke *et al*. 2020: 31).

It should be noted that the patterns and transformations discussed in this thesis are by no means restricted to the mainland. EM I-II Crete displays some related stylistic and technological changes in pottery production. From EM IIA, calcareous high-fired clays were used to produce the striking fine painted vessels and by EM IIB lustrous mottled red slipped and burnished shallow bowls, goblets as drinking vessels and long- and side-spouting jars, jugs as pouring vessels (Day and Wilson 2004; Wilson and Day 1994). These ceramic drinking and serving vessels appear to be imitating metal, a fashion which further developed into the palatial period of Crete (Day and Wilson 2004: 53).

By comparing the pottery assemblages at Koropi, Corinth and on Crete, it suggests that the changes of raw materials selection and elaborate manipulation of the calcareous paste recipes combined with the specific firing procedures can produce the metal-imitating very fine drinking and serving vessels which have been widely consumed and exchanged across the EB II Aegean. Nevertheless, there are also distinct differences even with the common use of high-fired calcareous clays and the imitation of metals.

This means that although some parts of manufacturing processes are shared, the local communities have adapted such new practices and knowledge as they were introduced into their communities of practice and traditions, sometimes used in the branding and reputation of production centre(s). It seems that the EH II production centre at Kontopigado was involved in this broad phenomenon across Aegean in EB II.

Amongst the ubiquitous presence of sauceboats with a variety of surface treatments and decorations, Kontopigado products stand out with their bluish grey to white slips which create a metallic effect on the surface. It is suggested that this finish is ultimately imitating metal vessels and thus emphasises the importance of metals in this period. Such metal skeuomorphic tableware is popular across the Aegean in EB II and tells us much about changes in consumption patterns and social value in the Aegean world. Such perceptions and expressions of value are clearly associated with the development of metallurgy and the desire for metals. Silver production is testified by the widespread discovery of litharge throughout Attica such as Lambrika, Koropi and Merenda during FN-EH II (Georgakopoulou *et al.* 2020; Kakavogianni *et al.* 2008, 2009a, 2009b; Kouka 2008; Kaza-Papageorgiou 2006b, pers. comm.). Litharge is also present at sites along the west coast, in particular at Asteria in Glyfada (Kaza-Papageorgiou 2006a, 2020a). Therefore, combining with the metallurgical activities that flourished in this region, especially silver working, it is possible to believe that the bluish grey to white slipped ware of Kontopigado intends to imitate silver which may reflect specific choices made by Kontopigado potters, perhaps linked to branding, reputation and even market strategy.

6.6 Conclusion

In the context of movement of goods, ideas and people in the EBA, Kontopigado offers an opportunity to examine the development of specialised craft production and the variable responses to the technological innovation and technical identity in the network of contact and exchange between potters and potter communities in the transition between EH I and EH II, a time of great change in the Aegean. Pottery production, consumption and exchange at Kontopigado provide an indication of connectivity of west Attica which previously received very little attention in the Aegean. The dominating new trend at Kontopigado and across Aegean, reflects their intimate connection to social circumstances and the transmission of knowledge and technical practices in EB II. The local development through the rejection, tolerance, acceptance and adoption of cultural and social norms as well as technology during the long-term interactions outline the connectivity and conformity between regions in the transitional EB I-II in general.

As a consequence, it is possible to think of Kontopigado as a production centre with associated goods bearing social value, through the large-scale production on site and widely distributed specialised tableware and transport jars involved in the short-distance and more distant trading activities across the Aegean. The technological innovation and transmission through the circulation of pottery and possibly, the movement of potters, may reflect the different attitudes towards the social and technological practices in the local potter and consumer communities.

During the EH II period, a standard ceramic repertoire of tableware and the use of fine calcareous clay are widespread across the Aegean. In spite of the subtle variations in form parts (rim, handle, bases types), surface finishes and paste recipes indicating the regional variations in local production, strong evidence of technology and stylistic transfer plays an important role in the cultural transmission and acceptance over a wider geographical area. Kontopigado is clearly part of this phenomenon. Moreover, the fabric analysis with comparative materials shows that the locally produced pottery including bluish grey to white fine tableware (mainly sauceboats), coarse slipped ware and coarse collared jars have been widely distributed in the Aegean. With respect to the study of the circulation of pottery, it shows that the socio-economic interconnections extend to a broader network, connecting the important nodes, from central Greece, northeast Peloponnese and central Attica, pass through west Attica, to the west Cyclades and ultimately to Crete.

Therefore, it suggests that beyond coastal Ayios Kosmas and the well-known sites of the eastern Attic coast, Kontopigado and west Attica join Koropi in testifying to a real economic dynamism and a greater level of connectivity with pan-Aegean networks and further indicates the multiple directions of exchange and trading routes, showing how complex were the socio-economic interconnections between regions and communities in the EB II period. Kontopigado is clearly an important production centre linked into these developing Aegean-wide networks: the increasing organised, homogeneous, apparently large-scale pottery production demonstrated at the site in EB II now needs to be combined with our understanding of silver and copper metallurgy which also characterises Kontopigado and its surrounding sites during this formative period. The new pottery repertoire including the large collared jars for liquid transport, through to the fine tableware to consume these liquids (most probable wine) – epitomise the changes in society and the emergence of long-distance exchange, and at the same time, shows that they are accompanied by deep changes in pottery technology, which may link to the technological changes and emergence of specialisation that Renfrew (1972) emphasised around fifty years ago.

Chapter 7 Conclusion

This thesis has aimed to provide a detailed understanding of ceramic production, consumption and circulation at Kontopigado in Alimos, west Attica during EH I late and the EH II early period. Through the macroscopic study of the assemblage and the further analysis of a range of representative samples, it has established locations of production and characterised changes in technological choices and practices, notably those involving raw materials and firing technology at Kontopigado and its environs. It has also investigated consumption patterns at Kontopigado in order to situate west Attica in its economic and social contexts, both on the Attica Peninsula and the wider Aegean networks in which it was involved.

These aims have been achieved through an integrated analytical methodology consisting of macroscopic, petrographic, microstructural and compositional analyses. Macroscopic observation allowed the categorisation of interrelated fabric, typology, and surface finish and provided information on certain aspects of firing conditions. Although being the first step of the methodological framework, it was not the least important part. More specifically, this method provides a real perspective on potters and consumers. For example, the compositionally similar surface finishes combined with similar firing techniques, however, result in subtle differences on surfaces that can be easily observed visibly (such as the chromatic variation of RSB ware). These data provide the basis for the sampling strategy employed for subsequent analysis. While the scope, logistics and timeline of the thesis allowed the study of a small range of contexts, compared to the wealth of material excavated from the site, it is considered representative. Certainly, the stark contrasts between the EH I and EH II deposits are reflected across the site and a recent detailed typological study by the excavator of another, contemporary EH I deposit on the site (Kaza-Papageorgiou *et al*. forthcoming) is entirely compatible with the picture gained from the author's macroscopic study.

The second analytical step was based on thin section petrography to examine technological choices and practices of paste recipes which not only has given clear indications of possible provenance – both in terms of geological environments and actual places of production – but also has enabled the identification of the technological practices and traditions employed by potters or potter's groups. When compared to cognate practices over space and time, these were related to social identity, social boundaries and the level of interaction between different communities.

Both SEM and XRD were employed for the study of firing technology. Apart from identifying equivalent firing temperatures, both SEM and XRD served to examine the different firing parameters within and between vessels in order to understand the different practices, differential control of firing episodes and possible signs of firing structures (such as built kilns). SEM focused on the vitrification stage of microstructure in individual vessels to assess the heating gradient of firing and even variability within a single vessel, hinting at variably maintain conditions of temperature and atmosphere. The XRD spectra proved to be valuable in providing complementary indications of firing temperature and in the comparison of the homogeneity of the firing patterns within and between fabric groups. The combination of SEM and XRD offers great promise for the exploration of prehistoric firing in pottery production and the development of complexity in firing techniques, though most such information was produced by SEM in the present study. The microstructural and compositional examination of the surface finishes using SEM-EDX is therefore essential for the investigation of raw materials and techniques and their reaction during firing, which contributes to the final appearance of the products.

The identification of technological tradition and the change of technological choices and practices in pottery production as well as consumption trends with Kontopigado ceramic assemblage can be summarised as follows:

1) Choices of raw materials – a clear dichotomy in the paste recipes (non- to low calcareous, dominant muscovite schist fabric vs a rarer range of associated calcareous sand-tempered fabrics) was identified in the EH I period while in EH II, a spectrum of calcareous clays from very fine to coarse with sand temper is predominantly used to make pottery vessels of different sizes. In addition, in EH II, different raw materials are selected and manipulated for specific surface finish. For example, a specific raw material (kaolinite or kaolinite-rich clay) for producing BGS slips at Kontopigado was found to have been procured from a volcanic source, probably from Melos in the Cyclades. This is a notable case of resource specialisation.

2) Firing technology – an increase in firing temperature ranges, an improved control of firing conditions which may indicate the investment in some sort of firing structure (e.g. kiln) are attested in the EH II. The firing temperature and firing atmosphere were tightly controlled to produce specific surface finish (BGS, RS, WS and DS) or specific vessel types such as plain cups and dishes.

In contrast, local EH I pottery seems to be fired in open firing or bonfire firing. The inconsistent vitrification of microstructure and inhomogeneous surface colour and/or slip colour with mottling suggest less control of firing conditions. Fine bloating pores detected in the core of some sherds suggest the steep temperature gradients characteristic of fast firing.

3) The RS ware is the dominant fashion in EH I and continued into EH II but as a much diminished proportion of the assemblage. The RSB ware in EH II is distinguished by developed vessel forms such as thickened rims, a rather homogenous red colour in surface slips, mostly locally produced. The broadly local RS ware in the two phases used similar raw material in the slips, as well as comparable thickness and application technique of slips. However, the visually thicker and more solid red slips, with consistent colour in EH II was shown to be the result of better controlled firing conditions, perhaps consistent with kiln production.

4) The high quality of very thin-walled, flat-based tableware, especially BGS ware, comprises a new fashion in EH II. They are made in high-fired, very fine calcareous clays, having specific surface finishes (e.g. BGS and DS) which benefit from the tight control of atmosphere, in combination with a variety of special slip materials applied to the surface, often in combination. Such sophistication reflects highly skilled craftsmanship and investment in time, labour and facilities during EH II.

5) White slipped (WS) ware is also popular in EH II. The vessels are mostly fired in the medium range of firing temperature, with a homogenous surface slip colour, indicating a consistency in firing conditions.

6) Black slipped (DS) ware is rare in EH I, but more frequent in EH II, mostly associated with tableware – especially sauceboats and saucers – and jars. It is mostly higher-fired. The contrast between the light clay body and the black slips suggests the alternation of firing atmosphere.

7) The medium to coarse BGS or grey/white slipped ware is locally produced (with overfired wasters). In a major finding of this thesis, the fabrics produced have been matched with those of the well-studied white slipped collared jars, previously characterised across Aegean (Day and Wilson 2016) whose origin was until now unknown.

8) Several distinct fabrics were identified in RSB shallow bowls and bowls, suggesting the importation of similar products from different production centres in the region of Attica during EH I.

9) Imports from Aegina are present in both phases. Both RSB ware and heavily polished/burnished vessels are imported in the EH I while the latter are the focus of importation in EH II.

10) Many distinct fabrics are identified in EH II are imported to the site and comparison with thin section from other assemblages, indicating sources including Corinthian black slipped vessels, Euboean white slipped ware and talc ware from the western Cyclades.

Such changes in production and consumption lead to the following conclusions:

1) The identification of a production centre at Kontopigado. While we do not have physical evidence of ceramic production at EH I Kontopigado, it does have clear dominant fabrics that are compatible with local geology and have close parallels with fabrics from EH II, about which we know much more detail. In EH II Kontopigado is a flourishing centre of ceramic production and we have characterised the specific clay choices and the manipulation of paste, the control of firing and investment in firing structures, alongside the introduction of new shapes and surface finishes, along with the manufacture of highly specialised pottery types (i.e. BGS ware). As a result, the large quantity and high quality of the pottery highlight the unique position of this production centre, providing evidence of increasing standardisation, scale and intensity in pottery production and organisation in response to the new demand and the associated social practices (e.g. the act of sharing and drinking) in the EBA Aegean.

2) The industrial landscape of west Attica – it is a region of several associated settlements and places of production involved in different industrial activities from pottery production, through copper and silver metallurgy, to obsidian working, etc. Kontopigado is a prominent centre of production at least in EH II and possibly in EH I, which must have developed a reputation by producing and exporting the characteristic ceramic products with their associated contents (i.e. BGS sauceboats and coarse slipped transport jars). The procurement of resources and other products from distant places are benefit from coastal sites such as Ayios Kosmas and Asteria

act as the harbours of this area to engage in interconnected maritime networks during the EH period.

3) A socio-cultural region with local variation in Attica – the similar settlement pattern, comparable tomb structure and burial and/or ritual practices, exhibiting a coherent cultural identity and a broader regional level. However, the different character of pottery repertoire and varying degrees of sophistication on specific vessels reflect the different production and consumption choices between discrete regions, separating the west, central and east zones of Attica. The strong connection between the regions of dispersing settlements and the intercommunal contact with the Aegean, the large-scale land management and intensive craft activities (pottery production, metallurgy, obsidian working, etc.), and the use of metals may lead to a reassessment of social identity within and between communities in Attica.

4) Interactions between communities of Attica and with nearby mainland areas, the Cycladic islands and even Crete – Kontopigado consumed distinctive products (i.e. Aeginetan heavily burnished vessels, Corinthian black slipped vessels, talc ware, etc.) from multiple production centres. It also exported its own characteristic products. This prompts ideas of the development of branding and reputation, with simultaneously technological and stylistic innovations exploited towards a certain degree of market-oriented strategies in the exchange mechanism, suggesting an organised craft specialisation and a level of technological transmission through the expansion of exchange networks. The cosmopolitanism of the pottery repertoire reflects the intensified interactions between communities and the negotiation of social identity and social status through shared and emulated practices in a coherent socio-cultural sphere where diversity and variability were embedded.

To draw together the threads of previous discussions in this chapter, the interpretation of lifestyle in EH I-II West Attica offers a continuous material discourse in different socio-cultural contexts: the flow of organic and inorganic commodities, the mobilisation of specialists, the redistribution of surplus, the control over metal and rare resources, the demand for high-value objects. More specifically, in ceramic terms, there are a range of differences between EH I and EH II pottery: changing technological choices and traditions, increasing control in pyrotechnology, the ubiquity of skeuomorphism of metals, the close relationship with metallurgy, the indicative of a general tendency to craft intensification, the more complex consumption pattern and organisation, the extended ceramic exchange in terms of a range of products – whether considered as containers of the exchanged contents or pottery itself – and the exchanged commodities from different distinct production centres. All of these take part in the new social strategy developed in response to broader transformations and instability of the environment they inhabited in the broader phenomenon of EBA Aegean.

The period under review in this thesis is characterised by a series of fundamental changes in social and technological aspects with a massive increase in the scale of economic activities, from subsistence and trading activities. The cultural processes in the fourth to third millennium BC Aegean stimulate the diversification in the increased consumption of valued goods. Materials circulated are the tangible manifestation of ideology and value, social identities and perception of the environment.

To respond to the initial questions raised about Renfrew's broad ideas of EB I-II Aegean, it has been argued by several scholars that certain aspects of craft production that were central to Renfrew's argument perhaps had their origin in earlier times; however, this study testifies to some substantial changes in technology that undoubtedly fit in with Renfrew's vision of EB II being a real change in craft production and in society. In terms of EB I-II changes at Kontopigado, it shows a likely greater scale of production, consistency of control, etc. which relates to organisation and choices. Therefore, while metallurgy and certain specialist knowledge in pottery manufacture may indeed have roots in earlier periods, in organisational terms of craft production, EB II seems to witness a greater transformation not only in metals, but in this case, in ceramics, and perhaps links to Renfrew's assumed great horizon of change. As has been shown here, the radical changes in production have links to social changes in consumption, movement, sharing practices of drinking sets, etc. The repertoire of consumed commodities and goods is not static; it changes with those prevailing in the specific social context, which enter circulation and are further diversified by the technological changes and innovations. It is equally important that the movement of goods and their consumption have been displayed in the formulated social performance, and ritual.

Future research prospects

The intention of this work has been to provide a relatively detailed investigation of a part of the pottery assemblage at Kontopigado to reconstruct the nature of the site and the associated human activities in this region. Future work at the site is needed to enable the detailed reconstruction of full vessel shapes, forming techniques, and the raw materials used in production at Kontopigado, as well as the provenance of non-local fabrics, etc. The fragmented nature of the pottery deposits examined in this study has resulted in restricted possibilities for the reconstruction of complete vessel shapes and investigation of the forming techniques.

Future analysis of geological samples is expected to provide additional evidence which may shed light on the variability of clay deposit(s) in the local and broader area. More comparative analyses of contemporary pottery assemblage in Alimos and within Attica are required in order to shed more light on the character of the EH settlements and placing them in an active role within the EBA communities in the flourishing Aegean context. Lastly, our knowledge of Kontopigado and adjacent areas in terms of the other types of finds (metallurgical remains, obsidian materials and stone tools, etc.) are understudied. I hope that this study offers impetus both for future work and for further consideration of human activity in the industrial landscape of the Attic peninsula.

Bibliography

Aloupi, E., Aslani, I., Karydas, A., Zarkadas, C., Ghika, M., Gionis, Y. and Chrysikos, Y. (2009). Μη καταστρεπτικές αναλύσεις διακοσμημένης κεραμικής από ανασκαφές της ανατολικής Αττικής (Non-destructive analyses of decorated pottery from eastern Attica). In: V. Vasilopoulou and S. Katsarou-Tzeveleki (eds.) *From Mesogeia to Argosaronikos: B' Ephorate of Prehistoric and Classical Antiquities. Research of a Decade, 1994-2003: Proceedings of Conference, Athens, December 18-20, 2003*. 92-102. Markopoulo: Dimos Markopoulou Mesogaias.

Aloupi, E., V. Perdikasis, and A. Lekka. (2001). Assessment of the White Slip Classification Scheme Based on Physico-Chemical Aspects of the Technique. In: V. Karageorghis (ed.) *The White Slip Ware of Late Bronze Age Cyprus. Proceedings of an International Conference Organized by the Anastasios G. Leventis Foundation, Nicosia in Honour of Malcolm Wiener, Nicosia, 29th30th October 1998*. 15-26. Wien: Verlag der Österreichischen Akademie der Wissenschaften.

Alram-Stern, E. (2014). Times of Change: Greece and the Aegean during the 4th Millennium BC. In: B. Horejs and M. Mehofer (eds.) *Western Anatolia before Troy. Proto-Urbanisation in the 4th Millennium BC? Proceedings of the International Symposium held at the Kunsthistorisches Museum Wien, Vienna, Austria, 21–24 November, 2012*. 305-328. Vienna: Austrian Academy of Sciences Press.

Alram-Stern, E. (2018). Early Helladic II Pottery from Midea in the Argolid: Forms and Fabrics Pointing to Special Use and Import. In: E. Alram-Stern and B. Horejs (eds.) *Pottery Technologies and Sociocultural Connections Between the Aegean and Anatolia During the 3rd Millennium BC*. 161-182. Vienna: Austrian Academy of Sciences Press.

Andrikou, E. (2013a). Ο οικισμός της Πρώιμης Εποχής του Χαλκού στο Κορωπί. Προκαταρκτικές παρατηρήσεις. *ΙΔ΄ Επιστημονική Συνάντηση Νοτιοανατολικής Αττικής*. 89-99. Καλύβια: Καλύβια Θορικού.

Andrikou, E. (2013b). Η κεραμεική και τα άλλα κινητά ευρήματα. Ο οικισμός της Πρώιμης Εποχής του Χαλκού στο ορωπί. Η κεραμική και τα άλλα κινητά ευρήματα. In: M. Doga-Toli and S. Oikonomou (eds.), *Αρχαιολογικές Συμβολές*. Τόμος Α: Αττική. ΣΤ΄ και Β΄ Εφορείες Προϊστορικών & λασικών Αρχαιοτήτων. 173-182. Athens.

Andrikou, E. (2020). *East Attica: The prehistoric finds in the 21st century*. In: N. Papadimitriou, J. Wright, S. Fachard, N. Polychronakou-Sgouritsa and E. Andrikou (eds.) *Athens and Attica in Prehistory: Proceedings of the International Conference, Athens, 27–31 May 2015*. 3-18. Oxford: Archaeopress.

Antoniadou, S. (2007). Common materials, different meanings: changes in Late Cypriot society. In: S. Antoniadou and A. Pace (eds.) *Mediterranean Crossroads*. 483-508. Athens: Pierides Foundation.

Apostolopoulou and Kakavogianni, O. (2002). Η Νεολι- θική Εποχή (6000-2000 π.Χ.). In: *Ντούμας 2002*. 18-27.

Appadurai, A. (ed.) (1986). *The Social Life of Things: Commodities in Cultural Perspective*. Cambridge: Cambridge University Press.

Arnold, D. E. (1985). *Ceramic Theory and Cultural Process*. Cambridge: Cambridge University Press.

Arnold, D. E. (1999). Advantages and Disadvantages of Vertical-half Molding Technology: Implications for Production Organization. In: J. Skibo & G. Feinman (eds.) *Pottery and People: A Dynamic Interaction*. 50-80. Salt Lake City: University of Utah Press.

Arnold, D.E. (2000). Does the standardisation of ceramic pastes really mean specialisation? *Journal of Archaeological Method and Theory* 7(4), 333-375.

Arnold, D. E. (2006). The threshold model for ceramic resources: A refinement. In: D. Gheorghiu (ed.) *Ceramic Studies: Papers on the Social and Cultural Significance of Ceramics and Europe and Eurasia from Prehistoric to Historic Times*. 3-9. Oxford: BAR International Series.

Aruz, J. (2008). *Marks of Distinction: Seals and Cultural Exchange between the Aegean and the Orient (ca. 2600-1360 B.C.)*. Corpus der minoischen und mykenischen Siegel (CMS) Beiheft 7. Mainz: Philipp von Zabern.

Aspiotis, Y. (2003). Consuming material ambiguity: The social and symbolic implications of Mycenaean pottery in Ugarit. M.A. thesis. University of Glasgow.

Attas, M. (1982). *Regional Ceramic Trade in Early Bronze Age Greece: Evidence from Neutron Activation Analysis of Early Helladic Pottery from Argolis and Korinthia*. Unpublished Ph.D. dissertation, McGill University.

Attas, M., Fossey, J. M. and Yaffe, L. (1987). An Archaeometric Study of Early Bronze Age Pottery Production and Exchange in Argolis and Korinthia (Corinthia), Greece. *Journal of Field Archaeology* 14(1), 77-90.

Balfet, H. (1984). Methods of formation and the shape of pottery. In: S. van der Leeuw and A. Pritchard (eds.) *The Many Dimensions of Pottery*. 171-198. Amsterdam: Universiteit van Amsterdam.

Barrett, J.C. and Halstead, P. (2004). *The emergence of civilisation revisited*. Oxford: Oxbow Books.

Baudrillard, J. (1981). *For a Critique of the Political Economy of the Sign*. St. Louis: Telos Press.

Berg, I. (2004). The meanings of standardisation: conical cups in the late Bronze Age Aegean. *Antiquity, 78*, 74-85.

Berg, I. (2008). Looking through Pots: Recent Advances in Ceramics X-radiography. *Journal of Archaeological Science* 35, 1177-1188.

Berg, I. (2009). X-radiography of Knossian Bronze Age Vessels: Assessing our Knowledge of Primary Forming Techniques. *Annual of the British Schools at Athens* 104, 137-173.

Betancourt, P.P. (2003). The Impact of Cycladic Settlers on Early Minoan Crete. *Mediterranean Archaeology and Archaeometry* 3 (1), 3-12.

Betancourt, P.P. and Myer, G.H. (2000). Appendix III. Petrographic Examination of Pottery Samples from Lerna III. In: M.H. Wiencke. Lerna: A Preclassical Site in the Argolid. Results of Excavations conducted by the American School at Athens. *The Architecture, Stratification, and Pottery of Lerna III*. Vol. II: Part II. 680-703. New Jersey: American School of Classical Studies at Athens.

Betancourt, P.P. and Swann, C.P. (1989). PIXE Analysis of Middle Minoan Pigments from Kommos. In: Y. Maniatis (ed.) *Archaeometry: Proceedings of the 25th International Symposium (Athens, Greece 1986)*, 177- 81.

Bevan, A. (2004). Emerging civilized values? The consumption and imitation of Egyptian stone vessels in EMII-MMI Crete and its wider eastern Mediterranean context. In: J.C. Barrett, and P. Halstead (eds.) The Emergence of Civilisation Revisited. 107-126. Oxford: Oxbow Books.

Bevan, A. (2007). *Stone Vessels and Values in the Bronze Age Mediterranean*. Cambridge: Cambridge University Press.

Bevan, A. (2010). Making and marking relationships: Bronze Age brandings and Mediterranean commodities. In: A. Bevan and D. Wengrow (eds.) *Cultures of commodity branding*. 35-86. Walnut Creek, CA: Left Coast Press.

Bevan, A. (2014). Mediterranean Containerization. *Current anthropology* 55(4), 387–418.

Bevan, A. and Bloxam, E. (2016). Stonemasons and Craft Mobility in the Bronze Age Eastern Mediterranean. In: E. Kiriatzi and C. Knappett (eds) *Mobile Technologies Across Dynamic Landscapes: Perspectives from Mediterranean Prehistory*. 68-93. Cambridge: Cambridge University Press.

Bintliff, J.L. (1977). *Natural Environment and Human Settlement in Prehistoric Greece*. British Archaeological Reports, Supplementary Series 28.

Blackman, M. j., Stein, G. and Vandiver, P. (1993). Standardisation Hypothesis and Ceramic Mass Production: Compositional, Technological, and Metric Indices of Craft Specialization at Tell Leilan (Syria). *American Anthropologist* 58, 60-80.

Blegen, C. W. (1921). *Korakou: A Prehistoric Settlement Near Corinth*. New York: American School of Classical Studies at Athens.

Blegen, C. W. (1928). *Zygouries: A Prehistoric Settlement in the Valley of Cleonae*. Cambridge, Massachusetts: American School of Classical Studies at Athens, Harvard University Press.

Blitz, J.H. (2015). Skeuomorphs, Pottery, and Technological Change. *American Anthropologist* 117, 665-678.

Boileau, M. and Whitley, J. (2010). Patterns of Production and Consumption of Coarse to Semi-Fine Pottery at Early Iron Age Knossos. *The Annual of the British School at Athens* 105, 225-268.

Boileau, M., Badre, L., Emmanuelle, C., Reinhard, J. and Mommsen, H. (2010). Foreign Ceramic Tradition, Local Clays: The Handmade Burnished Ware of Tell Kazel (Syria). *Journal of Archaeological Science* 37(7), 1678-89.

Bourdieu, P. (1977). *Outline of a Theory of Practice*. Cambridge: Cambridge University Press.

Bourdieu, P. (1984). *Distinction: A Social Critique of the Judgment of Taste*. Harvard: Harvard University Press.

Bourdieu, P. (1990). Structures, habitus, practices. In: P. Bourdieu. *The Logic of Practice*. 52-65. Stanford, Calif.: Stanford University Press.

Bourdieu, P. and Wacquant, Loïc J. D. (1992). *An Invitation to Reflexive Sociology*. Chicago: The University of Chicago Press.

Bowser, B. J. (2005). Transactional politics and the local and regional exchange of pottery resources in the Ecuadorian Amazon. In: A. Livingstone Smith, D. Bosquet and R. Martineau (eds.) *Pottery Manufacturing Processes: Reconstitution and Interpretation*. BAR International Series 1349. 23–32. Oxford: Archaeopress.

Boyadziev, Y. (1995). Chronology of prehistoric cultures in Bulgaria. In: D.W. Bailey and I. Panayotov (eds.) *Prehistoric Bulgaria*. 149-91. Madison: Prehistory Press.

Broodbank, C. (1989). The longboat and society in the Cyclades in the Keros-Syros culture. *American Journal of Archaeology* 93, 319-37.

Broodbank, C. (1993). Ulysses without sails: Trade, distance, knowledge and power in the early Cyclades. *World archaeology* 24(3), 315–331.

Broodbank, C. (2000). *An Island Archaeology of the Early Cyclades*. Cambridge: Cambridge University Press.

Brumfiel, E.M. and Earle, T.K. (1987). *Specialization, Exchange and Complex Societies*. Cambridge: Cambridge University Press.

Burke, C. (2017). *Crafting Continuity and Change: Ceramic Technology of the Early Helladic Peloponnese, Greece*. PhD Thesis. University of Sheffield.

Burke, C., Day, P.M. and Pullen, D. (2017). The contribution of petrography to understanding the production and consumption of Early Helladic ceramics from Nemea, Mainland Greece. In: M. Ownby, S. Kelly, M. Massucci and I. Druc (eds.) *Integrative Approaches in Ceramic Petrography*. 104-115. Salt Lake City: University of Utah Press.

Burke, C., Day, P.M., Alram-Stern, E., Demakopoulou, K. and Hein, A. (2018). Crafting and consumption choices: Neolithic–Early Helladic II ceramic production and distribution, Midea and Tiryns, Mainland Greece. In: Alram-stern, E. and B. Horejs (eds.) *Pottery Technologies and Sociocultural Connections Between the Aegean and Anatolia During the 3rd Millennium BC*. 145–59. Vienna: Austrian Academy of Sciences Press.

Burke, C., Day, P. M., and Kossyva, A. (2020). Early Helladic I And Talioti Pottery: Is It Just a Phase We're Going Through?. *Oxford Journal of Archaeology* 39, 19-40.

Carr, C. and Case, D. (2005). *Gathering Hopewell: Society, Ritual, and Ritual Interaction*. New York: Kluwer Academic.

Carter, T. (1998). Reverberations of the International Spirit: Thoughts upon 'Cycladica' in the Mesara. In: K. Branigan (ed.) *Cemetery and Society in the Aegean Bronze Age*. Sheffield Studies in Aegean Archaeology 1, 59-77. Sheffield: Sheffield Academic Press.

Carter, T. (1999). *Through a Glass Darkly: Obsidian and Society in the Southern Aegean Early Bronze Age*. PhD Thesis. University of London.

Carter, T. (2004). Mochlos and Melos: A special relationship? Creating identity and status in Minoan Crete. In: L.P. Day, M.S. Mook and J.D. Muhly (eds.) *Crete Beyond the Palaces: Proceedings of the Crete 2000 Conference*. 291-307. Philadelphia: INSTAP Academic Press.

Carter, T. (2008). The Consumption of Obsidian in the Early Bronze Age Cyclades. In: N. J. Brodie, J. Doole, G. Gavalas and C. Renfrew (eds.) *Horizon. A colloquium on the prehistory of the Cyclades*. 225-236. Cambridge: McDonald Institute for Archaeological Research.

Caskey, J. L. (1960). The Early Helladic Period in the Argolid. *Hesperia* 29(3), 285-303.

Caskey, J. and Caskey, E. G. (1960). The Earliest Settlements at Eutresis, Supplementary excavations, 1958. *Hesperia* 29, 126-167.

Cavanagh, W. and Mee, C. (1998). *A Private Place: Death in Prehistoric Greece*. *SIMA* 125. Jonsered: Paul Åström Förlag.

Cavanagh, W., Mee, C. and Renard, J. (2004). 'Sparta before Sparta': Report on the Intensive Survey at Kouphovouno 1999-2000. *The Annual of the British School at Athens* 99, 49-128.

Cavanagh, W., Mee, C. and Renard, J. (2016). Early Bronze Age Chronology of Mainland Greece: A Review with New Dates from the Excavations at Kouphovouno. *The Annual of the British School at Athens* 3(1), 35-49.

Charalambidou, X., Kiriatzi, E., Müller, N.S., Georgakopoulou, M., Müller Celka S. and Krapf, T. (2016). Eretrian ceramic products through time: Investigating the early history of a Greek metropolis. *Journal of Archaeological Science*: 7, 530-535.

Cherry, J.F. (1983). Evolution, Revolution, and the Origins of Complex Society in Minoan Crete. In: O. Krzyszkowska and L. Nixon (eds.) *Minoan Society. Proceedings of the Cambridge Colloquium 1982*. 33-45. Bristol: Bristol Classical Press.

Cherry, J.F. (1986). Polities and palaces: some problems with Minoan state formation. In: C. Renfrew And J.F. Cherry (eds.) *Peer Polity Interaction and Socio-Political Change*. 19-45. New York, Cambridge University Press.

Cherry, J., Davis, J. and Kalogirou, A. (2013). The Nemea Valley and the Early Bronze Age. In: K. Kissas and W. D. Niemeier (eds.) *Corinthia and the Northeast Peloponnese: Topography and History from Prehistoric Times until the End of Antiquity*. 333-343. Munich: Hirmer Verlag GmbH.

Childe, V.G. (1924). A Gold Vase of Early Helladic Type. *Journal of Hellenic Studies* 44(2), 163-165.

Childe, V.G. (1951). *Man Makes Himself*. New York: The New American Library, Mentor.

Childe, V.G. (1956). *Piecing Together the Past: The Interpretation of Archaeological Data*. London: Routledge & Kegan Paul.

Choleva, M. (2018). Craft behaviours during a period of transformations. The introduction and adoption of the potter's wheel in Central Greece during Early Bronze Age. In: I. Caloi and C. Langohr (eds.) *Technology in Crisis. Technological changes in ceramic production during periods of trouble*. 45-74. UCLouvain.

Choleva, M. (2020). Travelling with The Potter's Wheel in the Early Bronze Age Aegean. *The Annual of the British School at Athens 11*5, 59-104.

Chryssoulaki, S., Mavroeidi, I. and Psaraki, K. (2020). An Early Helladic settlement at Moschato. In: N. Papadimitriou, J. Wright, S. Fachard, N. Polychronakou-Sgouritsa and E. Andrikou (eds.) *Athens and Attica in Prehistory: Proceedings of the International Conference, Athens, 27–31 May 2015*. 299-308. Oxford: Archaeopress.

Clark, J.E. (1995). Craft Specialization as an Archaeological Category. *Research in Economic Anthropology* 16, 267-294.

Clark, J.E. and Parry, W.J. (1990). Craft Specialization and Cultural Complexity. *Research in Economic Anthropology* 12, 289-346.

Clarke, J. (2005). Transmissions and Transformations in Time and the Phenomenon of Continuity. In: J. Clarke (ed.) *Archaeological Perspectives on the Transmission and Transformation of Culture in the Eastern Mediterranean*. 81-83. Oxford, Oxbow Books.

Coleman, J.E. (1977). *Keos I: Kephala, A Late Neolithic Settlement and Cemetery*. Princeton, NJ: American School of Classical Studies at Athens.

Costin, C. (1991). Specialization: Issues in Defining, Documenting, and Explaining the Organization of Production. *Archaeological Method and Theory* 3, 1-56.

Costin, C. (2007). Thinking about Production: Phenomenological Classification and Lexical Semantics. *Archeological Papers of the American Anthropological Association* 17, 143-162.

Costin, C. and Earle, T. (1989). Status Distinction and Legitimation of Power as Reflected in Changing Patterns of Consumption in Late Prehispanic Peru. *American Antiquity 54*(4), 691-714.

Courty, M.A. and Roux, V. (1995). Identification of Wheel Throwing on the basis of Ceramic Surface Features and Microfabrics. *Journal of Archaeological Science* 22, 17-50.

Cultrone, G., Rodriguez-Navarro, C., Sebastian, E., Cazalla, O. And De La Torre, M.J. (2001). Carbonate and silicate phase reactions during ceramic firing. *European Journal of Mineralogy* 13 (3), 621-634.

Daszkiewicz, M. and Maritan, L. (2017). Experimental Firing and Re-firing. In: A. M. W. Hunt (ed.) *The Oxford Handbook of Archaeological Ceramic Analysis*. 487-508. New York: Oxford University Press.

Davis, J. L. (1979) Minos and Dexithea: Crete and the Cyclades in the Later Bronze Age. In: J. L. Davis and J. Cherry (eds.) *Papers in Cycladic Prehistory*. 143-157. Los Angeles: UCLA Institute of Archaeology.

Day, P.M. (1989). Technology and Ethnography in Petrographic studies of ceramics. In: Y. Maniatis (ed.) *Archaeometry: Proceedings of the 25th International Simposium (Athens, Greece 1986)*, 138-147. Amsterdam; New York : Elsevier.

Day, P. M. (2004). Marriage and Mobility: Tradition and the Dynamics of Pottery Production in Twentieth-Century East Crete. In: P. Betancourt, C. Davaras and R. Hope Simpson (eds.) *Pseira* VIII: *The Archaeological Survey of Pseira Island,* Part 1 (*Prehistory Monograph* 11), 105-142. Philadelphia: INSTAP Academic Press.

Day, P.M., and Kilikoglou, V. (2001). Analysis of Ceramics from the Kiln. In: J.W. Shaw, A. van de Moortel, P.M. Day and V. Kilikoglou *A LMIA Ceramic kiln in South-Central Crete. Function and pottery production. Hesperia Supplement* 30, 111-133.

Day, P. M. and Wilson, D. E. (2002). Landscapes of memory, craft and power in Prepalatial and Protopalatial Knossos. In: Y. Hamilakis (ed.) *Labyrinth Revisited: Rethinking 'Minoan'Archaeology*, 143-166. Oxford: Oxbow Books.

Day, P.M. and Wilson, D.E. (2004). Ceramic change and the practice of eating and drinking in Early Bronze Age Crete. In: P. Halstead and J. C. Barrett (eds.) *Food, cuisine and society in Prehistoric Greece*. Sheffield Studies in Aegean Archaeology 5. 45–62. Oxford: Oxbow Books.

Day, P.M. and Wilson, D.E. (2016). Dawn of the amphora: the emergence of maritime transport containers in the Early Bronze Age Aegean. In: S. Demesticha and A. B. Knapp (eds.) *Maritime Transport Containers in the Bronze-Iron Age Aegean and Eastern Mediterranean*. 17–37. Uppsala: Astroms forlag.

Day, P.M., Hein, A., Joyner, L., Kilikoglou, V., Kiriatzi, E., Tsolakidou, A. and Wilson, D.E. (2012). Petrographic and Chemical Analysis of Pottery from the Cemetery of Hagia Photia, Siteia. In: P.P. Betancourt and C. Davaras (eds.) *Hagia Photia II. The pottery*. 115-146. Philadelphia: INSTAP Academic Press.

Day, P.M., Kiriatzi, E., Tsolakidou, A. and Kilikoglou, V. (1999). Group Therapy in Crete: A Comparison between Analyses by NAA and Thin Section Petrography of Early Minoan Pottery. *Journal of Archaeological Science* 26 (8), 1025-1036.

Day, P.M., Relaki, M. and Faber, E. (2006). Pottery Making and Social Reproduction in Bronze Age Mesara. In: M. H. Wiener, J. L. Warner, J. Polonsky and E.E. Hayes (eds.) *Pottery and Society. The Impact of Recent Studies in Minoan Pottery. Gold Medal Colloquium in Honor of Philip P. Betancourt, 104th Annual Meeting of the Archaeological Institute of America, New Orleans, 5 January 2003*. 22–72. Boston: American Institute of Archaeology.

Day, P.M., Relaki, M. and Todaro, S. (2010). Living from pots? Ceramic perspectives on the economies of Prepalatial Crete. In: D. Pullen (ed.), *Political economies of the Bronze Age Aegean, Proceedings of the Langford Conference held at FSU Tallahassee Florida, 22-24 February 2007*. 205-229.Oxford: Oxbow Books.

Day, P. M., Wilson, D. E. and Kiriatzi, E. (1997). Reassessing Specialization in Prepalatial Cretan Ceramic Production. In: R. Laffineur and P. P. Betancourt (eds.) *TEXNH: Craftsmen, Craftswomen and Craftsmanship in the Aegean Bronze Age. Proceedings of the 6th International Aegean Conference, Philadelphia, Temple University, 18-21 April 1996. Aegaeum* 16. 275- 289. Liège: Université de Liège.

Day, P.M., Wilson, D.E. and Kiriatzi, E. (1998). Pots, Labels and People: Burying Ethnicity in the Cemetery of Aghia Photia, Siteias. In: K. Branigan (ed.) *Cemetery and Society in the Bronze Age*. Sheffield Studies in Aegean Archaeology 1. 133–149. Sheffield: Sheffield Academic Press.

de Freitas, L. (1997). *Ceramic Skeuomorphs of the Aegean Early Bronze Age and Their Social Context*. Unpublished MA Thesis. University College London.

Decavallas, O. (2007). Beeswax in the Neolithic: Perforated Sherds from the Northern Aegean: New Economic and Functional Implications. In: C. Mee and J. Renard (eds.) *Cooking Up the Past: Food and Culinary Activities in the Neolithic and Bronze Age Aegean*. 148–157. Oxford: Oxbow Books.

Dietler, M. (2006). Alcohol: anthropological/archaeological perspectives. *Annual Review of Anthropology* 35, 229–249.

Dietler, M. (2010). Consumption. In: D. Hicks and M.C. Beaudry (eds.) *The Oxford Handbook of Material Culture Studies*. 207-226. Oxford; New York: Oxford University Press.

Dobres, M.A. (1991). Production as process, artifacts as artifice. *Papers presented at the 56th Meetings of the Society for American Archaeology*. New Orleans.

Dobres, M.A. and Hoffman, C.R. (1994). Social agency and the dynamics of prehistoric technology. *Journal of Archaeological Method and Theory* 1(3), 211-258.

Dorais, M.J., Lindblom, M. and Shriner, C.M. (2004). Evidence for a Single Clay/Temper Source for the Manufacture of Middle and Late Helladic Aeginetan Pottery from Asine, Greece. *Geoarchaeology: An International Journal* 19(7), 657–684.

Douglas, M. and Isherwood, B. (1996). *The World of Goods: Towards an Anthropology of Consumption*. London and New York: Routledge.

Doumas, C. (1977). *Early Bronze Age burial habits in the Cyclades: to the memory of C. Tsountas*. (Studies in Mediterranean archaeology 48.). Göteborg: Åstrom.

Douni, K. (2015). *La céramique du Bronze Ancien II, en Attique*. PhD Thesis. Sorbonne I, Paris.

Douni, K. (2020). EB II ceramic production in Attica. In: N. Papadimitriou, J. Wright, S. Fachard, N. Polychronakou-Sgouritsa and E. Andrikou (eds.) *Athens and Attica in Prehistory: Proceedings of the International Conference, Athens, 27–31 May 2015*. 279-288. Oxford: Archaeopress.

Dousougli, A. 1987. Makrovouni-Kephalari Magoula Talioti: Bemerkungenzu den Stufen FH I und II in der Argolis. *Prähistorische Zeitschrift* 62, 164-220.

Driessen, J. (2001). History and Hierarchy. Preliminary Observations on the Settlement Pattern in Minoan Crete. In: K. Branigan (ed.) *Urbanism in the Aegean Bronze Age* (Sheffield Studies in Aegean Archaeology 4). 51-71. London: Sheffield academic press.

Earle, T.K. (1981). "Comment" on "Evolution of Specialized Pottery Production: A Trial Model" by P.M. Rice. *Current Anthropology* 22, 230-231.

Edmonds, M. (1990). Description, understanding, and the chaîne opératoire. *Archaeological Review from Cambridge* 9(1), 55-70.

Faber, E.W. 2004. *Middle Minoan Polychrome pottery: an integrated microstructural, geochemical and mineralogical investigation of its production*. PhD Thesis. University of Sheffield.

Faber, E. W., Kilikoglou, V., Day, P.M. and D. E. Wilson (2002). A Technological study of Middle Minoan polychrome pottery from Knossos, Crete. In: V. Kilikoglou, Y. Maniatis and A. Hein (eds.) *Modern Trends in Scientific Studies on Ancient Ceramics*. BAR International Series 1011. 129-141. Oxford: Archaeopress.

Fabbri, B., Gualtieri, S. and Santoro, S. (2002). The importance of the firing atmosphere in the production of coarse ceramics with calcite and chamotte inclusions. In: E. Jerem and K. Biro (eds.) *Archaeometry 98, Proceedings of the 31st Symposium, Budapest, April 26–May 3, 1998*. BAR International Series 1043. 191-195. Oxford: Archaeopress.

Fabbri, B., Gualtieri, S.and Shoval, S. (2014). The presence of calcite in archeological ceramics. *Journal of the European Ceramic Society* 34, 1899-1911.

Fachard, S., Levine, E. Papadimitriou, N., Andrikou, E. and Mari, A. (2020). Maps II. In: N. Papadimitriou, J. Wright, S. Fachard, N. Polychronakou-Sgouritsa and E. Andrikou (eds.) *Athens and Attica in Prehistory: Proceedings of the International Conference, Athens, 27–31 May 2015*. xiii. Oxford: Archaeopress.

Feinman, G. (2012) The Emergence of Social Complexity. Why More Than Population Size Matters. In: D. Carballo (ed.) *Cooperation and collective action: Archaeological perspectives*. 35-56. Boulder: University Press of Colorado.

Feinman, G. and Nicholas, L. (2010). A Multiscalar Perspective on Market Exchange in the Classic-Period Valley of Oaxaca. In: C.P. Garraty and B.L. Stark (eds.) *Archaeological Approaches to Market Exchange in Ancient Societies*. 85-98. Boulder: University Press of Colorado.

Feldman, M. (2006). *Diplomacy by Design*. Chicago: University of Chicago Press.

Franklin, U. (1999). *The real world of technology*. Toronto: Anansi.

Freestone, I. (1991). Extending ceramic petrology. In A. Middleton and I. Freestone (eds.) *Recent developments in ceramic petrology*. 399-409. London: British Museum Occasional Paper.

Freestone, I.C. and Middleton, A.P. (1991). Mineralogical Applications of the analytical SEM in archaeology. *Mineralogical Magazine* 51, 21-31.

Frieman, C. J. (2010). Imitation, identity and communication: The presence and problems of skeuomorphs in the Metal Ages. In: B. V. Eriksen (ed.) *Lithic technology in metal using societies: proceedings of a UISPP workshop, Lisbon, September 2006*. 33-44. Hojbjerg: Jutland Archaeological Society.

Frieman, C. J. (2013). Innovation and identity: The language and reality of prehistoric imitation and technological change. In: J. Card (ed.) *Hybrid Material Culture: The Archaeology of Syncretism and Ethnogenesis*. 318-41. Carbondale, IL: Center for Archaeological Investigations.

Forsén, J. (1996). The Early Helladic Period. In: B. Wells and C. Runnels (eds.) *The Berbati-Limnes Archaeological Survey 1988-1990*. 75-120. Stockholm: Paul Åströms Förlag.

Fossey, J. (1969). The Prehistoric Settlement by Lake Vouliagmeni, Perachora. *The Annual of the British School at Athens* 64, 53-69.

Gale, N., Kayafa, M. and Stos-Gale, Z. (2009). Further evidence for bronze age production of copper from ores in the Lavrion ore district, Attica, Greece. In: A. Giumlia-Mair, P. Craddock, A. Hauptmann, J. Bayley, M. Cavallini, G. Garagnani, B. Gimour, S. La Niece, W. Nicodemi and T. Rehren (eds.) *Proceedings of the 2nd International Conference: Archaeometallurgy in Europe, Aquileia 17-21 June 2007*. 158-176. Milano: Associazionz Italiana di Metallurgia.

Gardner, E. (1978). *The Pottery Technology of the Neolithic Period in Southeastern Europe*. PhD Thesis. University of California at Los Angeles.

Gauss, W. and Kiriatzi, E. (2011). *Pottery production and Supply at Bronze Age Kolonna, Aegina: An integrated archaeological and scientific study of a ceramic landscape*. Wien: Verlag der Österreichischen Akademie der Wissenshaften.

Gell, A. (1986). Newcomers to the world of goods: consumption among the Muria Gonds. In: A. Appadurai (ed.) *The Social Life of Things. Commodities in Cultural Perspective*. 110-140. Cambridge: Cambridge University Press.

Georgakopoulou, M. (2018). Metal Production, Working and Consumption Across the Sites at Dhaskalio and Kavos. In: C. Renfrew, O. Philaniotou, G. Gavalas, N. Brodie and M. Boyd (eds.) *The Sanctuary on Keros and the Origins of Aegean Ritual Practice, Vol. III: The Marble Finds from Kavos and the Archaeology of Ritual*. 501-532. Cambridge: McDonald Institute for Archaeological Research.

Georgakopoulou, M., Douni, K., Ginalas, M., Kakavogianni, O. and Bassiakos, I. (2020). Recent finds from Final Neolithic and Early Bronze Age silver production sites in Southeastern Attica. In: N. Papadimitriou, J. Wright, S. Fachard, N. Polychronakou-Sgouritsa and E. Andrikou (eds.) *Athens and Attica in Prehistory: Proceedings of the International Conference, Athens, 27–31 May 2015. 185-192*. Oxford: Archaeopress.

Giamalidi, M., Andreou, A. and Lourentzatou, I. (2020). The Northern Hill at the Peninsula of Laimos in Vouliagmeni: Preliminary Evidence from the Prehistoric Site. In: N. Papadimitriou, J. Wright, S. Fachard, N. Polychronakou-Sgouritsa and E. Andrikou (eds.) *Athens and Attica in Prehistory: Proceedings of the International Conference, Athens, 27–31 May 2015*. 163-172. Oxford: Archaeopress.

Gilstrap, W. (2015). *Ceramic Production and Exchange in the Late Mycenaean Saronic Gulf*. PhD Thesis. University of Sheffield.

Gkinalas, M., Stathi, M. and Zgouleta, Z. (2015). Προϊστορικός οικισμός στην περιοχή Γυαλού Σπάτων. Πρακτικά ΙΕ′ Επιστημονικής Συνάντησης ΝΑ Αττικής, Καλύβια Θορικού Αττικής, 337-352.

Glennie, P. (1995). Consumption within historical studies. In: D. Miller (ed.) *Acknowledging Consumption. A Review of New Studies*. 164-203. London: Routledge.

Goldman, H. (1931). *Excavations at Eutresis in Boeotia*. Cambridge, M.A.: Harvard University Press.

Gorogianni, E., Abell, N., and Hilditch, J. (2016). Reconsidering Technological Transmission: The Introduction of the Potter's Wheel at Ayia Irini, Kea, Greece. *American Journal of Archaeology* 120 (2), 195-220.

Gosselain, O. P. (1992). Bonfire of the enquiries. Pottery firing temperatures in archaeology: What for?. *Journal of Archaeological Science* 19 (3), 243-259.

Gosselain, O. P. (1994). Skimming Through Potter's Agenda: an Ethnoarchaeological Study of Clay Selection Strategies in Cameroon. In: S.T. Childs (ed.) *Society, Culture, and Technology in Africa*. 99-107. Philadelphia, PA: MASCA Research Papers in Science and Archaeology.

Gosselain, O. (2000). Materializing Identities: An African Perspective. *Journal of Archaeological Method and Theory 7*(3), 187-217.

Gosselain, O.P. (2002). *Poteries du* Cameroun *méridional. Styles techniques et rapports à. l'identité*. Paris: CNRS Editions.

Gosselain, O.P. (2016). Commentary: On Fluxes, Connections and their Archaeological Manifestations. In: E. Kiriatzi & C. Knappett (eds.) *Human Mobility and Technological Transfer in the Prehistoric Mediterranean* (British School at Athens Studies in Greek Antiquity). 193-205. Cambridge: Cambridge University Press.

Gosselain, O.P. and Livingstone Smith, A. (1995). The ceramics and society project: An ethnographic and experimental approach to technological choices. *KVHAA Konferenser* 34, 147-160.

Gosselain, O. P and Livingstone Smith, A. (2005). The Source. Clay Selection and Processing Practices in Sub-Saharian Africa. In: A. Livingstone Smith, D. Bosquet and R. Martineau (eds.) *Pottery Manufacturing Processes: Reconstitution and Interpretation*. BAR International Series 1349. 33-48. Oxford: Archaeopress

Grifa, C., Cultrone, G., Langella, A., Mercurio, M., Bonis, A.D. and Sebastián, E. (2009). Ceramic replicas of archaeological artefacts in Benevento area (Italy): Petrophysical changes induced by different proportions of clays and temper. *Applied Clay Science 46*, 231-240.

Hahn, H. (2012). Words and things: Reflections on people's interaction with the material world. In: J. Maran and P. Stockhammer (eds.) *Materiality and Social Practice: Transformative Capacities of Intercultural Encounters*. 4-12. Oxford, Oakville: Oxbow Books.

Halperin, R. H. (1994). *Cultural Economies Past and Present*. Austin: University of Texas Press.

Heidegger, M. (1977). *The question concerning technology, and other essays*. New York, London: Harper and Row.

Heidenreich, R. (1935-1936). Vorgeschichtlisches in der Stadt Samos. *AM* 60-61, 125-183.

Hekman, J. J. (2003). *The early Bronze Age cemetery at Chalandriani on Syros (Cyclades, Greece)*. PhD Thesis. University of Groningen

Higgins, M.D. and Higgins, R. (1996). *A Geological Companion to Greece and the Aegean*. Ithaca, NY: Cornell University Press.

Hilditch, J. (2007). Petrological Analysis of the Ceramics from Kavos, Keros. In: C. Renfrew, C. Doumas, L. Marangou and G. Gavalas (eds.) *Keros, Dhaskalio Kavos: The Investigations of 1987–88 (Keros 1; McDonald Institute Monographs)*. 238-263. Oxford: McDonald Institute for Archaeological Research.

Hilditch J. (2008). *Reconstruction of Technological Choice, Social Practice and Networks of Exchange from a ceramic perspective in the Middle Bronze Age Cyclades*. PhD Thesis. University of Exeter.

Hilditch, J. (2013). The fabrics of the ceramics at Dhaskalio. In: C. Renfrew, O. Philaniotou, N. Brodie, G. Gavalas and M.J. Boyd (eds.) *The Settlement at Dhaskalio* (McDonald Institute Monographs). 465-482. Cambridge: McDonald Institute for Archaeological Research.

Hilditch, J., Kiriatzi, E., Psaraki, K. and Aravantinos, V. (2008). Early Helladic II pottery from Thebes: An integrated typological, technological and provenance study. In: Y. Facorellis, N. Zacharias, K. Polikreti, T. Vakoulis, Y. Bassiakos, V. Kiriatzi, and E. Aloupi (eds.) *Archaeometry Studies in the Aegean: Reviews and Recent Developments. Proceedings of the 4th International Symposium of the Hellenic Society for Archaeometry*. 263-268. Oxford Archaeopress.

Hillditch, J., Knappett, C., Pirrie, D. and Power, M. (2012). Iasos pottery fabrics and technologies. In: N. Momigliano (ed.) *Bronze Age Carian Iasos, structures and finds from the Roman Agora: (ca. 3000-1500 BC)*. Vol. 166, 58-106. Missione Archeologica Italiana Di Iasos.

Hirth, K.G. (1998). The distributional approach: a new way to identify marketplace exchange in the archaeological record. *Current Anthropology* 39, 451-76.

Hirth, K.G. (2009). Craft production in a central Mexican marketplace. *Ancient Mesoamerica* 20, 89-102

Hirth, K. (2010). Finding the Mark in the Marketplace: The Organization, Development, and Archaeological Identification of Market Systems. In: C.P. Garraty and B.L. Stark (eds.) *Archaeological Approaches to Market Exchange in Ancient Societies*. 227-248. Boulder: University Press of Colorado.

Hoffman, C. (1991). Bronze, iron and lead: Iron age metallurgy in Mallorca, Spain. In: P. Glumac (ed.) *Recent Trends in Archaeometallurgical Research, MASCA Research Papers in Science and Archaeology* 8(1), 21-32. Philadelphia: MASCA Press, University of Pennsylvania.

Hurcombe, L. (2008). Organics from inorganics: Using experimental archaeology as a research tool for studying perishable material culture. *World Archaeology* 40(1), 83-115.

Immerwahr, S. A. (1971). *The Athenian Agora: Results of Excavations conducted by the American School of Classical Studies at Athens. XIII. The Neolithic and Bronze Ages*. Princeton, New Jersey: The American School of Classical Studies at Athens.

Insoll, T. (2007). *The Archaeology of Identities: a reader*. London: Routledge.

Jameson, M.H., Runnels, C.N. and van Andel, T.H. (1994). *A Greek Countryside: The Southern Argolid from Prehistory to the Present Day*. Stanford: Stanford University Press.

Johnson, M. (1999). Chronology of Greece and South-East Europe in the Final Neolithic and Early Bronze Age. *Proceedings of the Prehistoric Society* 65, 319-36.

Kakavogianni, O. (1986). Subterranean chambers of Early Helladic date at Koropi, Attica. In: R. Hägg and D. Konsola (eds.), *Early Helladic architecture and urbanization (*Studies in Mediterranenan Archaeology 76). 37-39. Jonsered: Paul Åströms Förlag.

Kakavogianni, O. (2020). Subterranean chambers of Final Neolithic and Early Bronze Age date in Koropi and Merenda (Mesogeia), Attica. In: N. Papadimitriou, J. Wright, S. Fachard, N. Polychronakou-Sgouritsa and E. Andrikou (eds.) *Athens and Attica in Prehistory: Proceedings of the International Conference, Athens, 27–31 May 2015*. 213-220. Oxford: Archaeopress.

Kakavogianni, O. Dimitriou, K., Koutsothanasis, Ch. and Petrou, A. (2009a) Οικισμός της Πρωτοελλαδικής εποχής και δύο μεμονωμένα κτίρια στη Μερέντα (Early Helladic settlement at Merenda). In: V. Vasilopoulou and S. Katsarou-Tzeveleki (eds.) *From Mesogeia to Argosaronikos: B' Ephorate of Prehistoric and Classical Antiquities. Research of a Decade, 1994-2003: Proceedings of Conference, Athens, December 18-20, 2003*. 159-176. Markopoulo: Dimos Markopoulou Mesogaias.

Kakavogianni, O., Douni, K. and Nezeri, F. (2008). Silver Metallurgical Finds dating from the End of the Final Neolithic Period until the Middle Bronze Age in the Area of Mesogeia. In: I. Tzachili (ed.), *Aegean Metallurgy in the Bronze Age. Proceedings of an International Symposium held at the University of Crete, Rethymnon, Greece, on November 19-21, 2004*. 45–57. Athens: Ta Pragmata Publications.

Kakavogianni, O., Michailidi, P., Nezeri, F. and Douni, K. (2009b). Από τον πρωτοελλαδικό οικισμό στα Λαμπρικά Κορωπίου (From the Early Helladic settlement at Lambrika, Koropi). In: V. Vasilopoulou and S. Katsarou-Tzeveleki (eds.) *From Mesogeia to Argosaronikos: B' Ephorate of Prehistoric and Classical Antiquities. Research of a Decade, 1994-2003: Proceedings of Conference, Athens, December 18-20, 2003*. 237–248. Markopoulo: Dimos Markopoulou Mesogaias.

Kakavogianni, O., Tselepi, E., Dimitriou, K., Katsavou, C., and Douni, K. (2016). The Neolithic and Early Bronze Age settlement in Merenta, Attica, in its regional context. In: Z. Tsirtsoni, (ed.) *The Human Face of Radiocarbon: Reassessing Chronology in prehistoric Greece and Bulgaria, 5000-3000 cal BC*. 437-451. Lyon: MOM Éditions.

Karantzali, E. (1996). *Le Bronze Ancien dans les Cyclades et en Crète. Les relations entre les deux régions. Infuence de la Grèce Continentale*. Oxford: Archaeopress.

Karantzali, E. (2006). The Pottery of Markiani Phases I and II. In: L. Marangou, C. Doumas, C. Renfrew and G. Gavalas (eds.) *Markiani, Amorgos. An Early Bronze Age Fortified Settlement. Overview of the 1985-1991 Investigations*. BSA Supplementary Volume 40, 101-23. London: British School at Athens.

Karantzali, E. (2008). The transition from EB I to EB II in the Cyclades and Crete: historical and cultural repercussions for Aegean communities. In: N. J. Brodie, J. Doole, G. Gavalas and C. Renfrew (eds.) *Horizon. A colloquium on the prehistory of the Cyclades*. 241-60. Cambridge: McDonald Institute for Archaeological Research.

Kaza-Papageorgiou, K. (2006a) Αστέρια Γλυφάδας. Τα πρώτα στοιχεία από μια νεα εγκατάσταση στη δυτική άκτη της Αττικής κατά την Πρώιμη και τη Μέση Εποχή του Χαλκού. *AAA* 39, 45-60.

Kaza- Papageorgiou, K. (2006b). Euonimon and Alimos. In: D. Lucas (ed.) *Alimos. Athens: municipality of Alimos. A Greek-English Edition of the City's History*. 15-151. Athens: Alexandros publications.

Kaza-Papageorgiou, K. (2011). Κοντοπήγαδο Άλιμου Αττικής. Οικισμός των ΠΕ και ΥΕ χρόνων και ΥΕ εργαστηριακή εγκατάσταση. *ΑΡΧΑΙΟΛΟΓΙΚΗ ΕΦΗΜΕΡΙΣ* 150, 197-274.

Kaza-Papageorgiou, K. (2012). Ἀνασκαφὴ στὰ Ἀστέρια Γλυφάδας. *Praktika tis en Athinais Archaiologikis Etaireias* 167, 1–8.

Kaza-Papageorgiou, K. (2013). Ἀνασκαφὴ στὰ Ἀστέρια Γλυφάδας. *Praktika tis en Athinais Archaiologikis Etaireias* 168, 1–7.

Kaza-Papageorgiou, K. (2014). Ἀνασκαφὴ στὰ Ἀστέρια Γλυφάδας. *Praktika tis en Athinais Archaiologikis Etaireias* 169, 1–7.

Kaza-Papageorgiou, K. (2012-4). Asteria. *Ergon tis Archaiologikis Etaireias*. 11-17.

Kaza-Papageorgiou, K. (2016). *The Ancient City Road and the Metro beneath Vouliagmenis Avenue*. Athens: Kapon Editions.

Kaza-Papageorgiou, K. (2019). Cycladic-type figurines from the Early Helladic cemetery of Asteria at Glyfada, Attica. In: M. Marthari, C. Renfrew and M. J. Boyd (eds.) *Beyond the Cyclades: Early Cycladic Sculpture in Context from Mainland Greece, the North and East Aegean*. 94-105. Oxford & Philadelphia: Oxbow Books.

Kaza-Papageorgiou, K. (2020a). Asteria at Glyphada. In: N. Papadimitriou, J. Wright, S. Fachard, N. Polychronakou-Sgouritsa and E. Andrikou (eds.) *Athens and Attica in Prehistory: Proceedings of the International Conference, Athens, 27–31 May 2015*. 309-315. Oxford: Archaeopress.

Kaza-Papageorgiou, K. (2020b). Kontopigado, Alimos, Attica. In: N. Papadimitriou, J. Wright, S. Fachard, N. Polychronakou-Sgouritsa and E. Andrikou (eds.) *Athens and Attica in Prehistory: Proceedings of the International Conference, Athens, 27–31 May 2015*. 541-549. Oxford: Archaeopress.

Kaza-Papageorgiou, K., Hachtmann, V. and Kardamaki, E. forthcoming. Early Helladic I at Kontopigado Alimos: The Pottery from Pit I.

Kerner, S. (2010). Craft Specialisation and its Relation with Social Organisation in the Late 6th to Early 4th Millennium BCE of the Southern Levant. *Paléorient 36*(1), 179-198.

Kilikoglou, V. (1994). Scanning electron microscopy. In: D.E. Wilson and P.M. Day. Ceramic Regionalism in Prepalatial Cententral Crete: the Mesara Imports at EMI-EMIIA Knossos. *The Annual of the British School at Athens 89*, 1-87.

Kilikoglou, V. Vekinis, G., Maniatis, Y. and Day, P.M. (1988). Mechnical Performance of Quartz-Tempered Ceramics: Part 1, Strength and Toughness. *Archaeometry* 40(1), 261-280.

Kiriatzi, E., Andreou, S., Dimitriadis, S., and Kotsakis, K. (1997). Co-existing traditions: Handmade and wheelmade pottery in Late Bronze Age central Macedonia. In: R. Laffineur and P. P. Betancourt (eds.) *TEXNH: Craftsmen, Craftswomen and Craftsmanship in the Aegean Bronze Age. Proceedings of the 6th International Aegean Conference, Philadelphia, Temple University, 18-21 April 1996. Aegaeum* 16. 361-367. Liège: Université de Liège.

Kiriatzi, E., Georgakopoulou, M. and Pentedeka, A. (2011). Pottery production and importation at Bronze Age Kolonna: the ceramic fabrics and the island's landscape. In: W. Gauss and E. Kiriatzi. *Pottery production and Supply at Bronze Age Kolonna, Aegina: An integrated archaeological and scientific study of a ceramic landscape*. 69-156. Wien: Verlag der Österreichischen Akademie der Wissenshaften.

Knappett, C. (2002). Photographs, Skeuomorphs And Marionettes: Some Thoughts on Mind, Agency and Object. *Journal of Material Culture* 7(1), 97-117.

Knappett C. (2016). Resisting Innovation? Learning, Cultural Evolution and the Potter's Wheel in the Mediterranean Bronze Age. In: L. Mendoza Straffon (ed.) *Cultural Phylogenetics: Concepts and Applications in Archaeology. Interdisciplinary Evolution Research*. Vol. 4. 97-111. Springer. Available from: doi: 10.1007/978-3-319-25928-4

Konsola, D. (1984). *Η πρώιμη αστικοποίηση στους πρωτοελλαδικούς οικισμούς,* Athens.

Konsola, D. (1986). Stages of Urban Transformation in the Early Helladic Period. In: R. Hägg and D. Konsola (eds.) *Early Helladic Architecture and Urbanization* (Studies in Mediterranean Archaeology 76). 9-19. Göteborg: Paul Aströms Förlag.

Kopytoff, I. (1986). The cultural biography of things: commoditization as process. In: A. Appadurai (ed.) *The Social Life of Things*. Commodities in Cultural Perspective. 64-91. Cambridge: Cambridge University Press.

Kossyva, A. (2009). The invisible dead of Delpriza, Kranidi. In: H.W. Cavanagh and J. Roy (eds.) *Honouring the Dead in the Peloponnese. Proceedings of the conference held at Sparta 23-25 April 2009*. CSPS Online Publication 2. 329-370. Nottingham: CSPS. Centre for Spartan and Peloponessian Studies.

Kostoula, M. (2000). Die Frühhelladischen Tonplomben mit Siegelabdrücken aus Petri bei Nemea. *CMS Beiheft* 6, 135-148.

Kotsonas, A. (2014). Standardization, variation, and the study of ceramics in the Mediterranean and beyond. In: A. Kotsonas (ed.) *Understanding Standardization and Variation in Mediterranean Ceramics: mid 2nd to late 1st millennium BC*. 7-23. Leuven: Peeters.

Koufovasilis, D. (2020). Bone palettes of the Chalcolithic and EH period. In: N. Papadimitriou, J. Wright, S. Fachard, N. Polychronakou-Sgouritsa and E. Andrikou (eds.) *Athens and Attica in Prehistory: Proceedings of the International Conference, Athens, 27–31 May 2015*. 257-263. Oxford: Archaeopress.

Kouka, O. (2008). Diaspora, Presence or Interaction? The Cyclades and the Greek Mainland from the Final Neolithic to Early Bronze II. In: N. J. Brodie, J. Doole, G. Gavalas and C. Renfrew (eds.) *Horizon. A colloquium on the prehistory of the Cyclades*. 271-279. Cambridge: McDonald Institute for Archaeological Research.

Kozatsas, J., Kotsakis, K., Sagris, D. and David, K. (2018). Inside out: Assessing pottery forming techniques with micro-CT scanning. An example from Middle Neolithic Thessaly. *Journal of Archaeological Science 100*, 102-119.

Krohe, A., Mposkos, E., Diamantopoulos, A. and Kaouras, G. (2010). Formation of basins and mountain ranges in Attica (Greece): The role of Miocene to Recent low-angle normal detachment faults. *Earth-Science Reviews* 98, 81-104.

Kuhrt, A. (1995). *The Ancient Near East, c. 3000-330 BC*. London and New York: Routledge.

Lamb, W. (1936). *Excavations at Thermi in Lesbos*. Cambridge: Cambridge University Press.

Lave, J. and Wenger, E. (1991). *Situated learning: legitimate peripheral participation*. Cambridge: Cambridge University Press.

Lemonnier, P. (1976). La description des chaînes opératoires: contribution a l'étude des systèmes techniques. *Techniques et culture* 1, 100-151.

Lemonnier, P. (1986). The study of material culture today: towards an anthropology of technical systems. *Journal of Anthropological Archaeology* 5, 147-186.

Lemonnier, P. (1993). Introduction. In: P. Lemonnier (ed.) *Technological choices: transformations in material cultures since the Neolithic*, 1-35. London: Routledge.

Lemonnier, P. (2002). *Technological choices: transformation in material cultures since the Neolithic*. London: Routledge.

Letsch, J. and Noll, W. (1983). Phase formation in several ceramic subsystems at 600°C -1000 °C as a function of oxygen fugacity. *Berichte der Deutschen Keramischen Gesellschaft* 7, 259–267.

Liard, F., Pomonis, P., Koutsovitis, P., Gait, J. and Stamatakis, M. (2018). Ophiolites Associated with Pottery Production in Bronze Age Crete. *Archaeometry* 60(4), 731-749.

Liaros, N. (2003). Korakovouni Ymettou. I proistoriki katoikisi. In: A. Vlachopoulos and K. Birtacha (eds.) *Argonautis. Timitikos Tomos gia ton Kathigiti Christo G. Ntouma apo tous mathites tou sto Panepistimio Athinon (1980-2000)*. 231-246. Athens: I Kathimerini A.E.

Livingstone Smith, A. (2001). Bonfire II: The Return of Pottery Firing Temperatures. *Journal of Archaeological Science* 28 (9), 991–1003.

Livingstone Smith, A. (2007). *Chaîne Opératoire de la Poterie*. Tervuren: Musée Royal de l'Afrique Centrale.

Livingstone Smith, A., Bosquet, D., and Martineau, R. (2005). *Pottery Manufacturing Processes:* Reconstitution *and Interpretation*. BAR International Series 1349. Oxford: Archaeopress.

Maggetti, M. (1982). Phase analysis and its significance for technology and origin. In: J.S. Olin and A.D. Franklin (eds.) *Archaeological Ceramics*. 121–133. Washington: Smithsonian Institute Press.

Maggetti, M., Neururer, C., and Ramseyer, D. (2011). Temperature evolution inside a pot during experimental surface (bonfire) firing. *Applied Clay Science* 53(3), 500-508.

Mahias, M.C. (1993). Pottery techniques in India: technological variants and social choice. In: P. Lemonnier (ed.) *Technological choices: Transformation in Material Cultures since the Neolithic*. 157-180. London: Routledge.

Maniatis, Y. (2009). The Emergence of Ceramic Technology and its Evolution as Revealed with the use of Scientific Techniques. In: A.J. Shortland, I.C. Freestone and T. Rehren (eds.) *From Mine to Microscope: Advances in the Study of Ancient Technology*. 1-18. Oxford: Oxbow Books.

Maniatis, Y. and Papadopoulos, S. (2011). Radiocarbon dating of a Final Neolithic-Early Bronze Age transition period settlement at Aghios Ioannis on Thassos (North Aegean). *Radiocarbon* 53, 21-37.

Maniatis, Y. and Tite, M.S. (1975). Scanning electron microscope examination of the bloating of fired clays. *Transactions and Journal of the British Ceramic Society* 74, 229–232.

Maniatis, Y. and Tite, M.S. (1978). Ceramic technology in the Aegean world during the Bronze Age. In: C. Doumas (ed.) *Thera and the Aegean World.* Vol. 1, 483-492. London: The Thera Foundation.

Maniatis, Y. and Tite, M.S. (1978/9). Examination of Roman and Medieval Pottery Using the Scanning Electron Microscope. *Acta Praehistorica et archaeologica* 9/10, 125-130.

Maniatis, Y. and Tite, M.S. (1981). Technological examination of Neolithic-Bronze Age pottery from central and southeast Europe and from the Near East. *Journal of Archaeological Science* 8, 59-76.

Maniatis, Y., Jones, R.E., Whitbread, I., Kostikas, A., Simopoulos, A., Karakalos, C. and Williams, C. (1984). Punic Amphorae: A problem of Origin and Technology. *Journal of Field Archaeology* 11, 205–222.

Maniatis, Y., Simopoulos, A. and Kostikas, A. (1981). Moessbauer study of the role of Ca in raw and fired clays. *Journal of the American Ceramic Society* 64(5), 263-269.

Maniatis, Y., Simopoulos, A. Perdikatsis, V. and Kostikas, A. (1983). The effect of reducing atmosphere on minerals and iron oxides developed in fired clays: The role of Ca. *Journal of the American Ceramic Society* 66(11), 773-781.

Maniatis, Y., Tsirtsoni, Z., Oberlin, C., Darcque, P., Koukouli-Chryssanthaki, C., Malamidou, D., Siros, T., Miteletsis, M., Papadopoulos, S., & Kromer, B. (2014). New ^{14}C evidence for the Late Neolithic-Early Bronze Age transition in Southeast Europe. *Open Journal of Archaeometry*, *2*(1), 43-50.

Manning, S.W. (1995). *The Absolute Chronology of the Aegean Early Bronze Age. Archaeology, Radiocarbon and History*. Monographs in Mediterranean Archaeology I. Sheffield: Sheffield Academic Press.

Maran, J. (1998). *Kulturwandel auf dem griechischen Festland und den Kykladen im späten 3. Jahrtausend v. Chr.: Studien zu den kulturellen Verhältnissen in Südosteuropa und dem zentralen sowie östlichen Mittelmeerraum in der späten Kupfer- und frühen Bronzezeit*. Bonn: Dr. Rudolf Habelt Gmb H.

Maritan, L. (2004). Archaeometric Study of Etruscan-Padan Type Pottery from the Veneto Region: Petrographic, Mineralogical and Geochemical–Physical Characterisation. *European Journal of Mineralogy* 16, 297–307.

Maritan, L., Nodari, L., Mazzoli, C., Milano, A. and Russo, U. (2006). Influence of Firing Conditions on Ceramic Products: Experimental Study on Clay Rich in Organic Matter. *Applied Clay Science* 31, 1-15.

Marthari, M. (2008). Aspects of Pottery Circulation in the Cyclades during the Early EB II Period: Fine and Semi- ne Imported Ceramic Wares at Skarkos, Ios. In: N. J. Brodie, J. Doole, G. Gavalas and C. Renfrew (eds.) *Horizon. A colloquium on the prehistory of the Cyclades*. 71-84. Cambridge: McDonald Institute for Archaeological Research.

Mauss, M. (1934). Les techniques du corps. *Journal de Psychologie* 32, 271-293.

Mauss, M. (1990). *The Gift: forms and functions of exchange in archaic societies*. London: Routledge.

Mavridis, F. and Tankosić, Ž. (2009). The Ayia Triadha Cave, Southern Euboea: Finds And Implications Of The Earliest Human Habitation In The Area (A Preliminary Report). *Mediterranean Archaeology and Archaeometry 9(2), 47-59*.

Mavridis, F. and Tankosić, Ž. (2016). Early Bronze Age Burial Deposits at the Ayia Triada Cave at Karystos, Euboia: Tentative Interpretations. *Hesperia 85*(2), 207-242.

McGeehan-Liritzis, V. (1990). *The role and development of metallurgy in the late Neolithic and early Bronze Age of Greece*. PhD Thesis. University of Oxford.

Mentesana, R. (2016). *The Final Neolithic-Early Bronze Age transition in Phaistos, Crete: an investigation of continuity and change in ceramic manufacture*. PhD Thesis. University of Sheffield.

Mentesana, R., Day, P.M., Kilikoglou, V. and Todaro, S. (2016a). United in our Differences: the production and consumption of pottery at EMIB Phaistos, Crete. *Journal of Archaeological Science: Reports* 7, 489-498.

Mentesana, R., Day, P., Todaro, S., and Ghilardi, M. (2016b). Looking for the invisible: landscape change and ceramic manufacture during the Final Neolithic – Early Bronze Age at Phaistos, Crete. In: M. Ghilardi (ed.) *La géoarchéologie des îles de Méditerranée*. 299–310, Paris: CNRS Editions.

Miller, D. (2008). The uses of value. *Geoforum* 39, 1122-1132.

Molera, J., Pradell, T. and Vendrell-Saz, M. (1998). The colours of Ca-rich ceramic pastes: origin and characterization. *Applied Clay Science* 13, 187-202.

Molera, J., Iñañez, J., Molina, G., Burch, J., Alberch, X., Glascock, M.D. and Pradell, T. (2015). Lustre and glazed ceramic collection from Mas Llorens, 16-17th centuries (Salt, Girona). Provenance and technology. *Periodico di Mineralogia* 84(1), 45-63.

Morgan, C., Pitt, R. K., Mulliez, D. and Evely, D. (2009-10). Archaeology in Greece 2009-2010. *Archaeological Reports* 56, 1-201.

Morris, I. (1986). Gift and commodity in archaic Greece. *Man* 3(1), 1-17.

Mountjoy, P.A. and Ponting, M.J. (2000)The Minoan Thalassocracy Reconsidered: Provenance Studies of LH IIA/LMIB Pottery from Phylakopi, Ayia Irini and Athens. *The Annual of the British Schoolat Athens* 95, 141-184.

Müller, N.S., Vekinis, G., Day, P.M. and Kilikoglou, V. (2015). The influence of microstructure and texture on the mechanical properties of rock tempered archaeological ceramics. *Journal of the European Ceramic Society* 35(2), 831-843.

Mylonas, G. E. (1959). *Aghios Kosmas. An Early Bronze Age Settlement and Cemetery in Attica*. Princeton: Princeton University Press.

Nakou, G. (1995). The cutting edge; a new look at early Aegean metallurgy. *Journal of Mediterranean Archaeology* 8, 1-32.

Nakou, G. (1999). *The End of the Early Bronze Age in the Aegean: Material Culture and Hisotry*. PhD Thesis. University of Oxford.

Nazou, M. (2014). *Defining the regional characteristics of Final Neolithic and Early Bronze Age pottery in Attica*. PhD Thesis. University College London.

Nazou, M. (2017). Euboean Connections with Attica and Kea: a view from final Neolithic and late Early Bronze age II pottery. In: Ž. Tankosić, F. Mavridis and M. Kosma (eds.) *An Island Between Two Worlds: the Archaeology of Euboea from Prehistoric to Byzantine Times*. 111-120. Athens: Norwegian Institute at Athens.

Nazou, M. (2020). Thorikos in the Neolithic and the Early Bronze Age: A View from the Mine 3 Pottery. In: N. Papadimitriou, J. Wright, S. Fachard, N. Polychronakou-Sgouritsa and E. Andrikou (eds.) *Athens and Attica in Prehistory: Proceedings of the International Conference, Athens, 27–31 May 2015*. 203-212. Oxford: Archaeopress.

Nicholson, P. T. and Patterson, H. L. (1989). Ceramic Technology in Upper Egypt: A Study of Pottery Firing. *World Archaeology* 21 (1), 71-86.

Nodari, L., Maritan, L., Mazzoli, C. and Russo, U. (2004). Sandwich structure in the Etruscan-Padan type pottery. *Applied Clay Science* 27, 119-128.

Nodarou, E. (2011). *Pottery production distribution and consumption in Early Minoan West Crete: an analytical perspective*. BAR International Series 2210. Oxford: Archaeopress.

Nodarou, E. (2013). Appendix A: Petrographic Analysis of the Pottery. In P.P. Betancourt (ed.) *Aphrodite's Kephali: An Early Minoan I Defensive Site in Eastern Crete*. 151-169. Philadelphia: INSTAP Academic Press.

Noghani, S. and Emami, M. (2014). Mineralogical Phase Transition on Sandwich-like Structure of Clinky Pottery from Parthian Period, Iran. *Periodico di Mineralogia* 83(2), 171-185.

Noll, W. (1982). Mineralogie und Technik der Keramiken Altkretas. *Neues Jahrbuch für Mineralogie Abhandlungen* 143, 150-199.

Noll, W. (1991). *Alte Keramiken und ihre Pigmente*. Stuttgart: E. Schweizerbart'sche Verlagsbuchhandlung.

Noll, W., Holm, R. and Born, L. (1975). Painting of ancient ceramics. *Angewandte Chemie International* 14(9), 602–613.

Nuttall, C. (2014). Friend or Foe: "Mycenaeanisation" at Phylakopi on Melos in the Late Bronze Age. *Rosetta* 16: 15-36.

O'Brien, M.J. (2008). *Cultural Transmission and Archaeology*. Washington D.C.: Society for American Archaeology Press.

Ouahabi, M., Daoudi, L., Hatert, F. and Fagel, N. (2015). Modified Mineral Phases During Clay Ceramic Firing. *Clays and Clay Minerals* 63 (5), 404-413.

Palaiologos, D. and Stefanopoulou, M. (2020). The prehistoric topography of northern Attica: recent discoveries. In: N. Papadimitriou, J. Wright, S. Fachard, N. Polychronakou-Sgouritsa and E. Andrikou (eds.) *Athens and Attica in Prehistory: Proceedings of the International Conference, Athens, 27–31 May 2015*. 127-138. Oxford: Archaeopress.

Pantelidou-Gofa, M. (1995). *Η Νεολιθική Νεά Μακρή: Η Κεραμική*. Athens: The Archaeological Society at Athens.

Pantelidou-Gofa, M. (2005). *Τσέπι Μαραθώνος: το πρωτοελλαδικό νεκοταφείο*. Athens: The Archaeological Society at Athens.

Pantelidou-Gofa, M. (2008). The EH I Deposit Pit at Tsepi, Marathon: Features, Formation and the Breakage of the Finds. In: N. J. Brodie, J. Doole, G. Gavalas and C. Renfrew (eds.) *Horizon. A colloquium on the prehistory of the Cyclades*. 281-290. Cambridge: McDonald Institute for Archaeological Research.

Pantelidou-Gofa, M. (2016). *Τσέπι Μαραθώνος. Ο Αποθέτης 39 του Προϊστορικού νεκροταφείου*. [Tsepi Marathonos; deposit 39 on the prehistoric cemetery]. Athens: The Archaeological Society at Athens.

Pantelidou-Gofa, M. (2020). The earliest tombs at Tsepi, Marathon. In: N. Papadimitriou, J. Wright, S. Fachard, N. Polychronakou-Sgouritsa and E. Andrikou (eds.) *Athens and Attica in Prehistory: Proceedings of the International Conference, Athens, 27–31 May 2015*. 239-243. Oxford: Archaeopress.

Papadatos, Y. and Nodarou, E. (2018). Pottery Technology(ies) in Prepalatial Crete: Evidence from Archaeological and Archaeometric Study. In: E. Alram-Stern and B. Horejs (eds.) *Pottery Technologies and Sociocultural Connections Between the Aegean and Anatolia During the 3rd Millennium BC*. 287-304. Vienna: Austrian Academy of Sciences Press.

Papadatos, Y., and P. Tomkins. (2014). The emergence of trade and the integration of Crete into the wider Aegean in the late 4th millennium: New evidence and implications. In: B. Horejs and M. Mehofer (eds.) *Western Anatolia before Troy: Proto-urbanisation in the 4th millennium BC*, Oriental and European archaeology, vol. 1. 329–343. Vienna: Austrian Academy of Sciences.

Papadimitriou, N, Wright, J., Fachard, S., Polychronakou-Sgouritsa, N. and Andrikou, E. (2020). *Athens and Attica in Prehistory: Proceedings of the International Conference, Athens, 27–31 May 2015*. Oxford: Archaeopress.

Papadopoulos, S. (2008). Silver and Copper Production Practices in the Prehistoric Settlement at Limenaria, Thasos. In: I. Tzachili (ed.), *Aegean Metallurgy in the Bronze Age. Proceedings of an International Symposium held at the University of Crete, Rethymnon, Greece, on November 19-21, 2004*. 59-67. Athens: Ta Pragmata Publications.

Papadopoulos, Z. and Marinos, P. (1992). On the Anisotropy of the Athenian Schist and Its Relation to Weathering. *Bulletin of the International Association of Engineering Geology* 45, 111–116.

Papadopoulou, Z. D. (2011). Akrotiraki and Skali: New Evidence for EBA Lead/ Silver and Copper Production from Southern Siphnos. In: P.P. Betancourt and S.C. Ferrence (eds.) *Metallurgy: Understanding How, Learning Why. Studies in Honor of James D. Muhly*.149-156. Philadelphia: INSTAP Academic Press.

Papadopoulou, Z. D. (2013). Archaeometallurgical Research in Southern Siphnos: Finds, Questions, Perspectives. In: G. Zervoudakis (ed.) *Proceedings of the 4th Siphnian Symposium*, Siphnos 25-26 June 2010. 29-44. Athens: Society for Sifnean Studies.

Papavassiliou, C., P. Chorianopoulou, St. Tsaila-Monopolis, V. Tsapralis and J. Bornovas. (1982). *Geological Map of Greece. 1:50,000. Athina-Piraieus*. IGME: Athens.

Papangeli, K. (1990). Ελευσίνα. *Archaiologikon Deltion* 45B, 56–8.

Papangeli, K. (2019). A Figurine from A Tomb At Mandra In Western Attica. In: M. Marthari, C. Renfrew and M. J. Boyd (eds.) *Beyond the Cyclades: Early Cycladic Sculpture in Context from Mainland Greece, the North and East Aegean*. 76-78. Oxford & Philadelphia: Oxbow Books.

Peacock, D.P.S. (1969). Neolithic Pottery Production in Cornwall. *Antiquity* 43, 145-149.

Peperaki, O. (2007). *Complexity, power and "associations that matter": rethinking social organisation in the Early Bronze Age 2 mainland Greece*. PhD Thesis. University of Sheffield.

Perlès, C. (1992). Systems of exchange and organization of production in Neolithic Greece. *Journal of Mediterranean Archaeology* 5, 115–164.

Perlès, C. and Vitelli, K.D. (1999). Craft Specialization in the Greek Neolithic. In: P. Halstead (ed.) *Neolithic Society in Greece* (Sheffield, Sheffield Studies in Aegean Archaeology 1). 96–107. Sheffield: Sheffield Academic Press.

Pfaffenberger, B. (1988). Fetishised Objects and Humanised Nature: Towards an Anthropology of Technology. *Man 23*(2), 236-252.

Pfaffenberger, B. (1992). Social anthropology of technology. *Annual Review of Anthropology* 21, 491-516.

Plassara, A. (2020). Early Helladic settlement at Gerakas. In: N. Papadimitriou, J. Wright, S. Fachard, N. Polychronakou-Sgouritsa and E. Andrikou (eds.) *Athens and Attica in Prehistory: Proceedings of the International Conference, Athens, 27–31 May 2015*. 331-336. Oxford: Archaeopress.

Polanyi, K. (1957). The Economy as Instituted Process. In: K. Polanyi, C.M. Arensberg and H.W. Pearson (eds.) *Trade and Market in the Early Empires: Economies in History and Theory*. 243–270. Glencoe: The Free Press.

Pomonis, P. (2020). Deposit 39 of the prehistoric cemetery at Tsepi (Marathon, Greece): Preliminary results from the petrographic analysis of the pottery. In: N. Papadimitriou, J. Wright, S. Fachard, N. Polychronakou-Sgouritsa and E. Andrikou (eds.) *Athens and Attica in Prehistory: Proceedings of the International Conference, Athens, 27–31 May 2015*. 251-255. Oxford: Archaeopress.

Poulaki-Pantermali, E., Vaxevanopoulos, M., Koulidou, S. and Siros, A. (2004). Καταρρά- κτες (Φράγμα) Σιδηροκάστρου 2004. *The Archaeological Work in Macedonia and Thrace* 18:63-71.

Prevedorou, E. (2020). Bioarchaeological approach to Early Helladic Attica: The human skeletal remains from Tsepi at Marathon (1970-1973 excavations). In: N. Papadimitriou, J. Wright, S. Fachard, N. Polychronakou-Sgouritsa and E. Andrikou (eds.) *Athens and Attica in Prehistory: Proceedings of the International Conference, Athens, 27–31 May 2015*. 245-250. Oxford: Archaeopress.

Pullen, D.J. (1985). *Social Organization in Early Bronze Age Greece: A Multidimensional Approach*. PhD Thesis. Indiana University.

Pullen, D.J. (1994). A Lead Seal from Tsoungiza, Ancient Nemea, and Early Bronze Age Aegean Sealing Systems. *American Journal of Archaeology* 98(1), 35-52.

Pullen, D.J. (1995). The Pottery of the Neolithic, Early Helladic I, and Early Helladic II Periods. In: C. Runnels, D.J. Pullen, and S. Langdon (eds.) *Artifact and Assemblage: The Finds from A Regional Survey of the Southern Argolid, Greece*. 6-42. Stanford: Stanford University Press.

Pullen, D.J. (2003). Site Size, Territory, and Hierarchy: Measuring Levels of Integration and Social Change in Neolithic and Bronze Age Aegean Societies. In: K. Polinger Foster and R. Laffineur (eds.) *Metron: Measuring the Aegean Bronze Age. Proceedings of the 9th International Aegean Conference, New Haven, Yale University, 18–21 April 2002. Aegaeum* 24, 29-37. Liège and Austin: Université de Liège and University of Texas Press.

Pullen, D.J. (2008). The Early Bronze Age in Greece. In: C.W. Shelmerdine (ed.) *The Cambridge Companion to the Aegean Bronze Age*. 19-46. Cambridge: Cambridge University Press.

Pullen, D.J. (2010). *Political economies of the Aegean Bronze Age: papers from the Langford Conference, Florida State University, Tallahassee, 22-24 February 2007*. Oxford: Oxford Books.

Pullen, D.J. (2011). *Nemea Valley Archaeological Project. Vol. 1. The Early Bronze Age Village on Tsoungiza Hill*. Princeton: American School of Classical Studies at Athens.

Renfrew, C. (1972). *The Emergence of Civilization. The Cyclades and the Aegean in the Third Millennium BC*. Oxford: Oxbow Books.

Renfrew, C. (1975). Trade as Action at a Distance: Questions of Integration and Communication. In: J.A. Sabloff, C.C. Lamberg-Karlovsky (eds.) *Ancient Civilization and Trade*. 3-59. Albuquerque: University of New Mexico Press.

Renfrew, C. and Evans, R. K. (2007). The Early Bronze Age Pottery. In: C. Renfrew (ed.) *Excavations at Phylakopi in Melos 1974-77*. BSA Supplementary Vol. *42*. 129-180. London: British School at Athens.

Renfrew, C., Boyd, M. and Bronk Ramsey, C. (2011). The oldest maritime sanctuary? Dating the sanctuary at Keros and the Cycladic Early Bronze Age. *Antiquity* 86, 144-60.

Rice, P.M. (1981). Evolution of Specialised Pottery Production: A Trial Model. *Current Anthropology* 22(3), 219–240.

Rice, P.M. (1987). *Pottery analysis: A Sourcebook*. University of Chicago Press.

Rice, P.M. (1991). Specialization, standardization, and diversity: A retrospective. In: R. L. Bishop, and F. W. Lange (eds.) *The Ceramic Legacy of Anna O. Shepard*. 257-279. Niwot: University Press of Colorado.

Rice, P.M. (1996). Recent Ceramic Analysis: 2. Composition, Production, and Theory. *Journal of Archaeological Research 4*(3), 165-202.

Roux, V. (2003). Ceramic Standardization and Intensity of Production: Quantifying Degrees of Specialization. *American Antiquity* 68(4), 768-782.

Roux, V. (2017). Ceramic Manufacture: The Approach. In: A. M. W. Hunt (ed.) *The Oxford Handbook of Archaeological Ceramic Analysis*. 101-113. New York: Oxford University Press.

Roux, V. (2019). Modeling the Relational Structure of Ancient Societies through the Chaîne opératoire: The Late Chalcolithic Societies of the Southern Levant as a Case Study. In: M. Saqalli and M. Vander Linden (eds.) *Integrating Qualitative and Social Science Factors in Archaeological Modelling. Computational Social Sciences*. 163-184. Cham, Switzerland: Springer.

Runnels, C. (1985). Trade and demand for millstones in southern Greece in the Neolithic and Early Bronze Age. In: A.B. Knapp and T. Stech (eds.) *Prehistoric Production and Exchange*. 30-43. Los Angeles: Institute of Archaeology, University of California.

Runnels, C., Pullen, D.J. and Langdon S. (1995). *Artifact and Assemblage: The Finds from a Regional Survey of the Southern Argolid, Greece. Vol. 1, The Prehistoric and Early Iron Age Pottery and the Lithic Artifacts*. Stanford: Stanford University.

Rutter, J.B. (1993a). Early Helladic Pottery: Inferences about Exchange and Production from Style and Clay Composition. In: C. Zerner, P. Zerner and J. Winder (eds.) *Wace and Blegen: Pottery as Evidence for Trade in the Aegean Bronze Age 1939-1989*. 19-37. Amsterdam: J.C. Gieben.

Rutter, J.B. (1993b). Review of Aegean Prehistory II: The Prepalatial Bronze Age of the Southern and Central Greek Mainland. *American Journal of Archaeology 97*(4), 745-797.

Rye, O.S. (1981). *Pottery Technology: principles and reconstruction*. Washington: Taraxacum.

Sall, M. (2005). Cultural Contacts and Technical Heritage in Senegambia. In: A. Livingstone Smith, D. Bosquet and R. Martineau (eds.) *Pottery Manufacturing Processes: Reconstitution and Interpretation*. BAR International Series 1349. 57-66. Oxford: Archaeopress.

Sampson, A. (1985). *Manika: Mia protoelladiki poli sti Chalkida*. Athens: Etaireia Evvoikon Spoudon.

Sampson, A. (1988). Early Helladic contacts with the Cyclades during the EBA II. In: R. Laffineur (ed.) *Annales d'archólogie égéenne de l'Université de Liège 2. Aegaeum* 2. 5-10. Liège: Université de Liège.

Sampson, A. and Fotiadi, P. (2008). Early Cycladic II–III finds from Rivari, Melos. In: N. J. Brodie, J. Doole, G. Gavalas and C. Renfrew (eds.) *Horizon. A colloquium on the prehistory of the Cyclades*. 217-24. Cambridge: McDonald Institute for Archaeological Research.

Santacreu, D. (2014). *Materiality, Techniques and Society in Pottery Production*. Warsaw, Poland: De Gruyter Open Poland.

Schofield, E. (1982) The western Cyclades and Crete: a 'special relationship'. *Oxford Journal of Archaeology* 1, 9-25.

Shanks, M. and Tilley, C. (1987). *Social Theory and Archaeology*. Cambridge: Polity Press.

Shelford, P. (1981). The geology of Melos. In: C. Renfrew and W. J. Malcolm (eds) *An Island polity: The archaeology of exploitation in Melos*. 74-81. Cambridge; New York: Cambridge University Press.

Shennan, S. (1989). Introduction. In: S. Shennan (ed.) *Archaeological Approaches to Cultural Identity*. 1-32. London: Unwin-Hyman.

Shennan, S. (2013). Lineages of Cultural Transmission. In: E. Roy, S. J. Lycett and S. E. Johns (eds) *Understanding Cultural Transmission in Anthropology: A Critical Synthesis*. Methodology and History in Anthropology. 346–360. Oxford: Berghahn Books

Shepard, A.O. (1963). *Ceramics for the Archaeologist*. Carnegie Institute of Washington Publication 609. Washington, D.C.: Carnegie Institute of Washington.

Sherratt, A. (1993). What Would a Bronze-Age World System Look Like? Relations Between Temperate Europe and the Mediterranean in Later Prehistory. *Journal of European Archaeology* 1(2), 1-58.

Sherratt, A. (2002). Diet and cuisine: farming and its transformations as reflected in pottery. *Documenta Praehistorica 29*, 61-71.

Sherratt, A. (2004). Material resources, capital, and power: The coevolution of society and culture. In: G. M. Feinman and L. M. Nicholas (eds.) *Archaeological perspectives on political economies*. 79–104. Salt Lake City: University of Utah Press.

Sherratt, A. and Sherratt, S. (2001). Technological Change in the East Mediterranean Bronze Age: Capital, Resources and Marketing. In: A. J. Shortland (ed.) *The Social Context of Technological Change: Egypt and the Near East, 1650-1550 BC: proceedings of a conference held at St. Edmund Hall, Oxford 12-14 September 2000*. 15-38. Oxford: Oxbow Books.

Sherratt, A. and Taylor, T. (1997). Metal Vessels in Bronze Age Europe and the Context of Vulchetrun. In: A. Sherratt (ed.) *Economy and Society in Prehistoric Europe: Changing Perspectives*. 431-456. Edinburgh: Edinburgh University Press.

Sherratt, S. (1999). E pur si muove: Pots, Markets and Values in the Second Millennium Mediterranean. In: J. P. Crielaard, V. Stissi and G. J. van Wijngaarden (eds.) *The Complex Past of Pottery: Production, Circulation and Consumption of Mycenaean and Greek Pottery (sixteenth to early fifth centuries BC)*. 163–211. Amsterdam: J.C. Gieben.

Sherratt, S. (2010). The Aegean and the wider world: some thoughts on a world-systems perspective. In: M. Galaty and W. Parkinson (eds.) *Archaic State Interaction: The Eastern Mediterranean in the Bronze Age*. 81-106. Santa Fe, N.M.: School for Advanced Research Press.

Sherratt, S. and Sherratt, A. (1991). From Luxuries to Commodities: The Nature of Mediterranean Bronze Age Trading Systems. In: N. H. Gale (ed.) *Bronze Age Trade in the Mediterranean*. 351- 386. Jonsered: Paul Åströms Förlag.

Sotirakopoulou, P. (1986). Early Cycladic Pottery from Akrotiri on Thera and Its Chronological Implications. *The Annual of the British School at Athens 81*, 297-312.

Spitaels, P. (1982). Final Neolithic Pottery from Thorikos. In: P. Spitaels (ed.) *Vol. 5 of Miscellanea Graeca: Studies in South Attica I*. 9-45. Ghent: Belgian Archaeological Mission in Greece.

Stampolidis, N. Chr. and Sotirakopoulou, P. (2011). Early Cycladic pottery. In: V. Şahoğlu and P. Sotirakopoulou (eds.) *Across: The Cyclades and Western Anatolia during the 3rd Millennium BC*. 42-50. Istanbul: Sakip Sabanci Muzesi.

Star, S. and Griesemer, J. (1989). Institutional Ecology, ‘Translations’ and Boundary Objects: Amateurs and Professionals in Berkeley's Museum of Vertebrate Zoology, 1907-39. *Social Studies of Science* 19(3), 387-420.

Stark, B.L. and Garraty, C.P. (2010). Detecting Marketplace Exchange in Archaeology: A Methodological Review. In: C.P. Garraty and B.L. Stark (eds.) *Archaeological Approaches to Market Exchange in Ancient Societies*. 33-59. Boulder: University Press of Colorado.

Stathi, M. (2015). Η ανασκαφική έρευνα στα Σπάτα (2008-2013). Πρακτικά ΙΕ′ Επιστημονικής Συνάντησης ΝΑ Αττικής, Καλύβια Θορικού Αττικής, 135-147.

Stos-Gale, Z. (1998). The role of Kythnos and other Cycladic islands in the origins of Early Minoan metallurgy. In: L. G. Mendoni and A. J. Mazarakis Ainian (eds.) *Kea-Kythnos: History and Archaeology. Proceedings of International Symposium, 22-25 June 1994*. Meletemata 27. 717-735. Athens/Paris: KERA- EIE/Diffusion de Boccard.

Sterne, J. (2003). Bourdieu, technique and technology. *Cultural Studies* 17, 367-389.

Tankosić, Ž. (2017). The northernmost Cycladic island? Insularity and the case of prehistoric southern Euboea (the Karystia). In: Ž. Tankosić, F. Mavridis and M. Kosma (eds.) *An Island Between Two Worlds: the Archaeology of Euboea from Prehistoric to Byzantine Times*. 99-110. Athens: Norwegian Institute at Athens.

Televantou, C.A. (2008). The Early Cycladic cemetery at Rivari on Melos. In: N. J. Brodie, J. Doole, G. Gavalas and C. Renfrew (eds.) *Horizon. A colloquium on the prehistory of the Cyclades*. 209-16. Cambridge: McDonald Institute for Archaeological Research.

Theochares, D. (1951). Ανασκαφή εν Παλαιά οκκινιά Πειραιώς. *PAE* 1951, 93-116.

Theocharis, D. (1952). Ανασκαφή εν Αραφήνι. *PAE* 1952, 129-151.

Theocharis, D. (1953). Ανασκαφή εν Αραφήνι. *PAE* 1953, 105-118.

Theocharis, D. (1953-4). Ασκηταριό. Πρωτοελλαδική ακρόπολις παρά την Ραφήναν. *PAE* 1953-1954, 59-75.

Theocharis, D. (1955). Ανασκαφή εν Αραφήνι: Ραφήνα. *PAE* 1955, 109-117.

Theodorou-Mavrommatidi, A. (2007). The Early Helladic Sauceboat: Reshaped and Reconsidered. *Praktika tou Z' Diethnous Synedriou Peloponnesiakon Spoudon B*, 241-259.

Thér. R. Kallistová, A., Svoboda, Z., Květina, P., Lisá, L., Burgert, P. and Bajer, A. (2019). How Was Neolithic Pottery Fired? An Exploration of the Effects of Firing Dynamics on Ceramic Products. *Journal of Archaeological Method and Theory* 26, 1143–1175.

Tilley, C., Keane, W., Küchler, S., Rowlands, M. and Spyer, P. (2006). *Handbook of material culture*. New Delhi: SAGE Publications Ltd.

Tite, M.S. (1992). The impact of electron microscopy on ceramic studies. *Proceedings of the British Academy* 77, 111–131.

Tite, M.S. (1999). Pottery Production, Distribution, Consumption. The contribution of the Physical Sciences. *Journal of Archaeological Method and Theory* 6(3), 181-233.

Tite, M.S. and Maniatis, Y. (1975). Examination of ancient pottery using the scanning electron microscope. *Nature* 257(5522), 122–123.

Tite, M.S., Bimson, M. and Freestone, I.C. (1982). An examination of the high gloss surface finishes on Greek Attic and Roman Samian wares. *Archaeometry* 24(2), 117–126.

Tomkins, P., and Day, P.M. (2001). Production and exchange of the earliest ceramic vessels in the Aegean: a view from Early Neolithic Knossos, Crete. *Antiquity* 5, 259–260.

Torrence, R. (1986). *Production and exchange of stone tools: prehistoric obsidian in the Aegean*. Cambridge and New York: Cambidge University Press.

Traoré, K., Kabré, T. and Blanchart, P. (2003). Gehlenite and anorthite crystallisation from kaolinite and calcite mix. *Ceramics International* 29, 377–383.

Treuil, R., Darcque, P., Poursat, J. and Touchais, G. (1996). Οι πολιτισμοί του Αιγαίου κατά τη Νεολιθική και την Εποχή του Χαλκού (Πολυχρονοπούλου O., Touchais A. μτφρ.). Athḗna: M. Kardamítsa.

Tsirtsoni, Z. (2016). The chronological framework in Greece and Bulgaria between the late 6th and the early 3rd millennium BC, and the “Balkans 4000” project. In: Z. Tsirtsoni (ed.) *The Human Face of Radiocarbon: Reassessing Chronology in prehistoric Greece and Bulgaria, 5000-3000 cal BC*. Lyon: MOM Éditions.

Tsirtsoni, Z. (2020). The End of the Neolithic and the Transition to the Early Bronze Age in Attica (Mid 5th – Late 4th Millennium BC): Present State and Research Perspectives. In: N. Papadimitriou, J. Wright, S. Fachard, N. Polychronakou-Sgouritsa and E. Andrikou (eds.) *Athens and Attica in Prehistory: Proceedings of the International Conference, Athens, 27–31 May 2015*. 175-184. Oxford: Archaeopress.

Tsountas, C. (1899). Kykladika II. *AE*, 73-134.

Tzavella-Evjen, H. (1985). *Lithares. An Early Bronze Age Settlement in Boeotia*. Los Angeles: Cotsen Institute of Archaeology Press at UCLA.

van Andel, T. and Runnels, C. (1988). An essay on the ‘emergence of civilization’ in the Aegean world. *Antiquity* 62(235), 234-247.

van der Leeuw, S. E. (1993). Giving the potter a choice: Conceptual aspects of pottery techniques. In: P. Lemonnier (ed.) *Technological Choices. Transformation in Material Cultures Since the Neolithic*. 238–288. London: Routledge.

van der Leeuw, S., Papousek, D. and Coudart, A. (1991). Technical traditions and unquestioned assumptions: The case of pottery in Michoacan. *Techniques et Culture* 17-18, 145-173.

Varga, G. (2007). The structure of kaolinite and metakaolinite. *Epitoanyag-Journal of Silicate Based and Composite Materials 59*, 6-9.

Vaughan, S.J. (2002). Petrographic Analysis of Ceramics from the Pseira Cemetery. In: P.P. Betancourt and C. Davaras (eds.) *Pseira VI: The Pseira Cemetery 1. The Surface Survey*. 147-165. Philadelphia: INSTAP Academic Press.

Vaughan, S.J. (2006). Macroscopic and petrographic studies of pottery from Markianion Amorgos. In: L. Marangou, C. Renfrew, C. Doumas and G. Gavalas (eds.) *Markiani, Amorgos: An Early Bronze Age Fortified Settlement. Overview of the 1985–1991 Investigations*. British School at Athens. Supplementary 40, 99–101. London: British School at Athens.

Vaughan, S.J. and Wilson, D.E. (1993). Interregional contacts in the Aegean Early Bronze II: the Talc Ware connection. In: C. Zerner, P. Zerner and J. Winder (eds.) *Wace and Blegen: Pottery as Evidence for Trade in the Aegean Bronze Age 1939-1989*. 169-86. Amsterdam: J.C. Gieben.

Vaughan, S.J., Myer, G.H. and Betancourt, P.P. (1995). Discussion and Interpretation of the Petrographic Data. In: J.B. Rutter. *Lerna: A Preclassical Site in the Argolid. Vol. III: The Pottery of Lerna IV*. 693-710. Princeton: The American School of Classical Studies at Athens.

Vickers, M. (1999). *Skeuomorphismus oder die Kunst, aus Wenig Viel zu machen*. Presented at 16. Trierer Winckelmannsprogramm 1998. Mainz: Von Zabern.

Vickers, M. and Gill, D. W. J. (1994). *Artful Crafts: Ancient Greek Silverware and Pottery*. Oxford: Clarendon Press.

Vitelli, K.D. (1993). Power to the potters. Comment on Perlès 'Systems of Exchange and Organization of Production in Neolithic Greece' [JMA 5:115-64]. *Journal of Mediterranean Archaeology* 6(2), 247-257.

Wace, A. J. B., and Blegen, C. W. (1916-1918). The Pre-Mycenaean Pottery of the Mainland. *The Annual of the British School at Athens* 22, 175-89.

Wallaert, H. (2012). Apprenticeship and the Confirmation of Social Boundaries. In: W. Wendrich (ed.) *Archaeology and Apprenticeship. Body Knowledge, Identity, and communities of practice*. 20-42. Tucson: University of Arizona Press.

Warren, P. (1972). *Myrtos. An Early Bronze Age Settlement in Crete*. London: British School at Athens.

Warren, P. and Hankey, V. (1989). *Aegean Bronze Age Chronology*. Bristol: Bristol Classical Press.

Weiberg, E. (2007). *Thinking the Bronze Age: Life and death in Early Helladic Greece*. (Uppsala Studies in Ancient Mediterranean and Near Eastern Civilizations 29). Uppsala: Uppsala Universitet.

Weiberg, E. (2010). Pictures and people: seals, figurines and Peloponnesian imagery. *Opuscula. Annual of the Swedish Institutes at Athens and Rome* 3, 185–218.

Weiberg, E. (2017). Contrasting Histories in Early Bronze Age Aegean: Uniformity, Regionalism and the Resilience of Societies in the Northeast Peloponnese and Central Crete. *Cambridge Archaeological Journal* 27(3), 479-494.

Weiberg, E. and Finné, M. (2013). Mind or matter? People-environment interactions and the demise of Early Helladic II society in the northeastern Peloponnese. *American Journal of Archaeology* 117(1), 1–31.

Weinberg, S. (1969). A Gold Sauceboat in The Israel Museum. *Antike Kunst 12*(1), 3-8.

Weingarten, J., Macveagh Thorne, S., Prent, M. and Crouwel, J.H. (2011). More Early Helladic sealings from Geraki in Laconia, Greece. *Oxford Journal of Archaeology* 30, 131-63.

Wenger, E. (1998). *Communities of Practice: Learning, Meaning and Identity*. Cambridge: Cambridge University Press.

Wengrow, D. (2008). Prehistories of Commodity Branding. *Current Anthropology 49*(1), 7-34.

Whitbread, I.K. (1995). *Greek Transport Amphorae: a petrological and archaeological study*. London: British School at Athens.

Whitbread, I.K. (1996). Detection and interpretation of preferred orientation in ceramic thin sections. In: I. Stratis, M. Vavelidis, K. Kotsakis, G. Tsokas, E. Tsoukala (eds.) *Archaeometrical and Archaeological Research in Macedonia and Thrace. Proceedings of the 2nd Symposium, Thessaloniki 26-28 May 1993*. 413-425. Thessaloniki: Hellenic Archaeometrical Society.

Whitbread, I. K. and Mari, A. (2014). Provenance and Proximity: A Technological Analysis of Late and Final Neolithic Ceramics from Euripides Cave, Salamis. *Journal of Archaeological Science* 41, 79-88.

Whitelaw, T. (2004). Alternative Pathways to Complexity in the Southern Aegean. In: J. Barrett and P. Halstead (eds.) *The Emergence of Civilisation Revisited*. 232-256. Oxford: Oxbow Books.

Whitelaw, T. (2014). Feasts of clay? Ceramics and feasting at Early Minoan Myrtos: Fournou Korifi. In: Y. Galanakis, T. Wilkinson and J. Bennet (eds.) *ΑΘΥΡΜΑΤΑ: Critical essays on the archaeology of the Eastern Mediterranean in honour of E. Susan Sherratt*. 247-259. Oxford: Archaeopress.

Whitelaw, T., Day, P. M., Kiriatzi, E., Kilikoglou, V. and Wilson, D. E. (1997). Ceramic Traditions at EM IIB Myrtos, Fournou Korifi. In: R. Laffineur and P. P. Betancourt (eds.) *TEXNH: Craftsmen, Craftswomen and Craftsmanship in the Aegean Bronze Age. Proceedings of the 6th International Aegean Conference, Philadelphia, Temple University, 18-21 April 1996. Aegaeum* 16. 265-274. Liège: Université de Liège.

Whitney, D. L. and Evans, B.W. (2010). Abbreviations for names of rock-forming minerals. *American Mineralogist* 95, 185–187.

Wiencke, M.H. (1969). Further Seals and Sealings from Lerna. *Hesperia* 38, 500-521.

Wiencke, M.H. (1989). Change in Early Helladic II. *American Journal of Archaeology 93*(4), 495-509.

Wiencke, M.H. (2000). *Lerna: A Preclassical Site in the Argolid. Results of Excavations conducted by the American School at Athens*. Vol. IV: *The Architecture, Stratification, and Pottery of Lerna III*. New Jersey: American School of Classical Studies at Athens.

Wiencke, M.H. (2011). Further thoughts on the Lerna sealings. In: D.Katsonopoulou (ed.) *Helike IV. Ancient Helikeand Aigialeia*. 221-231. Athens: Helike Society Publications.

Wilson, D.E. (1985). The Pottery and Architecture of the EMIIA West Court House at Knossos. *Annual of the British Schools at Athens* 80, 281-364.

Wilson, D.E. (1987). Kea and East Attike in Early Bronze II. Beyond pottery typology. In: J. M. Fossey (ed.) *Syneisfora McGill I. Papers in Greek Archaeology and History, in memory of C. D. Gordon*. 35-49. Amsterdam: J.C. Gieben.

Wilson, D.E. (1994). Knossos before the Palaces: An Overview of the Early Bronze Age (EMI - EM III). In: D. Evely, H. Hughes-Brock and N. Momigliano (eds.) *Knossos: A Labyrinth of History. Papers Presented in Honour of Sinclair Hood*. 23-44. London: British School at Athens.

Wilson, D.E. (1999). *Keos IX. Ayia Irini: Periods I-III. The Neolithic and Early Bronze Age Settlements*. Mainz am Rhein: Philipp von Zabem.

Wilson, D.E. (2007). Early Prepalatial (EMI-EMII): EMI Well, West Court House, North-East Magazines and South Front Groups. In: N. Momigliano (ed.) *Knossos Pottery Handbook: Neolithic And Bronze Age (Minoan)*. British School at Athens Studies 14, 49-77. London: British School at Athens.

Wilson, D.E. (2013). Ayia Irini II-III, Kea: The Phasing and Relative Chronology of the Early Bronze Age II Settlement. *Hesperia* 82(3), 385-434.

Wilson, D.E. and Day, P.M. (1994). Ceramic Regionalism in Prepalatial Central Crete: The Mesara Imports at EM I to EM IIA Knossos. *Annual of the British Schools at Athens* 89, 1–87.

Wilson, D.E. and Day, P.M. (2000). EMI chronology and social practice: pottery from the early palace tests at Knossos. *Annual of the British Schools at Athens* 95, 21-63.

Wilson D.E., Day, P.M. and Dimopoulou-Rethemiotaki, N. (2008). The Gateway Port of Poros-Katsambas: Trade and Exchange between North-central Crete and the Cyclades in EBI-II. In: N. Brodie, J. Doole, G. Gavalas, and C. Renfrew (eds.) *Horizon, a colloquium on the Prehistory of the Cyclades*. 261-270. Cambridge: McDonald Institute.

Woods, A.J. (1985). An introductory note on the use of tangential thin sections for distinguishing between wheel-thrown and coil/ring-built vessels. *Bulletin of the Experimental Firing Group* 3, 100-114.

Yiouni P. (1995). Technological analysis of the Neolithic pottery from Makri. *Bulletin de correspondance hellénique*. Vol. 119, 607-620.

Yiouni, P. (2000). Painted Pottery from East Macedonia, in North Greece: Technological Analysis of Decorative Techniques. *Documenta Praehistorica* XXVII, 198-214.

Yiouni, P. (2001). Surface treatment of Neolithic vessels from Macedonia and Thrace. *The Annual of the British School at Athens* 96, 1-25.

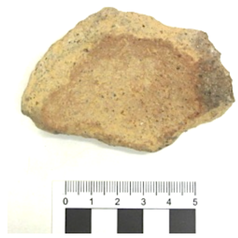
Zapheiropoulou, P. (1984). The Chronology of the Kampos Group. In: J. A. MacGillivray and R. L. N. Barber (eds.) *The Prehistoric Cyclades*. 31-40. Edinburgh: Department of Classical Archaeology.

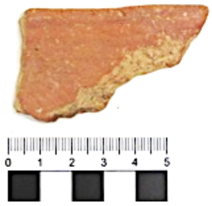
Zgouleta, Z. (2020). Neolithic settlement at Gyalou, Spata. In: N. Papadimitriou, J. Wright, S. Fachard, N. Polychronakou-Sgouritsa and E. Andrikou (eds.) *Athens and Attica in Prehistory: Proceedings of the International Conference, Athens, 27–31 May 2015*. 97-104. Oxford: Archaeopress.

Appendix I: Catalogue of samples

List of studied pottery samples from Kontopigado, with an indication of chronological phase, pottery unit, vessel shape, surface treatment and petrographic fabric groups. Pottery sherds with no clear surface treatment observed on the surface are left blank in the catagloue. Samples 18/3, 12, 60, 61, 62, 63, 64, 65, 72, and 99 are not included in the analytical programme of this thesis.

Sample no.	Period	Pottery Unit	Vessel shape	Surface treatment	FG	Figure
18/1	EH I	170	Bowl	Red slip and burnish	19	
18/2	EH I	245	Closed vessel		1	
18/4	EH I	268	Baking plate		19	
18/5	EH I	268	Bowl		1	
18/6	EH I	268	Basin	Burnish	19	

Sample no.	Period	Pottery Unit	Vessel shape	Surface treatment	FG	Figure
18/7	EH I	268	Shallow bowl	Red slip and burnish	4	
18/8	EH I	268	Deep bowl/basin		17	
18/9	EH I	277	Closed vessel		8	
18/10	EH I	279	Closed vessel		15	
18/11	EH I	279	Closed shape		17	
18/13	EH I	292	Basin		19	

Sample no.	Period	Pottery Unit	Vessel shape	Surface treatment	FG	Figure
18/14	EH I	292	Deep bowl/basin	Red slip and burnish	1	
18/15	EH I	292	Bowl	Red slip	3	
18/16	EH I	292	Baking plate	Burnish	1	
18/17	EH I	292	Bowl		1	
18/18	EH I	292	Closed vessel		19	
18/19	EH I	297	Cheese-pot		17	
18/20	EH I	339	Basin	Black burnished	19	

Sample no.	Period	Pottery Unit	Vessel shape	Surface treatment	FG	Figure
18/21	EH I	340	Bowl	Red slip and burnish	6	
18/22	EH I	341	Shallow bowl	Red slip and burnish	3	
18/23	EH I	341	Bowl		1	
18/24	EH I	377	Pedestalled open vessel		1	
18/25	EH I	377	Closed vessel	Red slip	6	
18/26	EH I	377	Shallow bowl	Red slip and burnish	6	
18/27	EH I	382	Jar		4	

Sample no.	Period	Pottery Unit	Vessel shape	Surface treatment	FG	Figure
18/28	EH I	382	Jar	Burnish	7	
18/29	EH I	383	Shallow bowl	Black slip and burnish	19	
18/30	EH I	383	Baking plate	Burnish	1	
18/31	EH I	383	Shallow bowl	Burnish	6	
18/32	EH I	383	Closed vessel		loner	
18/33	EH I	383	Cheese-pot		1	
18/34	EH I	384	Handle	Red slip and burnish	loner	

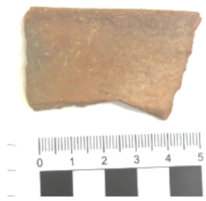
Sample no.	Period	Pottery Unit	Vessel shape	Surface treatment	FG	Figure
18/35	EH I	388	Jar		1	
18/36	EH I	388	Shallow bowl	Red slip and burnish, mottled	4	
18/37	EH I	389	Bowl	Red and brown slip and burnish, mottled	4	
18/38	EH I	389	Closed vessel		loner	
18/39	EH I	390	Deep bowl/basin		3	
18/40	EH I	390	Shallow bowl		7	

Sample no.	Period	Pottery Unit	Vessel shape	Surface treatment	FG	Figure
18/41	EH I	390	Closed vessel		16	
18/42	EH I	392	Bowl	Brown slip and impression on lip	6	
18/43	EH I	392	Bowl	Red slip and burnish	8	
18/44	EH I	392	Basin/bowl	Red slip (exterior) and black slip (interior)	6	
18/45	EH I	392	Cylindrical cup		1	
18/46	EH I	392	Basin	Red to brown slip and burnish	4	

Sample no.	Period	Pottery Unit	Vessel shape	Surface treatment	FG	Figure
18/47	EH I	424β	Pithoid jar		8	
18/48	EH I	424β	Shallow bowl	Black slip and burnish	loner	
18/49	EH I	424β	Basin		9	
18/50	EH I	424β	Pyxis		loner	
18/51	EH I	424β	Closed vessel		1	
18/52	EH I	424β	Handle		loner	
18/53	EH I	425α	Shallow bowl	Red slip and burnish	1	

Sample no.	Period	Pottery Unit	Vessel shape	Surface treatment	FG	Figure
18/54	EH I	425α	Bowl		1	
18/55	EH I	425β	Bowl		1	
18/56	EH I	425β	Basin	Burnish	19	
18/57	EH I	425β	Bowl		17	
18/58	EH I	425β	Jug/jar		1	
18/59	EH I	425β	Pithos		8	

Sample no.	Period	Pottery Unit	Vessel shape	Surface treatment	FG	Figure
18/66	EH I	428	Bowl	Red slip and burnish	4	
18/67	EH I	430	Bowl		1	
18/68	EH I	430	Jar		1	
18/69	EH I	431	Shallow bowl	Brown slip and burnish	1	
18/70	EH I	431	Baking plate		17	
18/71	EH I	431	Cheese-pot		1	

Sample no.	Period	Pottery Unit	Vessel shape	Surface treatment	FG	Figure
18/73	EH I	436	Deep bowl		1	
18/74	EH I	436	Basin	Burnish and applique	1	
18/75	EH I	437	Basin		1	
18/76	EH I	437	Basin	Red to black slip and burnish	19	
18/77	EH I	438	Shallow bowl	Red slip and burnish, impression on lip	1	
18/78	EH I	438	Bowl		1	

Sample no.	Period	Pottery Unit	Vessel shape	Surface treatment	FG	Figure
18/79	EH I	438	Bowl		1	
18/80	EH I	438	Miniature conical cup		1	
18/81	EH I	438	Closed vessel	Black burnish	15	
18/82	EH I	438	Shallow bowl	Brown slip and burnish	8	
18/83	EH I	438	Shallow bowl	Red slip and burnish	4	
18/84	EH I	438	Deep bowl	Light brown to red slip and burnish	6	
18/85	EH II	438	Basin	Grey/white slip	7	

Sample no.	Period	Pottery Unit	Vessel shape	Surface treatment	FG	Figure
18/86	EH I	441α	Pithos		7	
18/87	EH I	441α	Shallow bowl	Red and brown slip and burnish	4	
18/88	EH I	441α	Bowl	Brown slip and burnish	1	
18/89	EH I	441α	Deep bowl	Red slip and burnish	loner	
18/90	EH I	441α	Shallow bowl	Burnish	1	
18/91	EH I	441β	Bowl	Burnish	1	

Sample no.	Period	Pottery Unit	Vessel shape	Surface treatment	FG	Figure
18/92	EH I	441β	Open vessel	Slipped, red to brown/black mottled	9	
18/93	EH I	441β	Jar	Red slip	10	
18/94	EH II	446	Collared jar	Brown slip and burnish and red slip	8	
18/95	EH I	446	Shallow bowl	Red slip and burnish	3	
18/96	EH I	449	Bowl	Burnish	1	
18/97	EH I	449	Closed vessel		1	

Sample no.	Period	Pottery Unit	Vessel shape	Surface treatment	FG	Figure
18/98	EH II	449	Closed vessel	Grey/white slip	7	
18/100	EH I	451	Handle	Red slip and burnish	1	
18/101	EH II	177	Sauceboat or saucer?	Bluish grey slip	6	
18/102	EH II	177	Bowl		5	
18/103	EH II	177	Bowl		5	
18/104	EH II	177	Bowl	White slip and polish	5	
18/105	EH II	177	Jar	Black slip	12	

Sample no.	Period	Pottery Unit	Vessel shape	Surface treatment	FG	Figure
18/106	EH II	177	Sauceboat	Bluish grey to white slip (exterior) and creamy white slip (interior)	11	
18/107	EH II	182	Shallow bowl		12	
18/108	EH II	182	Open vessel		12	
18/109	EH II	182	Bowl		5	
18/110	EH II	182	Saucer	Silver grey slip (exterior) and white slip (interior)	11	
18/111	EH II	182	Dish		11	

Sample no.	Period	Pottery Unit	Vessel shape	Surface treatment	FG	Figure
18/112	EH II	182	Bowl		14	
18/113	EH II	182	Shallow bowl		5	
18/114	EH II	182	Jar	Black slip (exterior and inner rim)	13	
18/115	EH II	182	Bowl	Pink slip	5	
18/116	EH II	182	Jar	Smooth	loner	
18/117	EH II	182	Sauceboat	Bluish grey to white slip	11	

Sample no.	Period	Pottery Unit	Vessel shape	Surface treatment	FG	Figure
18/118	EH II	182	Jar	Grey slip	13	
18/119	EH II	182	Jar		18	
18/120	EH II	182	Basin	White slip	5	
18/121	EH II	182	Basin		5	
18/122	EH II	182	Jug	White slip	loner	
18/123	EH II	182	Saucer		5	

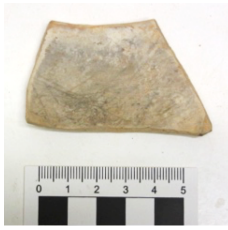
Sample no.	Period	Pottery Unit	Vessel shape	Surface treatment	FG	Figure
18/124	EH II	182	Bowl		5	
18/125	EH II	182	Pipe		loner	
18/126	EH II	182	Collared jug/jar	Red slip and burnish	5	
18/127	EH II	182	Saucer	Red slip	8	
18/128	EH II	182	Pedestalled bowl		loner	
18/129	EH II	182	Bowl		16	

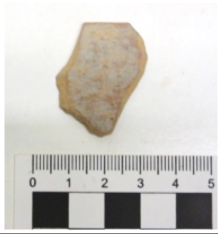
Sample no.	Period	Pottery Unit	Vessel shape	Surface treatment	FG	Figure
18/130	EH II	182	Bowl		1	
18/131	EH II	182	Pithos/jar		5	
18/132	EH II	182	Closed vessel		loner	
18/133	EH II	182	Open vessel	Polish/scoring	2	
18/134	EH II	182	Jar (waster?)		5	
18/135	EH II	182	Jar (waster)	Black slip	8	
18/136	EH II	182	Jug	Red slip (exterior)	5	

Sample no.	Period	Pottery Unit	Vessel shape	Surface treatment	FG	Figure
18/137	EH II	239	Bowl	Black brown slip	5	
18/138	EH II	239	Basin	Red slip	5	
18/139	EH II	239	Bowl/sauceboat		5	
18/140	EH II	302	Large bowl (waster)	Bluish grey slip	11	
18/141	EH II	302	Jar (waster)		8	
18/142	EH II	302	Jar		5	

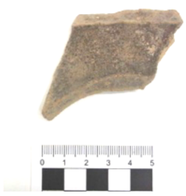
Sample no.	Period	Pottery Unit	Vessel shape	Surface treatment	FG	Figure
18/143	EH II	302	Sauceboat	Grey to white slip	11	
18/144	EH II	302	Dish	Burnish (interior)	5	
18/145	EH II	302	Bowl	Bluish grey slip	5	
18/146	EH II	302	Saucer	Brown slip (exterior) and buff white slip (interior)	5	
18/147	EH II	302	Saucer	Brown slip (exterior) and buff white slip (interior)	8	
18/148	EH II	305	Bowl	Polish	5	

Sample no.	Period	Pottery Unit	Vessel shape	Surface treatment	FG	Figure
18/149	EH II	305	Bowl	Polish	5	
18/150	EH II	305	Sauceboat	Red slip	loner	
18/151	EH II	305	Jar	Red slip	5	
18/152	EH II	318	Closed vessel		8	
18/153	EH II	318	Closed vessel	Black slip	loner	
18/154	EH II	318	Bowl	White slip	5	
18/155	EH II	318	Pithos		5	

Sample no.	Period	Pottery Unit	Vessel shape	Surface treatment	FG	Figure
18/156	EH II	318	Sauceboat	White slip (exterior) and bluish grey to white slip (interior)	11	
18/157	EH II	318	Jar (waster)		8	
18/158	EH II	318	Sauceboat	Bluish grey slip (exterior) and highly burnished (interior)	12	
18/159	EH II	318	Sauceboat	Red slip	12	
18/160	EH II	318	Jar	Red slip, mottled	5	
18/161	EH II	318	Shallow bowl	White slip	5	
18/162	EH III/ MH?	318	Open vessel		19	

Sample no.	Period	Pottery Unit	Vessel shape	Surface treatment	FG	Figure
18/163	EH II	318	Jar	Grey/white slip	5	
18/164	EH II	318	Shallow bowl	Black slip	8	
18/165	EH II	318	Sauceboat	Bluish grey slip (exterior) and dark brown slip (interior)	11	
18/166	EH II	318	Jar	Brown slip	8	
18/167	EH II	318	Open vessel with ring foot	Black brown slip	2	
18/168	EH II	318	Bowl	Bluish grey slip (exterior) and dark brown to red slip (rim and interior)	11	
18/169	EH II	318	Goblet	Bluish grey to white slip	5	

Sample no.	Period	Pottery Unit	Vessel shape	Surface treatment	FG	Figure
18/170	EH II	318	Basin	White slip	5	
18/171	EH II	318	Basin	Black slip	5	
18/172	EH II	318	Collared jar	Red slip	5	
18/173	EH II	319	Jug	Brown slip	5	
18/174	EH II	319	Bowl		5	
18/175	EH II	319	Conical cup		12	
18/176	EH II	319	Jar		2	

Sample no.	Period	Pottery Unit	Vessel shape	Surface treatment	FG	Figure
18/177	EH II	319	Jar	Polish	6	
18/178	EH II	319	Basin		5	
18/179	EH II	319	Jar		18	
18/180	EH II	319	Dish		5	
18/181	EH II	319	Bowl		5	
18/182	EH II	319	Jug (waster)		8	
18/183	EH II	319	Jug (waster)		8	

Sample no.	Period	Pottery Unit	Vessel shape	Surface treatment	FG	Figure
18/184	EH II	319	Goblet	Pink slip	11	
18/185	EH II	321	Open vessel	Brown slip	5	
18/186	EH II	321	Shallow bowl		5	
18/187	EH II	321	Shallow bowl		16	
18/188	EH II	325	Shallow bowl	Brown slip (exterior) and red slip (interior)	4	
18/189	EH II	379	Bowl	Heavy polish	19	
18/190	EH II	379	Basin	Red slip and burnish	8	

Sample no.	Period	Pottery Unit	Vessel shape	Surface treatment	FG	Figure
18/191	EH II	379	Bowl	Red slip and burnish	6	
18/192	EH II	379	Bowl	Brown slip	5	
18/193	EH II	379	Bowl		14	
18/194	EH II	379	Shallow bowl	Red slip and burnish	5	
18/195	EH II	379	Bowl		11	
18/196	EH II	380	Cooking pot		loner	
18/197	EH II	380	Saucer	Black slip	11	

Sample no.	Period	Pottery Unit	Vessel shape	Surface treatment	FG	Figure
18/198	EH II	380	Sauceboat	Brown slip	11	
18/199	EH II	380	Basin	Black slip	1	
18/200	EH II	380	Closed vessel	Brown slip	10	

Appendix II: Petrographic descriptions

Abbreviations

List of abbreviations used in the petrographic descriptions.

a	angular
c:f:v	coarse fraction:fine fraction:voids ratio
FG	fabric group
PPL	plane polarized light
r	rounded
sa	sub-angular
sr	sub-rounded
TCFs	textural concentration features
XP	crossed polars

Fabric group 1 (Dominant muscovite schist fabric)

Sample no.	Vessel shape	Surface treatment
Kon18/2	Closed vessel	
Kon18/5	Bowl	
Kon18/14	Deep bowl/basin	Red slip and burnish
Kon18/16	Baking plate	Burnish
Kon18/17	Bowl	
Kon18/23	Bowl	
Kon18/24	Pedestalled open vessel	
Kon18/30	Baking plate	Burnish
Kon18/33	Cheese-pot	
Kon18/35	Jar	
Kon18/45	Cylindrical cup	
Kon18/51	Closed vessel	
Kon18/53	Shallow bowl	Red slip and burnish
Kon18/54	Bowl	
Kon18/55	Bowl	
Kon18/58	Jug/jar	
Kon18/67	Bowl	
Kon18/68	Jar	

Sample no.	Vessel shape	Surface treatment
Kon18/69	Shallow bowl	Brown slip and burnish
Kon18/71	Cheese-pot	
Kon18/73	Deep bowl	
Kon18/74	Basin	Burnish and applique
Kon18/75	Basin	
Kon18/77	Shallow bowl	Red slip and burnish, impression on lip
Kon18/78	Bowl	
Kon18/79	Bowl	
Kon18/80	Miniature conical cup	
Kon18/88	Bowl	Brown slip and burnish
Kon18/90	Shallow bowl	Burnish
Kon18/91	Bowl	Burnish
Kon18/96	Bowl	Burnish
Kon18/97	Closed vessel	
Kon18/100	Handle	Red slip and burnish
Kon18/130	Bowl	
Kon18/199	Basin	Black slip

Microstructure

This group consists of very few to rare mega vughs and channel voids, common to rare macro vughs and channel voids, very rare meso channel voids and vesicles. The voids tend to be randomly distributed, single- to double-spaced. The aplastic inclusions are close- to single-spaced and have no preferred orientation.

Groundmass

Homogeneous in terms of texture and inclusions types but slightly heterogeneous in colour. The micromass is yellow, orange brown, brown, dark brown to grey in PPL and light grey, yellow, yellowish brown, orange, reddish orange, red, reddish brown to black in XP (x40). Sometimes yellow patches can be observed in PPL and textural concentration features are present. Optical activity varies from strongly active to inactive. Some samples (Kon18/2, 14, 58, 67 and 91) display different core/margin colours and optical activity, showing slight optical activity or are inactive in the core and moderately to highly optically active in the margins. Kon 18/74 exhibits higher optical activity in the core and slight optical activity in the margins.

Inclusions

c:f:$v_{10\mu m}$ ca. 25:70:5 to 45:40:15
Coarse fraction = 5.6 mm to 0.13 mm
Fine fraction = 0.13 mm or less
The inclusions appear to have a bimodal grain size distribution with moderately sorting of inclusions.

Coarse Fraction

Dominant to common	Muscovite ± opaque ± biotite schist, a-sa., elongate, size = 5.6 mm or less, mode = 1.5 mm. Frequently with opaque (veins), few with biotite and rarely with amphibole.
Few	Polycrystalline quartz, a-sa., elongate and equant, size = 2.2 mm or less, mode = 0.8 mm.
Few to very few	Quartz, a., size = 2.48 mm or less, mode = 0.4 mm. The discrete angular quartz may disaggregate from metamorphic rock fragments and polycrystalline quartz?
	Phyllite, a-sr., elongate, size = 1.5 mm or less, mode = 0.4 mm.
Very rare to absent	Sillimanite-amphibole schist, a., size = 0.76 mm.
	Sandstone, sa., equant, size = 0.13 mm.
	Mudstone, sa., size = 0.72 mm. Containing quartz and muscovite mica laths.
	Chert, a-r., size = 0.462 mm or less.
	Limestone, a., size = 0.8 mm.
	Calcite, r., size = 0.56 mm or less. Mostly grades into sparite and micrite.
	Microfossils, elongate, size = 2.08 mm. Infilling with micrite.
	Amphibole, a., size = 0.64 mm or less.
	Plagioclase feldspar, a., size = 0.48 mm.

Fine Fraction

Frequent to common	Mica, laths. Quartz.

Variants

Kon18/2 and 79
These samples are compatible with the main group, with additional TCFs, possibly clay pellets. The textural concentration features (TCFs) have clear to merging boundaries, are angular to subrounded, prolate and equant and distorted, of neutral optical density, concordant with the host fabric. The TCFs are consistent with the host clay.

Kon18/14, 16, 58, 68, 77 and 91
As the main group but the common to few elongate voids are the result of organic material burning out during firing, suggesting the addition of organic vegetal material as temper.

Kon18/24
As the main group but with very rare amphibole (green in PPL and yellow to orange in XP).

Kon18/69 and 80
As the main group but with very rare calcareous materials (bioclast limestone and micrite).

Kon18/199
As the main group but with very few micrite and very rare limestone. The section has a more oxidised interior and reduced exterior, suggesting a partial reducing atmosphere.

Fabric group 2 (Biotite schist and shimmer phyllite fabric)

Sample no.	Vessel shape	Surface treatment
Kon18/133	Open vessel	Polish/scoring
Kon18/167	Open vessel with ring foot	Black brown slip
Kon18/176	Jar	

Microstructure

There are common macro vughs and channel voids, randomly distributed and close- to single-spaced. The aplastic inclusions appear to have a random orientation, close- to single-spaced.

Groundmass

Homogeneous. The colour is generally reddish brown to dark grey in PPL and dark brown to black in XP (x40). Optical activity is very weak to absent, suggesting a high firing temperature.

Inclusions

c:f:v$_{10\mu m}$ ca. 30:55:15
Coarse fraction = 2.16 mm to 0.16 mm
Fine fraction = 0.16 mm or less
The inclusions appear to be poorly sorted and have a bimodal grain size distribution.

Coarse Fraction

Few to very few	Metamorphic rock fragments: Phyllite, a., size = 2.16 mm or less, mode = 1.04 mm. Shimmering. Mostly muscovite mica, sometimes with biotite, amphibole and rarely with opaque. Biotite schist, a., size = 1.84 mm or less, mode = 0.92 mm. very few contains feldspar.
	Quartz, a., size = 0.3 mm or less, mode = 0.24 mm. The discrete angular monocrystalline quartz may disaggregate from metamorphic rock fragments and polycrystalline quartz?
Very few to rare	Polycrystalline quartz, sa., size = 1.48 mm or less, mode = 0.46 mm.
	Biotite mica laths, a., size = 0.72 mm or less.
Rare	Pyroxene, a., size = 0.64 mm or less.
Very rare	Orthoclase feldspar, sa-sr., size = 0.8 mm. Frequently displaying simple twinning.

Fine Fraction

Common	Quartz.
Few	Pyroxene.
Very few	Mica laths (both biotite and muscovite mica).

Fabric group 3 (Micrite and serpentine fabric)

Sample no.	Vessel shape	Surface treatment
Kon18/15	Bowl	Red slip
Kon18/22	Shallow bowl	Red slip and burnish
Kon18/95	Shallow bowl	Red slip and burnish
Variant		
Kon18/39	Deep bowl/basin	

Microstructure

There are very rare macro vughs and channel voids, rare meso vughs, close- to open-spaced. Aplastic inclusions have no preferred orientation, close- to single-spaced.

Groundmass

Homogeneous. Reddish orange and brown to brown in PPL, reddish brown to brown in XP (x40), optically slightly active.

Inclusions

c:f:$v_{10\mu m}$ ca. 22:76:2
Coarse fraction = 2.08 mm to 0.2 mm
Fine fraction = 0.2 mm or less
Bimodal grain size distribution with moderate sorting. The aplastic inclusions in Kon18/15 are slightly coarser.

Coarse Fraction

Common to few	Micrite
Few	Polycrystalline quartz, a. size = 1.76 mm or less, mode = 0.4 mm.
Few to very few	Quartz, a. size = 0.5 mm or less, mode= 0.2 mm.
	Serpentine, sa-sr., elongate. size = 1 mm or less, mode =0.4 mm. Altered, frequently contains speckles of opaque. Dark brown in PPL, yellow to orange in XP.
Few to rare	Muscovite schist, a-sr. size = 1.05 mm or less, mode = 0.8 mm. Mostly composed by muscovite mica and opaque, rarely biotite.

Very few	Opaque.
Very few to very rare	Sparite, sa-sr. size = 2.08 mm or less.
Rare to very rare	Phyllite, a. size = 0.8 mm or less, mode = 0.45 mm. Almost composed by muscovite mica laths.
Very rare	Shale, sa., elongate. Size = 0.66 mm or less.
	Yellow mineral (possibly serpentine?), sr., elongate. Size = 0.9 mm or less.
Very rare to absent	Chert, sa., equant. Size = 1.32 mm or less.
	Sandstone, sr. size = 1.45 mm or less. It contains quartz, mica laths and schist fragments.
	Siltstone, sa. size =1.6 mm or less.
	Calcium carbonate, r. size = 1.2 mm or less.
	Epidote-calcite-quartz-micrite aggregate, sa., size = 0.92 mm or less.

Fine fraction

Common	Quartz
Rare	Sparite
Very rare to absent	Mica laths (both biotite and muscovite). Microfossils.

Textural concentration features

Rare. r. Clear boundaries, rounded to well-rounded, equant, high optical density, discordant with the groundmass. Brown in PPL and red to brown in XP. Presumably clay pellets, representing possible signs of clay mixing.

Variant

Kon18/39

This sample is the coarser version of the main group and additional clinopyroxene (?) with higher percentage of voids. The partial elongate voids and inclusions exhibit parallel to the vessel margins. The moderate optical activity in the groundmass is suggesting a relatively lower firing regime.

Fabric group 4 (Ultrabasic and marble fabric)

Sample no.	Vessel shape	Surface treatment
Kon18/7	Shallow bowl	Red slip and burnish
Kon18/27	Jar	
Kon18/36	Shallow bowl	Red slip and burnish, mottled
Kon18/37	Bowl	Red and brown slip and burnish, mottled
Kon18/46	Basin	Red to brown slip and burnish
Kon18/66	Bowl	Red slip and burnish
Kon18/83	Shallow bowl	Red slip and burnish
Kon18/87	Shallow bowl	Red and brown slip and burnish
Kon18/188	Shallow bowl	Brown slip (exterior) and red slip (interior)

Microstructure

This group contains common to rare voids, including few to rare macro and common to few meso vughs with rare channel voids, single- to open-spaced and has no preferred orientation. The aplastic inclusions are closed- to double-spaced, randomly distributed.

Groundmass

This group is homogeneous with respect to voids and types of inclusions but heterogeneous in colour and optical activity. The colour ranges from brown to orange brown in PPL and orange, brown, dark brown and black (Kon18/188) in XP (x40). Optical activity generally ranges from inactive to slightly active, indicating a small range of higher firing temperature, with the exception of Kon18/46, which presents strong optical activity suggesting a much lower firing temperature.

Inclusions

c:f:$v_{10\mu m}$ ca. 6:93:1 to 17:78:5
Coarse fraction = 1.65mm to 0.06 mm
Fine fraction = 0.06 mm or less
The aplastic inclusions are poorly to moderately sorted and have a unimodal grain size distribution.

Coarse Fraction

Common to few	Pyroxene, a-r., size = mode = 0.06 mm. Mostly clinopyroxene with second order yellow, pink, green and blue.
	Micrite.
Few to very few	Ultrabasic rock fragments, sa-sr., size = 1.06 mm or less, mode = 0.8 mm. Mostly contains plagioclase feldspar, clinopyroxene and orthoclase feldspar (simple twinned).
	Marble, sa-r., size = 1.65 mm or less, mode = 0.73 mm. Sometimes disaggregated to calcite crystals or grades into sparite (sa-sr., size = 0.20-0.33 mm).
Very few to rare	Polycrystalline quartz, sa-sr., size = 1.06 mm or less, mode = 0.58 mm.
	Plagioclase, a., size = 0.55 mm or less. Polysynthetic twinning.
	Alkali feldspar, sr., equant, size = 0.16 mm or less. Sometimes altered.
	Quartz, a-sa., size = 0.12-0.55 mm, mode = 0.4 mm.
Rare	Biotite schist, sa-r., size = 0.76-0.83 mm. Microfossils.
Very rare	Chert, sa., size = 0.12 mm or less.
Very rare to absent	Serpentine, sa., size = 0.47 mm. Occasionally shows mesh texture. Yellow in PPL and XP.

Fine Fraction

Common to few	Quartz.
Few	Pyroxene (mostly clinopyroxene).
Very few to rare	Micrite.
Rare to very rare	Mica laths (mostly muscovite).

Textural concentration features

Kon18/46. Few. Diffuse boundaries, sa-r., mostly rounded, equant and distorted, neutral to low optical density, discordant. It contains quartz, plagioclase feldspar and schist fragments in a fine matrix. Light brown in PPL and dark grey in XP. Possibly clay pellets.

Fabric group 5 (Calcite well-sorted sand fabric)

Sample no.	Vessel shape	Surface treatment
Kon18/104	Bowl	White slip and polish
Kon18/109	Bowl	
Kon18/113	Shallow bowl	
Kon18/115	Bowl	Pink slip
Kon18/120	Basin	White slip
Kon18/121	Basin	
Kon18/124	Bowl	
Kon18/126	Collared jug/jar	Red slip and burnish
Kon18/136	Jug	Red slip (exterior)
Kon18/137	Bowl	Black brown slip
Kon18/138	Basin	Red slip
Kon18/139	Bowl/sauceboat	
Kon18/142	Jar	
Kon18/144	Dish	Burnish (interior)
Kon18/146	Saucer	Brown slip (exterior) and buff white slip (interior)
Kon18/148	Bowl	Polish
Kon18/149	Bowl	Polish
Kon18/151	Jar	Red slip
Kon18/154	Bowl	White slip
Kon18/155	Pithos	
Kon18/160	Jar	Red slip, mottled
Kon18/163	Jar	Grey/white slip
Kon18/169	Goblet	Bluish grey to white slip
Kon18/170	Basin	White slip
Kon18/171	Basin	Black slip
Kon18/173	Jug	Brown slip
Kon18/178	Basin	
Kon18/181	Bowl	
Kon18/186	Shallow bowl	
Variants		
Kon18/102	Bowl	

Sample no.	Vessel shape	Surface treatment
Kon18/103	Bowl	
Kon18/123	Saucer	
Kon18/131	Pithos/jar	
Kon18/134	Jar (waster?)	
Kon18/145	Bowl	Bluish grey slip
Kon18/161	Shallow bowl	White slip
Kon18/172	Collared jar	Red slip
Kon18/174	Bowl	
Kon18/180	Dish	
Kon18/185	Open vessel	Brown slip
Kon18/192	Bowl	Brown slip
Kon18/194	Shallow bowl	Red slip and burnish

Microstructure

There are few to very few voids. Very rare mega vughs, very few to rare macro vughs, few to rare meso vughs and vesicles, few to absent channel voids. Both voids and aplastic inclusions are randomly distributed, close- to single-spaced. Kon18/181 shows moderate alignment of voids parallel to vessel margins.

Groundmass

Heterogeneous. The colour in PPL is orange (Kon18/113, 121 and 151), brown to grey (Kon18/115, 154 and 169) and in XP is brown, reddish orange (Kon18/113, 151 and 160) to grey (Kon18/115, 136, 154 and 169) (x40). The micromass ranges from moderately to highly optically active in the low-fired samples to weakly optically active to inactive in the very high-fired samples.

Inclusions

c:f:$v_{10\mu m}$ ca. 20:65:15 to 10:85:5
Coarse fraction = 1.55 mm to 0.24 mm
Fine fraction = 0.24 mm or less
The inclusions appear to have a bimodal grain size distribution with well to moderately sorted inclusions.

Coarse Fraction

Common to few	Quartz, a., elongate and equant. size = 0.64 mm or less, mode = 0.4 mm.

Common to few	Calcite, a. size = 0.65 mm or less, mode= 0.4 mm. Frequently grades into sa-r. micrite and sparite aggregates.
Common to rare	Marble, a-sr., size = 1.05 mm, mode = 0.5 mm. The angular calcite possibly disaggregated from marble?
Few to rare	Metamorphic rock fragments: Muscovite-biotite schist, a., size = 0.96 mm or less, mode = 0.6 mm. Sometimes contains opaque (veins). Some shown the decussate texture. Muscovite schist, sa., size = 0.96 mm or less. Frequently composed of quartz and opaques. Phyllite, sr., size = 1.06 mm or less, mode = 0.5 mm. Mainly muscovite mica laths with or without opaque, sometimes crenulated and in few cases shown the decussate texture. Biotite-muscovite phyllite, sa-sr., size = 0.7 mm, mode = 0.3 mm.
	Epidote, a-sa., equant, size = 0.4 mm or less, mode = 0.32 mm. Very rarely with recrystallised quartz, size = 0.8 mm or less.
Few to very rare	Polycrystalline quartz, a-sa., elongate and equant, size = 1.28 mm or less, mode= 0.3 mm. Sometimes altered.
Few to absent	Bioclast limestone and microfossils, sa-sr., size = 0.73 mm, mode = 0.24 mm. Elongate and rounded microfossils (bivalves, gastropods and peloids?) in the fine micrite or sparite matrix.
Rare to absent	Biotite, a-sr., size = 0.88 mm or less. Sometimes appears as sr. aggregated laths.
	Mudstone, sa-r., size = 1.36 mm or less.
Very rare to absent	Plagioclase feldspar, a., elongate and equant, size = 0.3 mm or less. Frequently showing twinning and sometimes zoning.
	Alkali feldspar, a., size = 0.63 mm.
	Chert, sa., equant. Size = 1 mm or less, mode = 0.3 mm.
	Orange mineral, sr, size = 1.6 mm or less. Possibly the aggregates of amphibole.
	Siltstone, sa., size = 1.55 mm or less.

	Basalt, sa., size = 0.65 mm.
	Serpentine, sa-sr., size = 0.76 mm or less. Dark green in XP, orange in PPL; in Kon18/115 show green-brown in XP, yellow in PPL.

Fine Fraction

Common to few	Quartz. Opaque.
Few to rare	Mica laths. Epidote.

Textural Concentration Features

TCF1: Kon18/109, 113, 121, 144, 149, 151, 160, 163, 185 and 186.
Few. Clear to diffuse boundaries, a-r., equant and elongate, high optical density, discordant. Red in PPL and XP. Internal contains common to few quartz and mica laths (highly birefringent). This is the most common types of TCFs in this fabric group. Presumably clay pellets as the sign of clay mixing.

TCF2: Kon18/109, 138, 160 and 186.
Very few. Diffuse boundaries, elongate, sa-sr., neutral optical density, discordant. It contains higher amount of coarser grained of quartz and mica laths compare to the host clay. Yellowish brown in PPL and yellow to grey in XP. The possible sign of clay mixing.

TCF3: Kon18/113, 149 and 186.
Very rare. Clear boundaries, r., equant, high optical density, discordant and concordant. It contains very few inclusions of quartz in a yellow fine matrix. Kon18/149 shows zones of fine clay and fine clay pellets.

TCF4: Kon18/126, 148 and 186.
Very few. Clear boundaries, sa-r., equant, high to neutral optical density, discordant. Very fine brown clay pellets. Such clay pellets have been identified in LBA Kontopigado (Gilstrap 2015: 82, FG1, fig. 6.1).

<u>Variants</u>

Kon18/102
As the main group but this sample is packed with coarse-grained inclusions with the additional sedimentary rock fragments (siltstone, limestone and radiolarian cherts). This sample consists of TCFs as an indication of clay mixing.

Kon18/103, 123, 145, 161, 172 and 194

As the main group but these samples contain more frequent quartz-rich rock fragments (monocrystalline and polycrystalline quartz and quartz aggregates) and very rare alkali feldspars in both the fine and coarse fraction. Clay striations and textural concentration features (TCF1&TCF2) are common. The coarser quartz silt inclusions in the base clay exhibit considerable variability. Kon18/161 and 172 are identical, standing out by the occurrence of quartz and few mica laths in the matrix which are similar to Kon18/180. Furthermore, there are microfossils present in samples Kon18/161 and 172. The fine fraction of Kon18/194 additionally consists of slightly higher amount of mica laths.

Kon18/131 and 134

As the main group, but contain coarse-grained inclusions which have the same range of minerals as the main fabric together with the frequent to common elongate voids may result from the high proportion of sand temper (Müller et al. 2015: 835).

Kon18/174, 185 and 192

As the main group, but with fewer inclusions and mostly coarse-grained in a fine matrix. Kon18/185 exhibits streaky clay striations and brown fine clay pellets (similar to TCF4), presumably the sign of clay mixing.

Kon18/180

This sample is a fine version of the main group. It is composed of very few micrite, calcite and monocrystalline quartz in the coarse fraction and frequent to common quartz and mica laths in the fine fraction. The groundmass exhibits rim-core differentiation (brown core with orange-red margins) and moderate optical activity.

Fabric group 6 (Micrite and quartz sand in calcareous matrix fabric)

Sample no.	Vessel shape	Surface treatment
Kon18/21	Bowl	Red slip and burnish
Kon18/25	Closed vessel	Red slip
Kon18/26	Shallow bowl	Red slip and burnish
Kon18/31	Shallow bowl	Burnish
Kon18/42	Bowl	Brown slip and impression on lip
Kon18/44	Basin/bowl	Red slip (exterior) and black slip (interior)

Sample no.	Vessel shape	Surface treatment
Kon18/84	Deep bowl	Light brown to red slip and burnish
Kon18/101	Sauceboat or saucer?	Bluish grey slip
Kon18/177	Jar	Polish
Kon18/191	Bowl	Red slip and burnish

Microstructure

There are very few to rare mega vughs, rare macro vughs, very few meso vughs and vesicles, micro vesicles, rare to absent macro channel voids. The voids tend to be randomly distributed, single-spaced. The aplastic inclusions are close- to single-spaced and have no preferred orientation.

Groundmass

Heterogeneous. Yellowish to light brown in PPL and yellowish to greenish brown, brown and grey in XP (x40). Most samples show weak to absent optical activity indicating the high firing. Kon18/191 exhibits moderately active on the margins with the inactive core.

Inclusions

$c:f:v_{10\mu m}$ ca. 50:45:5
Coarse fraction = 3.2 mm to 0.3 mm
Fine fraction = 0.3 mm or less
The inclusions appear to have a bimodal grain size distribution and are well to moderately sorted.

Coarse Fraction

Common to few	Micrite.
Common to very few	Quartz, a-sa., size = 0.72 or less, mode = 0.32 mm. Mostly equant, sometimes elongate.
Common to rare	Calcite, a-sr., size = 0.66 mm or less, mode = 0.36 mm and 0.66 mm for subrounded and angular shapes respectively. It may suggest that the angular calcite is disaggregated from marble, whilst the subrounded calcite is naturally occurred in the tempering material or clay deposit? Frequently grades into sparite. Marble, a-r., elongate and equant, size= 3.2 mm or less,

	mode = 0.56 mm.
Common to absent	Microfossils (bivalves, ostracods?, gastropods, ooids or peloids?)
Few to rare	Polycrystalline quartz, sa-sr., size = 1.52 mm or less, mode= 0.5 mm. Sometimes altered.
	Muscovite schist, equant, sr., size = 1.2 mm, mode = 0.5 mm. Sometimes contains biotite, opaque.
Very few to very rare	Phyllite, sa.-sr., elongate, size = 1.84 mm or less, mode = 0.65 mm. Frequently contains opaque and sometimes biotite mica laths. Rarely crenulated.
	Opaque.
Rare to absent	Sandstone, a-r. elongate and equant, size = 2.7 mm or less, mode = 0.4 mm or less. Including quartz arenite and greywacke, mostly altered.
Very rare to absent	Biotite schist, sa., size = 0.5 mm or less.
	Siltstone, sa-r. elongate and equant, size = 0.54 mm or less. Some are composed of red clay and monocrystalline quartz.
	Limestone, sa., size = 0.46 or less.
	Shale, r., equant, size = 0.4 mm or less.
	Calcareous mudstone (marl), r., size = 1.04 mm or less. Frequently contain monocrystalline quartz.
	Chert, a-r., size = 0.8 mm or less. Sometimes with finely interspersed opaque minerals.
	Serpentine, sa., size = 1.12 mm or less. Altered, yellow to orange in PPL, yellow, green to brown in XP.
	Pyroxene, sa., size = 0.46 mm or less.
	Plagioclase, elongate and equant, sr., size = 0.3 mm or less. Frequently showing twinning and sometimes zoning.
	Microcline-plagioclase-quartz aggregate, r., size = 0.35 mm.

Fine Fraction

Common	Quartz. Micrite.
Few to very few	Opaque.

Textural concentration features

Kon18/101. TCF1: diffuse boundaries, sr., equant, low optical density, concordant with the host clay. TCF2: diffuse boundaries, r., prolate, low optical density, discordant. Both are presumably clay pellets and signs of clay mixing.

Fabric group 7 (Dark brown micrite and metamorphic coarse fabric)

Sample no.	Vessel shape	Surface treatment
Kon18/28	Jar	Burnish
Kon18/40	Shallow bowl	
Kon18/85	Basin	Grey/white slip
Kon18/86	Pithos	
Kon18/98	Closed vessel	Grey/white slip

Microstructure

There are rare to absent mega vughs, rare to absent macro vughs, few to rare meso vughs, very few to very rare macro and meso channel voids. The voids are close- to single-spaced and slightly parallel to the vessel margins. The aplastic inclusions are close- to double-spaced and weakly parallel to the vessel margins.

Groundmass

Mostly homogeneous in matrix and composition with the exception of Kon18/98, whose matrix is packed with microfossils. The colour varies from orange brown, brown and grey in PPL and dark brown to grey in XP (x40). All samples are optically inactive with the exception of Kon18/86, in which the matrix is moderately optically active.

Inclusions

$c:f:v_{10\mu m}$ ca. 30:65:10
Coarse fraction = 3 mm to 0.4 mm
Fine fraction = 0.4 mm or less
This fabric is moderately to poorly sorted and has a bimodal grain size distribution.

Coarse Fraction

Common	Micrite, r.
Few	Mica laths, both biotite mica and muscovite mica. Quartz, a. size = 1 mm or less, mode = 0.4 mm.
Few to very few	Polycrystalline quartz, a., size = 1.05 mm or less, mode = 0.4 mm.
Few to very rare	Calcium mudstone, size = 3 mm or less. Mostly contain quartz, micrite, polycrystalline quartz, one has a fine-grained schist fragment.
Very few	Phyllite, sr-r, size = 2.11 mm or less, mode = 0.46 mm. Sometimes crenulated and contain opaques.
Very few to rare	Microfossils.
Rare	Muscovite schist, a., size = 1.7 mm or less. Frequently decussate texture and sometimes contains biotite or rarely chlorite mica. Show a higher birefringence, from 2nd to 3rd order, yellow, pink and purple.
Rare to absent	Sparite, sr-r, size = 0.76 mm or less.
Very rare to absent	Siltstone, a., size = 0.6 mm or less.
	Chlorite mica laths. size = 0.6 mm or less.
	Altered calcite, a-sa., size = 0.5 mm or less.
	Epidote.
	Plagioclase feldspar, a. size = 0.46 mm or less.
	Feldspar, r., size = 0.4 mm, orthoclase feldspar, rarely intergrowth of quartz and feldspar.

Fine Fraction

Common	Quartz
Common to few	Mica laths, mostly muscovite.
Common to absent	Microfossils (sponge spicules?)

Textural concentration features

Kon18/40.
Rare. Merging boundaries, sr., elongate, low optical density, concordant with the host clay. These TCFs contain frequent quartz. feldspar and mica laths and are surrounded by voids. The matrix is similar to the host clay.
Rare. Clear boundaries, angular and prolate, low optical density, discordant, different texture and composition from the host fabric, containing monocrystalline and polycrystalline quartz, mica laths and epidote.

Kon18/85. Very few. Clear boundaries, subangular and prolate, high optical density, discordant.

Fabric group 8 (Medium calcareous and metamorphic with opaques)

Sample no.	Vessel shape	Surface treatment
Kon18/9	Closed vessel	
Kon18/43	Bowl	Red slip and burnish
Kon18/47	Pithoid jar	
Kon18/59	Pithos	
Kon18/82	Shallow bowl	Brown slip and burnish
Kon18/94	Collared jar	Brown slip and burnish and red slip
Kon18/127	Saucer	Red slip
Kon18/135	Jar (waster)	Black slip
Kon18/141	Jar (waster)	
Kon18/147	Saucer	Brown slip (exterior) and buff white slip (interior)
Kon18/152	Closed vessel	
Kon18/157	Jar (waster)	
Kon18/164	Shallow bowl	Black slip
Kon18/166	Jar	Brown slip
Kon18/182	Jug (waster)	
Kon18/183	Jug (waster)	
Kon18/190	Basin	Red slip and burnish

Microstructure

This group has frequent to very few voids, containing few to absent mega vughs and channel voids, few macro vughs, vesicles and channel voids, common to rare meso vughs, vesicles and channel voids, close- to open-spaced. Mostly randomly distributed, sometimes the channel voids show a slight parallel orientation to the vessel margins. The aplastic inclusions appear to have a random orientation, close- to double-spaced.

Groundmass

Heterogeneous. The colour ranges from orange, brown and grey in PPL and yellow, orange, light brown to brown and dark brown to grey in XP (x40). Optical activity varies from weak to strong active whilst the samples of wasters with a grey matrix are optically inactive. There are few to rare TCFs, possibly suggesting clay mixing.

Inclusions

$c{:}f{:}v_{10\mu m}$ ca. 30:67:3 to 20:30:50
Coarse fraction = 2.56 mm to 0.35 mm
Fine fraction = 0.35 mm or less
The inclusions present a bimodal grain size distribution and well to poorly sorted.

Coarse Fraction

Common to few	Metamorphic rock fragments: Phyllite, sa-sr., size = 1.36 mm or less, mode = 0.65 mm. Consisting of muscovite mica laths and many contains opaque (veins). Biotite-opaque-phyllite, sa., size = 2.56 mm or less, mode = 0.35 mm. Biotite-muscovite phyllite, a., size = 1.12 mm or less, mode = 0.35 mm. Muscovite±amphibole±biotite±opaque schist, a-sa., size = 2.2 mm or less, mode= 0.45 mm. Mostly contains muscovite mica laths, occasionally amphibole, biotite and opaque. Rarely shows decussate texture (randomly oriented interlocking platy, prismatic or elongated crystals). Biotite schist, a., size = 0.8mm or less.
	Calcite: Calcite crystals, a., size= 1.06 mm or less, mostly recrystallised, possibly disaggregated from marble. Marble, sr-r., size = 2 mm or less, mode = 0.4 mm. Micrite.
Very few	Quartz, a-sa., size = 2.28 mm or less, mode = 0.56 mm. Opaque.

Very few to very rare	Polycrystalline quartz, a-sa., elongate and equant, size = 2.2 mm or less, mode= 0.4 mm. Sometimes altered and contain alkali feldspar. Medium-coarse- to fine-grained are both presented, the fine-grained presumably is natural occurrence in the sediment.
Very few to absent	Serpentine, sa-sr. size = 0.53 mm or less, mode = 0.3 mm.
	Microfossils.
Rare to absent	Greywacke, a-sr. size = 0.88 mm or less, mode = 0.72 mm.
Very rare to absent	Biotite gneiss, sa., size = 0.96 mm or less.
	Mineral, sr., size = 0.76 mm or less. Green-brown in XP, yellow in PPL. Possibly serpentine?
	Sandstone, sr., equant, size = 0.7 mm or less.
	Mudstone, a., size = 1.52 mm or less. Sometimes contains quartz, calcite.
	Alkali feldspar, sa., size = 1 mm or less.
	Plagioclase feldspar, a. size = 1.05 mm or less.
	Chert, a-sr., elongate and equant, size = 1 mm or less, mode = 0.5 mm. Kon18/82 consists of radiolarian mudstone, radiolarian chert and chalcedony quartz.

Fine Fraction

Common to few	Micrite.
Few	Quartz.
Few to rare	Mica laths (mostly muscovite).

Textural concentration features

Kon18/47. Rare. Clear to diffuse boundaries, a-sr., prolate, high to neutral optical density, discordant with the host fabric. Internally consists of calcite, micrite and coarse to fine monocrystalline quartz in a calcareous matrix. Probably grog.

Kon18/59. Very few. Sharp boundaries, subangular, elongate, high optical density, discordant with the host fabric. Red in PPL and XP and optically less active than the host matrix. The internal structure contains common to few very fine quartz and mica laths. Possibly grog.

Kon18/47 and 59. Very few. Diffuse boundaries, rounded and distorted, neutral optical density, discordant. The internal structure contains very few to very rare fine silt quartz inclusions and very rare to absent mica laths. In addition, Kon 18/59 has a streak of clay which the matrix is not compatible to the host clay, perhaps an indication of clay mixing.

Kon18/94. Very few. Diffuse boundaries, angular and prolate, high to neutral optical density, concordant. The TCFs seem to part of the host clay and loosely distributed throughout the thin section. It is difficult to identify whether they are natural occurring clay pellets or a possible sign of clay mixing.

Kon18/147, 152 and 166

Few. Sharp to merging boundaries, rounded and distorted, elongate and equant, neutral optical density, discordant. Light to dark brown in PPL and grey to dark brown in XP. Accompanying with clay striations of brown clay without medium or coarse inclusions. May indicate clay mixing.

Fabric group 9 (Marble, schist and sand fabric)

Sample no.	Vessel shape	Surface treatment
Kon18/49	Basin	
Kon18/92	Open vessel	Slipped, red to brown/black mottled

Microstructure

Common to very rare mega vughs and channel voids, few to rare macro vughs, very few meso vughs, few to very rare macro to meso channel voids; close- to single-spaced. The aplastic inclusions are single-spaced and have no preferred orientation.

Groundmass

This group is relatively heterogeneous with respect to the percentage of inclusions and colour of the matrix. The colour varies from orange, red to brown in PPL and orange, reddish brown to dark brown in XP (x40). Optical activity is low.

Inclusions

c:f:$v_{10\mu m}$ ca. 12:85:3 to 15:75:10
Coarse fraction = 2.4 mm to 0.2 mm
Fine fraction = 0.2 mm or less
Bimodal grain size distribution with well to moderate sorted inclusions.

Coarse Fraction

Few to rare	Marble, r. size = 1.85 mm or less, mode = 0.65 mm. Sparite, a-sr., size =1.68mm or less, mode = 0.65 mm. Micrite. Quartz, a. size = 1.05 mm or less, mode = 0.65 mm.
Very few to rare	Muscovite-biotite-opaque schist, a-sa. size = 2.4 mm or less, mode = 0.8 mm. Very rarely contains chlorite crystals.
Rare	Greywacke, a-sr. size = 0.88 mm or less, mode = 0.72 mm. Polycrystalline quartz, a.-sa., size = 1.36 mm or less, mode= 0.65 mm.
Very rare to absent	Sandstone, sa., size = 1.36 mm or less, containing polycrystalline quartz, mica laths, lithic fragments including siltstone.
	Siltstone, a., size =0.63 mm or less.
	Phyllite, sa-sr. size = 1.12 mm or less.
	Plagioclase feldspar, sa., size = 0.2 mm. Calcite, size = 1.06 mm or less.

Fine Fraction

Common to few	Quartz.
Few	Mica laths.
Very few	Micrite. Schist and phyllite fragments.

Fabric group 10 (Coarse calcareous fabric)

Sample no.	Vessel shape	Surface treatment
Kon18/93	Jar	Red slip
Kon18/200	Closed vessel	Brown slip

Microstructure

There are few voids consisting of mega to meso vughs and channel voids, single-to double-spaced, exhibiting diagonal to weak parallel to vessel margins. The aplastic inclusions also show weak parallel to diagonal alignment with vessel margins and are close- to single-spaced.

Groundmass

Slightly heterogeneous. The colour is brown in PPL and XP (x40) with moderate optical activity.

Inclusions

$c:f:v_{10\mu m}$ ca. 10:80:10
Coarse fraction = 2.48 mm to 0.16 mm
Fine fraction = 0.16 mm or less
The aplastic inclusions are poorly sorted and appear to have a bimodal grain size distribution.

Coarse Fraction

Few	Calcite, a-sr., size = 1.25 mm or less, mode = 0.55 mm, mostly contains recrystallised calcite, few with muscovite laths.
	Limestone, sr-r., size = 1.92 mm or less, mode = 0.55 mm, frequently grades into sparite and micrite. Mostly presented in Kon18/93.
	Marble, sa., size = 0.8 mm or less, mode = 0.6 mm, very few contains muscovite laths. Mostly presented in Kon18/200.
Few to rare	Polycrystalline quartz, a., size = 0.3-2.48 mm.
Very few	Mica schist, sr., size = 0.5-1.4 mm, containing both muscovite and fewer biotite mica laths, very rare with opaque veins.
	Quartz, a., size = 0.7 mm or less, mode = 0.16 mm.

	Micrite.
	Microfossils.
Rare	Sandstone, a-sa., size = 1.52 mm or less, mode = 0.72 mm.
Very rare to absent	Phyllite, sr., size = 0.54 mm or less, with the brighter birefringence and occasionally with opaque veins.
	Serpentine, sr., size = 0.53 mm.
	Bioclast limestone, a., elongate, size = 1.36 mm or less.
	Siltstone/Mudstone, a., size =1.84 mm or less.
	Chert, r., size = 0.3 mm or less.

Fine Fraction

Few to rare	Quartz.
Few	Mica laths, mostly muscovite.
Few to very few	Opaque.
Rare	Microfossils.

Textural concentration features

Kon18/200. Very few. Clear to diffuse boundaries, r., equant, high optical density, concordant with the host clay with quartz inclusions. Brown in PPL and red in XP. These are probably clay pellets.

Fabric group 11 (Very fine mica and quartz fabric)

Sample no.	Vessel shape	Surface treatment
Kon18/106	Sauceboat	Bluish grey to white slip (exterior) and creamy white slip (interior)
Kon18/110	Saucer	Silver grey slip (exterior) and white slip (interior)
Kon18/111	Dish	
Kon18/117	Sauceboat	Bluish grey to white slip
Kon18/140	Large bowl (waster)	Bluish grey slip

Sample no.	Vessel shape	Surface treatment
Kon18/143	Sauceboat	Grey to white slip
Kon18/156	Sauceboat	White slip (exterior) and bluish grey to white slip (interior)
Kon18/165	Sauceboat	Bluish grey slip (exterior) and dark brown slip (interior)
Kon18/168	Bowl	Bluish grey slip (exterior) and dark brown to red slip (rim and interior)
Kon18/184	Goblet	Pink slip
Kon18/195	Bowl	
Kon18/197	Saucer	Black slip
Kon18/198	Sauceboat	Brown slip

Microstructure

There are few to very few meso and rare to absent mega and macro vughs, rare to absent meso channel voids infills with micrite, close- to open-spaced and some samples (Kon18/110, 140 and 198) show a weak orientation parallel to the margins. The aplastic inclusions are close- to open-spaced and some exhibit concentric circles (Kon18/111, 143, 156, 184 and 198).

Groundmass

Slightly heterogeneous in terms of texture and inclusion types, light brown, brown to grey in PPL and orange, greenish, dark brown to grey in XP (x40). The optical activity is varied from almost inactive to highly active. The varied colour and optical activity reflects variable firing conditions in this fabric group.

Inclusions

c:f:$v_{10\mu m}$ ca. 5:90:5
Coarse fraction = 1.36 mm to 0.06 mm
Fine fraction = 0.06 mm or less
Generally unimodal grain size distribution with well sorting of inclusions, whilst there are exceptions (Kon18/143 and 184) with bimodal grain size distribution.

Coarse Fraction

Very few to rare	Micrite.
Rare	Quartz, a-sa., size = 0.5 mm or less, mode = 0.06 mm.
Rare to very rare	Polycrystalline quartz, sa-sr., size = 0.27 mm or less.
Rare to absent	Siltstone, sa-sr., size = 1.2 mm or less. Containing coarse silt-sized inclusions of quartz, feldspar, mica laths and micrite, rarely accompanying with orange minerals (amphibole?). Some show a clearly calcareous matrix (Kon18/110, 143, 156, 184 and 198).
	Red siltstone, equant and rarely elongate, sa-r., size = 0.72 mm or less, mode = 0.26 mm. Frequently containing medium silt-sized inclusions of quartz and mica laths in red matrix (Kon18/111, 143, 156, 168 and 184).
	Sparite. Opaques.
Very rare to absent	Siltstone, sa-sr., elongate, size = 1.36 mm or less. Packed with coarse to medium silt-sized inclusions of quartz and very rare mica laths. Light brown in PPL and dark brown in XP (x40) (Kon18/117).
	Limestone, r., elongate, size = 0.8 mm or less. (Kon18/143).
	Biotite mica, infills in voids.
	Microfossils.

Fine Fraction

Frequent to few	Quartz
Common to very few	Mica laths (mostly muscovite and commonly biotite).
Common to rare	Micrite.
Common to absent	Opaques.

Textural concentration features

Rare. Clear to diffuse boundaries, sa-r., equant, high optical density, generally concordant with the matrix and occasionally discordant without any inclusions. Greenish brown in PPL and red in XP (x40).

Rare. clear to diffuse boundaries, rounded and equant, high and neutral optical density, discordant with the external groundmass. Very fine clay and not packed with aplastic inclusions. Red to dark brown in XP (x40). Probably clay pellets.

Fabric group 12 (Micrite and red mudstone in calcareous clay)

Sample no.	Vessel shape	Surface treatment
Kon18/107	Shallow bowl	
Kon18/108	Open vessel	
Kon18/158	Sauceboat	Bluish grey slip (exterior) and highly burnished (interior)
Kon18/159	Sauceboat	Red slip
Variants		
Kon18/105	Jar	Black slip
Kon18/175	Conical cup	

Microstructure

There are very few to rare macro and meso vughs, very rare mega and rare macro and meso channel voids, single- to open-spaced. Aplastic inclusions are single- to open-spaced. The voids and the elongate inclusions display moderate to weak alignment parallel to the vessel margins respectively.

Groundmass

This is a relatively homogenous group in terms of matrix and inclusions types. The colour shows a slight variation from orange, brown to grey in PPL, greyish, pale brown to reddish brown in XP (40x). Kon18/107 and 108 exhibit yellow to red striations and swirls of clay. Optically slightly to moderately active, though Kon18/105 has low optical activity.

Inclusions

c:f:v$_{10\mu m}$ ca. 2:94:4 to 4:91:5
Coarse fraction = 1.76 mm to 0.05 mm
Fine fraction = 0.05 mm or less
Bimodal grain size distribution, with well sorting of inclusions.

Coarse Fraction

Very few to rare	Calcite, a-sa., size = 0.5 mm or less. Including calcite crystals and grades into micrite and sparite.
	Quartz, sa-sr., size = 0.05-0.25 mm.
Very few to absent	Microfossils (bivalves?).
Rare	Polycrystalline quartz, a., size = 0.6 mm or less.
	Red to black opaques.
Very rare to absent	Siltstone, sr., size = 1.76 mm or less. Mostly contains quartz, muscovite and biotite mica laths, calcite and micrite in calcareous matrix. Light brown in PPL and Brown in XP. (Kon18/107).
	Red siltstone, sa-sr., elongate and equant, size = 0.9 mm or less. Usually contains quartz, muscovite and biotite mica laths in red matrix (Kon18/108, 158 and 159). One grain also contains calcite (Kon18/107).
	Muscovite-biotite mica schist fragments, sa., size = 0.6 mm or less (Kon18/107 and 175).
	Muscovite mica schist fragments, a-sa., size = 0.75 mm or less. Frequently contains opaque (Kon18/105).
	Serpentine, r., size = 0.4 mm (Kon18/175).
	Biotite mica aggregates (Kon18/105).

Fine Fraction

Common to few	Quartz. Micrite.
Common to very few	Mica laths (both muscovite and biotite). Opaques.
Few	Calcite.
Few to absent	Tcfs.

Textural Concentration features

Few. Clear to diffuse boundaries, sr-r. and equant, high to neutral optical density, discordant. Possibly clay pellets.

Variants

Kon18/105 and 175. These samples are the coarse version of the main group with slightly coarser grains of inclusions and contains more sand-sized inclusions of quartz, calcite and schist fragments. Kon18/105 is high-fired and the reduced greyish brown core contains lower levels of mica laths.

Fabric group 13 (Medium quartz and polycrystalline quartz fabric)

Sample no.	Vessel shape	Surface treatment
Kon18/114	Jar	Black slip (exterior and inner rim)
Kon18/118	Jar	Grey slip

Microstructure

There are very few macro and meso vughs and vesicles, close- to double-spaced, no preferred orientation. The aplastic inclusions are close- to single-spaced and randomly distributed.

Groundmass

Homogeneous. The colour is greenish brown in PPL and XP (x40). Optically inactive, suggesting very high firing temperature.

Inclusions

c:f:$v_{10\mu m}$ ca. 10:85:5

Coarse fraction = 2.12 mm to 0.52 mm

Fine fraction = 0.52 mm or less

The aplastic inclusions are very poorly sorted and have a unimodal grain size distribution.

Coarse Fraction

Very few	Polycrystalline quartz, a.-sa., size = 2.12 mm or less, mode = 0.52 mm.
Very rare	Red to black opaques, sometimes with quartz inclusions.
	Red siltstone, sr., size = 0.6 mm or less, containing quartz and calcite.
	Micrite.

Fine Fraction

Common	Quartz. Red to black opaques.
Rare	Mica laths (both muscovite and biotite).

Fabric group 14 (Coarse subrounded calcite and sand fabric)

Sample no.	Vessel shape	Surface treatment
Kon18/112	Bowl	
Kon18/193	Bowl	

Microstructure

There are rare mega vughs, rare macro vughs and channel voids, open-spaced. The aplastic inclusions tend to be randomly distributed and close- to single-spaced.

Groundmass

Homogeneous micromass with slight heterogeneity in composition. Orange brown in PPL and orange in XP (x40). Optically slightly to moderately active.

Inclusions

$c:f:v_{10\mu m}$ ca. 20:79:1
Coarse fraction = 1.52 mm to 0.72 mm
Fine fraction = 0.72 mm or less
The aplastic inclusions are moderately sorted and have a bimodal grain size distribution.

Coarse Fraction

Few	Calcite, sa-sr., size = 1.08 mm or less. Mostly grade into sr. sparite.
Very few	Muscovite-biotite schist, sa-r., size = 1.52 mm or less, mode = 0.72 mm. Containing mainly biotite and muscovite mica and quartz, sometimes chlorite mica, calcite.
	Chlorite schist, sa-r., size = 1.06 mm or less, mode = 0.6 mm. Varied from sr-r. low-grade to sa. medium-grade.
	Amphibolite, sr., elongate, size = 1.22 mm or less.

	Polycrystalline and monocrystalline quartz, a., size = 1.36 mm or less, mode = 0.72 mm.
	Micrite, r.
Rare	Microfossils.
Very rare	Marble, sr., size = 1.28 mm.
	Opaque.
Very rare to absent	Chert, sa., elongate. Size = 0.93 mm or less.
	Siltstone, a., size = 1 mm.
	Shale, r., elongate. Size = 1.12 mm or less.
	Phyllite, sr., size = 1.3 mm or less.
	Slate, sr., equant. Size = 1.22 mm or less.
	Serpentine, sr., size = 1.04 mm.

Fine Fraction

Few	Quartz
Rare	Mica laths.

Textural concentration features

Clear boundaries, well-rounded, equant, high optical density and concordant with the host clay. Dark brown in PPL and light brown to brown in XP (x40). Most probably clay pellets.

Fabric group 15 (**Metamorphosed rock fragments and zoisite fabric**)

Sample no.	Vessel shape	Surface treatment
Kon18/10	Closed vessel	
Kon10/81	Closed vessel	Black burnish

Microstructure

There are very few to rare meso vughs, close- to singled spaced. The aplastic inclusions are close- to double-spaced. Both voids and inclusions have no preferred orientation.

Groundmass

Relatively homogeneous with a slightly variation in mineral composition. Generally brown in PPL and orange to brown in XP (x40). Both samples present slight to moderate optical activity.

Inclusions

$c:f:v_{10\mu m}$ ca. 6:89:5
Coarse fraction= 2.25 mm to 0.16 mm
Fine fraction= 0.16 mm or less
The inclusions appear to have a bimodal grain size distribution and are moderately sorted.

Coarse Fraction

Common to few	Quartz-muscovite-zoisite-epidote-biotite schist, sa., equant and elongate, size = 2 mm or less, mode = 0.4 mm. Mainly contains quartz and muscovite mica with epidote, very rare grains contain plagioclase feldspar. Frequently show relic texture of intermediate igneous rock fragments.
Few	Epidote, a-sr., size = 0.4 mm or less, mode = 0.16 mm.
Few to very few	Polycrystalline quartz, a-sa., size = 2.25 mm or less, mode = 0.64 mm.
Very few to rare	Micrite, very rarely grading into sparite.
Very few	Muscovite mica laths.
	Zoisite, sa., equant, size = 0.32 mm or less.
Rare	Chlorite schist, a., size = 1.6 mm or less.
	Serpentinite, sr., size = 1.76 mm or less.
	Red mudstone, sr-r., size = 0.52 mm or less.
Very rare to absent	Siltstone, sa-sr., size = 1.12 mm or less. Sometimes contains polycrystalline and monocrystalline quartz.
	Shale/slate, a., elongate, size = 1.4 mm.
	Limestone, sa, size = 0.55 mm or less.

	Orthoclase feldspar, a., size = 0.7 mm.
	Plagioclase feldspar, a., elongate, size = 0.7 mm or less. Some altered.

Fine Fraction

Common	Quartz.
Few	Epidote
Very rare	Muscovite mica laths.

Textural Concentration Features

Very few to rare. Sharp boundaries, equant and rounded, high optical density, concordant with the host fabric. Mostly composed of monocrystalline quartz and rarely with epidote.

Fabric group 16 (Crushed calcite fabric)

Sample no.	Vessel shape	Surface treatment
Kon18/41	Closed vessel	
Kon18/129	Bowl	
Kon18/187	Shallow bowl	

Microstructure

Few to very few macro vughs, rare meso vughs, few to rare macro and meso channel voids, and very rare macro planar voids, close- to double-spaced, with no clear preferred orientation. The aplastic inclusions are close- to single-spaced and randomly orientated.

Groundmass

Hetergenous with respect to inclusion types. The colour is orange brown to brown in PPL and orange red to brown in XP (x40). The optical activity is absent to weak (Kon18/41 and 187) and moderate (Kon18/129).

Inclusions

c:f:v $_{10\mu m}$ ca. 18:80:2 to 30:60:10
Coarse fraction = 3.04 mm to 0.12 mm
Fine fraction = 0.12 mm or less.
The inclusions are poorly sorted and have a bimodal grain size distribution.

Coarse Fraction

Common to few	Calcite, a., size = 3.04 mm or less, mode = 0.16 mm & 0.72 mm. Mostly crushed.
Common to absent	Serpentinite, a-sa., elongate and equant, size = 0.13-2.05 mm. Light yellow (Kon18/129) to orange (Kon18/187) in PPL and grey to yellow (Kon18/129) to orange (Kon18/187) in XP. Opaque formed internally (Kon18/129).
	Igneous rock fragments, sa., size = 0.4 mm or less. Altered and heavily metamorphosed. Granular and porphyritic textures. Containing plagioclase and alkali feldspars (Polysynthetic and simple twinning visible respectively), quartz and pyroxene phenocrysts (the first order pale yellow to second order orange and pink, rarely blue). (Kon18/129 and 187)
Very few	Muscovite-biotite-chlorite mica schist, a., size = 1.52 mm or less, mode = 0.8 mm.
Very few to rare	Polycrystalline quartz, a-sa., size = 0.73 mm or less, mode = 0.24 mm.
Very few to absent	Micrite (Kon18/187).
Rare	Alkali feldspar, a., size = 0.32 mm or less. Simple twinning occasionally visible. Some intergrowth with quartz and first-order yellow pyroxene.
	Muscovite mica schist, a., size = 1.92 mm or less.
Rare to absent	Opaque, some with quartz inclusions (Kon18/41).
	Marble, sa., size = 0.88-1.36 mm (Kon18/129).
	Quartz-clinozoisite, a., size = 0.3 mm (Kon18/129).
	Quartz-opaque, a-sa., size = 2 mm or less (Kon18/187).
Very rare	Amphibole aggregates, sr., size = 0.22 mm.
	Biotite mica.
Very rare to absent	Shale, sr. size = 0.46 mm (Kon18/41).
	Red mudstone, sr. size = 0.5 mm or less, consisting of quartz

inclusions (Kon18/41).

Biotite mica schist, r., size = 0.65 mm (Kon18/187).

Fine Fraction

Common to few	Calcite.
Few	Quartz.
Few to very few	Mica laths (mostly muscovite).
Few to rare	Serpentine. Pyroxene. Altered igneous rock fragments.

Textural concentration features

Kon18/129. Rare. Clear boundaries, equant and rounded, high optical density, mostly concordant, internal inclusions as matrix, containing quartz and mica laths.

Fabric group 17 (Coarse sedimentary and metamorphic fabric)

Sample no.	Vessel shape	Surface treatment
Kon18/8	Deep bowl/basin	
Kon18/11	Closed shape	
Kon18/19	Cheese-pot	
Kon18/57	Bowl	
Kon18/70	Baking plate	

Microstructure

There are few to rare mega, macro and meso vughs and very few to very rare mega, macro and meso channel and planar voids, closed to double spaced. The voids show weak parallel or diagonal preferred alignment to the vessel wall whilst the aplastic inclusions have no preferred orientation.

Groundmass

The groundmass is heterogeneous with respect to voids, colour and contains a wide range of inclusions. The colour ranges from yellowish to reddish brown in PPL and yellow, red to dark brown in XP (x40). The red to dark brown groundmass (Kon18/11 and 19) displays weak optical activity implying higher firing temperature, whilst the low-fired yellowish-brown groundmass in Kon18/8, 57 and 70 exhibits moderate to high optical activity, suggesting a low firing temperature.

Inclusions

c:f:$v_{10\mu m}$ ca. 20:65:15 to 35:50:15
Coarse fraction = 3.68 mm to 0.18 mm
Fine fraction = 0.18 mm or less
The inclusions appear to have a bimodal grain size distribution and poorly sorted.

Coarse Fraction

Few to very few	Sedimentary rock fragments: Sandstone, a., size = 2.5 mm or less, mode = 0.9 mm. Usually containing quartz, feldspar, biotite, muscovite, amphibole, rock fragments (mostly metamorphic and few sedimentary) in fine matrix, presumably greywacke. Siltstone, a-sr., equant, size = 0.95 mm or less, mode = 0.6 mm. Shale, sr., size = 2.25 mm or less, mode = 0.65 mm.
	Quartz, a., size = 0.48 mm or less, mode = 0.18 mm.
Very few to rare	Talc, a., elongate and equant, size = 3.68 mm or less, mode = 0.8 mm. Showing the typical second-order birefringence colour, dominantly yellow, and intergrowth with marble in very rare cases.
Very few to very rare	Calcite/calcareous mudstone, sr., size = 1.76 mm. Mostly composed by microcrystalline calcite, sometimes graded into sparite. Some present fine dark brown calcareous matrix containing fine sand quartz, one coarse grain with fragment of amphibolite.
Rare	Polycrystalline quartz, a-sr., size = 1.4 mm or less, mode= 0.6 mm.
Very rare	Muscovite phyllite, a., size = 2.32 mm or less. Mostly with shimmer appearance and internal crenulations shown.
Very rare to absent	Mudstone, sa., size = 1.35 mm or less.
	Fine muscovite-biotite phyllite, sr-r., size = 0.85 mm or less. Very fine-grained.
	Biotite schist, sr., size = 0.55 mm or less. Rarely with aggregates of amphibole.

Serpentine, sr., size = 0.96 mm or less.

Sillimanite schist, a, size = 1.72 mm or less. Mostly very fine needles of fibrolitic shape.

Kyanite, size = 0.34 mm or less, subhedral prismatic, colourless in PPL and white to yellow in XP.

Rock fragments (feldspar and quartz), sa., size = 0.45 mm or less.

Plagioclase feldspar, sa-sr., equant, size = 0.45 mm or less. Only presented in Kon18/70.

Fine Fraction

Common to few	Quartz.
Few to very few	Mica laths (both biotite and muscovite).

Fabric group 18 (Talc schist fabric)

Sample no.	Vessel shape	Surface treatment
Kon18/119	Jar	
Kon18/179	Jar	

Microstructure

There are very few macro and meso vughs and rare macro channel voids, which tend to be randomly distributed, single- to double-spaced. The aplastic inclusions are close-spaced with no preferred orientation.

Groundmass

Homogeneous. The clay matrix is red-brown to brown in PPL and reddish orange to dark brown in XP (x40). Optical activity ranges from weakly active to inactive.

Inclusions

c:f:$v_{10\mu m}$ ca. 32:65:3
Coarse fraction= 4.8 mm to 0.3 mm
Fine fraction= 0.3 mm or less
The inclusions appear to have a bimodal grain size distribution and are moderately to poorly sorted.

Coarse Fraction

Frequent	Talc schist, sa., size = 4.8 mm or less. Very few contain biotite-muscovite-talc schist and rarely serpentine-talc schist.
Very rare	Quartz-muscovite-feldspar aggregates, sa-sr., size = 0.35 mm or less. Aggregates of monocrystalline quartz, feldspar, muscovite laths.
Very rare to absent	Serpentinite, sr., equant, size = 1.88 mm.
	Kyanite, size = 0.3 mm or less, subhedral prismatic, colourless in PPL and white to yellow in XP.

Fine Fraction

Frequent	Talc fragment.
Common	Mica laths (mostly muscovite and very few biotite).
Very few	Quartz.

Fabric group 19 (Intermediate volcanic fabric)

Sample no.	Vessel shape	Surface treatment
Kon18/1	Bowl	Red slip and burnish
Kon18/4	Baking plate	
Kon18/6	Basin	Burnish
Kon18/13	Basin	
Kon18/18	Closed vessel	
Kon18/20	Basin	Black burnished
Kon18/29	Shallow bowl	Black slip and burnish
Kon18/56	Basin	Burnish
Kon18/76	Basin	Red to black slip and burnish
Kon18/189	Bowl	Heavy polish
Variant		
Kon18/162	Open vessel	

Microstructure

There are few to rare mega, macro and meso vughs, few to very rare mega, macro and meso channel voids, close- to open-spaced. Mostly no preferred orientation, but samples Kon18/4 and 13 show weak diagonal alignment and an orientation parallel to vessel margins respectively.

The aplastic inclusions are close- to single-spaced and randomly distributed.

Groundmass

Homogenous in the texture of matrix but heterogeneous with respect to colour and inclusion types. The colour ranges from reddish brown, brown to dark brown in PPL and yellow, orange to black in XP (x40). Optical activity is moderately active to inactive.

Inclusions

c:f:$v_{10\mu m}$ ca. 22:75:3 to 35:48:17
Coarse fraction = 4.4 mm to 0.43 mm
Fine fraction = 0.43 mm or less
The inclusions are poorly sorted and have a bimodal grain size distribution.

Coarse Fraction

Common to few	Intermediate volcanic rock fragments (possibly andesite), a-sr., equant and elongate, size = 4.4 mm or less, mode = 0.8 mm. Most volcanic rock fragments consist of biotite mica, pale yellow clinopyroxene (sometimes twinned and/or zoned), plagioclase feldspar (twinned and/or sometimes zoned) and opaque in a glassy matrix. Clear alteration shown in Kon18/76. Kon18/1 and 4 are dominated by volcanic rock fragments containing diamond-shaped green amphibole, biotite mica, twinned and zoned plagioclase feldspar in a fine matrix.
Common to rare	Plagioclase feldspar, a., elongate and equant, size = 1.84 mm or less, mode = 0.72 mm. Mostly twinned and/or zoned. Biotite mica laths. Strongly pleochroic.
	Amphibole.
Very few	Quartz, a., size = 1.2 mm or less, mode = 0.5 mm.
Very rare	Volcanic rock fragments, sr., size = 0.8 mm. Containing phenocrysts of clinopyroxene (first to second order blue, pink), orthoclase feldspar, plagioclase feldspar in a finer matrix (Kon18/189).

	Altered orthoclase feldspar, r., size = 0.43 mm or less. Clear simple-twinned feature.
Very rare to absent	Micrite (Kon18/56).

Fine Fraction

Common to very few	Biotite mica laths. Amphibole.
Few to very rare	Quartz. Pyroxene.
Rare	Opaques.

Textural concentration features

Kon 18/56. Rare. Clear to diffuse boundaries, rounded and equant, high optical density, concordant with the groundmass. Possibly clay pellets.

Kon 18/76. Rare. Clear boundaries, angular and prolate, high optical density, discordant with the external fabric, with inclusions (radiolarian chert, quartz and mica laths). Clear surface layer exhibited. Possibly grog?

<u>Variant</u>

Kon18/162. This sample has the same range of inclusion types as the main group, containing volcanic rock fragments, plagioclase feldspar, biotite mica, amphibole, pyroxene and opaque. However, the matrix is greenish brown in PPL and XP (40x), suggesting a calcareous clay. The optically inactive matrix reflects a high firing temperature. It is taken to be EB II whilst it is typologically different from the others, it has calcareous volcanic fabric which becomes common in the EB III and Middle Helladic period (Kiriatzi et al. 2011: 100). Therefore, it is possible that this sample is accidently intrusive to this pottery unit.

Petrographic loners

Sample no.	Vessel shape	Surface treatment
Kon18/32	Closed vessel	

Microstructure

There are very rare macro vughs and rare meso vughs with rare meso vesicles. Both voids and aplastic inclusions are single- to open-spaced and randomly distributed.

Groundmass

Very fine calcareous, mostly homogeneous in terms of the texture of groundmass. The heterogeneous colour ranges from light brown to brown in PPL and yellow to brownish yellow in XP (x40), possibly due to the natural differentiation of the clay deposit. The groundmass is optically inactive.

Inclusions

c:f:$v_{10\mu m}$ ca. 12:85:3
Coarse fraction = 1.7 mm to 0.1 mm
Fine fraction = 0.1 mm or less
The aplastic inclusions are moderately sorted and have a bimodal grain size distribution.

Coarse Fraction

Very few	Micrite, sa-sr. Size = 1.7 mm or less, mode = 0.6 mm.
	Chert, a., elongate to equant, size = 0.73 mm, mode = 0.45 mm. Frequently radiolarian chert with very few chalcedonic quartz.
	Limestone, sa-sr., elongate and equant, size = 1.2 mm or less, mode = 0.24 mm.
Rare	Sparite, r., size = 1.32 mm or less, mode = 0.46 mm. Sometimes with silt-size quartz inclusions.
	Calcite, a-sa, size = 0.13-1.12 mm.
	Serpentine, a., size = 0.1-0.33 mm.
	Quartz, a., size = 0.4 mm or less, mode = 0.1 mm. Some aggregates of quartz.
	Red siltstone, a-sa., elongate and equant, size = 0.47 mm or less.
Very rare	Mudstone, sa., size = 0.7 mm.
	Phyllite, r., elongate., size = 1.05 mm.
	Biotite mica, size = 0.36 mm.

Fine Fraction

Few	Quartz. Calcite.

Textural concentration features

Rare. Brown, with diffuse boundaries, sa-r., prolate and equant, high optical density, concordant. Mostly compatible to the host matrix, possibly clay pellets.

Sample no.	Vessel shape	Surface treatment
Kon18/34	Handle	Red slip and burnish

Microstructure

There are few macro, very few meso and rare mega vughs, very rare mega channel voids, single- to double-spaced, randomly distributed. The aplastic inclusions have no preferred orientation, single-spaced.

Groundmass

Homogeneous throughout the section. Brown in PPL and reddish brown in XP (x40), with an optical activity that ranges from inactive in the core to slightly active close to the margins.

Inclusions

c:f:v$_{10\mu m}$ ca. 20:76:4
Coarse fraction = 1.8 mm to 0.05 mm
Fine fraction = 0.05 mm or less
The inclusions are poorly sorted with bimodal grain size distribution.

Coarse Fraction

Few	Sandstone, sr-r., equant., Size = 1.8 mm or less, mode = 0.6mm, containing quartz, muscovite and biotite mica laths, and sometimes plagioclase feldspar as well as lithic fragments in fine calcareous matrix.
	Quartz, a., size = 0.25 mm or less, mode = 0.05 mm.
Rare	Siltstone, a., equant, size = 0.5-2.05 mm. Containing muscovite and biotite mica laths and quartz. Laminated.

	Micrite, rarely contains quartz.
Very rare	Plagioclase feldspar, sr., size = 0.25 mm or less. Polysynthetic twinning.

Fine Fraction

Frequent	Quartz.
Few	Plagioclase feldspar.
Very few	Mica laths.

Sample no.	Vessel shape	Surface treatment
Kon18/38	Closed vessel	

Microstructure

There are very few macro vughs and very rare mega channel voids, single-spaced. The aplastic inclusions are single- to double-spaced. Both voids and inclusions have no preferred orientation.

Groundmass

This group is slight heterogeneous with the colour in groundmass, ranging from light brown in PPL and brown to dark brown in XP (x40). Optically inactive.

Inclusions

c:f:v =15:80:5
Coarse fraction = 1.68 mm to 0.12 mm
Fine fraction = 0.12 mm or less
Bimodal grain size distribution with moderately sorted inclusions.

Coarse Fraction

Few	Muscovite schist, sa., equant, size = 1.44 mm or less, mode = 0.56 mm.
	Quartz, a-sa., size = 1.68 mm or less, mode = 0.12 mm.
Very few	Opaque, sometimes with quartz.
Rare	Polycrystalline quartz, a., size = 1 mm or less.

	Siltstone, r., size = 1.6 mm or less.
	Rock fragments, sa-sr., size = 1 mm or less. Commonly contains plagioclase feldspar (zoned or twinned) with few quartz and biotite mica laths.
	Chert, a-r., elongate, size = 0.66 mm or less.
	Mudstone, sr-r., size = 1.45 mm or less.
Very rare	Plagioclase feldspar, sa., size = 0.48 mm or less, both Carlsbad and Polysynthetic twinning.
	Sandstone, a., size = 1.52 mm, mostly composed by quartz.

Fine Fraction

Common	Quartz
Very few	Mica laths (commonly muscovite and biotite, very rarely chlorite).

Textural concentration features

Few. Clear to diffuse boundaries, sa-sr., prolate, low to neutral optical density, concordant with the micromass. Packed with medium-fine to fine quartz, frequently containing metamorphic rock fragments of phyllite and muscovite schist, polycrystalline quartz, mica laths and some with zoisite and vughs, showing an internal alignment of mica laths. More easily observed under PPL. Some have voids along the margin.

Sample no.	Vessel shape	Surface treatment
Kon18/48	Shallow bowl	Black slip and burnish

Microstructure

There are few macro and meso vughs and very rare macro channel voids, single-to double-spaced. The aplastic inclusions are close- to single-spaced. The voids and aplastic inclusions show slightly parallel to the vessel margins.

Groundmass

Slightly heterogeneous in terms of colour, orange to brown in PPL and yellow to orange in XP (40x). The optical activity is moderate.

Inclusions

c:f:v $_{10\mu m}$ ca. 25:69:6
Coarse fraction = 2.05 mm to 0.35 mm
Fine fraction = 0.35 mm or less
Bimodal grain size distribution with poor sorting of inclusions.

Coarse Fraction

Common	Biotite-muscovite-opaque schist, a-sa., size = 2.05 mm or less, mode = 0.65 mm.
Few	Polycrystalline quartz, a-sa., size = 0.55 mm or less, mode = 0.35 mm.
Very few	Opaque.

Fine Fraction

Few	Quartz. Mica laths (mainly muscovite). Opaque.
Very few	Polycrystalline quartz.

Sample no.	Vessel shape	Surface treatment
Kon18/50	Pyxis	

Microstructure

There are very few macro vughs and channel voids as well as rare meso vughs, open-spaced, slightly align to the vessel margins. The aplastic inclusions are close- to single-spaced. The elongate inclusions show a weak orientation parallel to the vessel margins.

Groundmass

Homogenous throughout the thin section. Yellowish brown in PPL and XP (40x). Moderate to high optical activity.

Inclusions

c:f:v $_{10\mu m}$ ca. 32:63:5
Coarse fraction = 2.08 mm to 0.05 mm
Fine fraction = 0.05 mm or less
Bimodal grain size distribution with moderately sorted inclusions

Coarse Fraction

Frequent	Muscovite-chlorite±biotite±opaque schist, sa., size = 2.08mm or less, mode = 0.6 mm. Mostly elongate, shimmer, some with crenulation cleavage.
Very few	Polycrystalline and monocrystalline quartz, a-sa., elongate, size = 0.53 mm or less, mode = 0.05 mm.
	Mica laths (mostly muscovite and chlorite).
	Opaque.
Rare	Marble, sr., size = 0.66 mm.

Fine Fraction

Few	Muscovite-chlorite schist fragments. Mica laths (muscovite and chlorite). Quartz. Opaque.

Sample no.	Vessel shape	Surface treatment
Kon18/52	Handle	

Microstructure

There are rare macro and meso channel voids, single-spaced and show a slightly diagonal direction. The aplastic inclusions are close- to single-spaced and randomly distributed.

Groundmass

This fabric is homogeneous throughout the section. The groundmass is slightly optically active and orange in PPL and yellowish orange in XP (40x). The optical activity is slight.

Inclusions

c:f:v $_{10\mu m}$ ca. 12:86:2
Coarse fraction = 1.76 mm to 0.1 mm
Fine fraction = 0.1 mm or less
Unimodal grain size distribution with poorly sorted inclusions.

Coarse Fraction

Few	Quartz, a-sa., equant and elongate, size = 0.63 mm or less, mode = 0.2 mm.
Very few	Polycrystalline quartz, a-sr., equant and occasionally elongate, size = 0.1-0.45 mm.
	Amphibole.
	Biotite mica laths.
Rare	Volcanic rock fragments, a., size = 1.76 mm or less.
	Plagioclase feldspar, a., equant, size = 0.56 mm or less. Calcite, sa-sr., equant., size = 0.53 mm or less. Including metamorphose calcium carbonate reformed into coarse and interlocking grains of calcite along with quartz, sparite and micrite.
	Opaque.
Very rare	Limestone, a-r., size = 0.2 mm. Including biotite mica and opaque.
	Phyllite.

Fine Fraction

Few	Quartz. Biotite mica. Amphibole.
Rare	Opaque.

Textural concentration features

Very rare. Diffuse boundaries, rounded and equant, neutral optical density, concordant with the groundmass. Possibly clay pellets.

Sample no.	Vessel shape	Surface treatment
Kon18/89	Deep bowl	Red slip and burnish

Microstructure

There are few mega and macro channel voids and very few macro to meso vughs, close- to single-spaced. Some voids are filled with recrystallised calcite. The aplastic inclusions are close- to single-spaced. Both the voids and aplastic inclusions are aligned to the same direction in different zones and slightly parallel to the vessel margins.

Groundmass

Homogeneous in terms of texture and slightly heterogeneous in terms of colour. The colour varies from orange, red to brown both in PPL and yellow-, red-brown to brown in XP (x40). The optical activity ranges from slight to moderate.

Inclusions

c:f:v $_{10\mu m}$ ca. 23:71:6
Coarse fraction = 2 mm to 0.4 mm
Fine fraction = 0.4 mm or less
The aplastic inclusions are poorly sorted and exhibit a bimodal grain size distribution.

Coarse Fraction

Few	Muscovite-opaque schist, sa-sr., size = 1.44 mm or less, mode = 0.65 mm, with the higher birefringence.
	Limestone, sr., size = 2 mm or less, mode = 0.8 mm, mostly grades into subrounded micrite.
Very few	Polycrystalline quartz, a-sa. size = 1.05 mm or less. mode = 0.85 mm.
	Marble, sa-sr., size = 1.28 mm or less, mode = 0.95 mm.
	Calcite, sa-r., size = 0.72 mm or less, mode = 0.4 mm.
Very rare	Chert, sa., size = 1.12 mm or less.
	Orange biotite, sa., size = 0.76 mm, overlapped with polycrystalline quartz.
	Epidote-biotite-pyroxene schist, sa., size = 0.8 mm.
	Epidote/zoisite, size = 0.43 mm.

Fine Fraction

Very few	Quartz. Micrite. Mica laths (mostly muscovite).
Rare	Calcite.

Sample no.	Vessel shape	Surface treatment
Kon18/116	Jar	Smooth

Microstructure

There are very few macro and meso channel voids and very rare meso vughs. Both voids and aplastic inclusions are close- to single-spaced and voids are aligned to the vessel wall.

Groundmass

The groundmass is homogeneous with yellowish brown in PPL and yellowish orange in XP (x40). Very active birefringent groundmass.

Inclusions

c:f:$v_{10\mu m}$ ca. 20:75:5
Coarse fraction= 1.68 mm to 0.2 mm
Fine fraction= 0.2 mm or less
Clear bimodal grain size distribution with well-sorted sand-sized inclusions.

Coarse Fraction

Few	Calcite, a-sa., size = 0.64 mm or less, mode = 0.4 mm.
	Quartz, a-sa., size = 0.8 mm or less, mode = 0.2 mm.
Very few	Phyllite, a-sa., size = 1.36 mm or less, mode = 0.88 mm, exhibiting the higher birefringence, mostly made of muscovite and opaque.
	Polycrystalline quartz, sa., size = 1.68 mm or less, mode = 0.55 mm.
	Limestone, sa-sr., size = 1 mm or less, mode = 1 mm. Commonly contains quartz and mica laths and some zones grades into carbonate muds.
	Micrite.
Rare	Mudstone, sa-sr., size = 1mm or less. Seldom with quartz.
Very rare	Orthoclase feldspar, a., size = 0.5 mm or less. Simple twinning visible.

Fine Fraction

Very few	Quartz. Calcite.
Very rare	Muscovite mica laths.

Sample no.	Vessel shape	Surface treatment
Kon18/122	Jug	White slip

Microstrcuture

There are very few voids, mostly mega to meso channel voids and very rare meso vughs, double- to open-spaced and slightly parallel to the vessel margins. The aplastic inclusions are double- to open-spaced with no clear orientation.

Groundmass

Hetergenous in terms of colour, yellowish brown to orange in PPL and XP (40x). The groundmass is highly active.

Inclusions

c:f:$v_{10\mu m}$ ca. 2:97:1
Coarse fraction = 0.35 mm to 0.25 mm
Fine fraction = 0.25 mm or less
The inclusions are well-sorted and present a unimodal grain size distribution.

Coarse Fraction

Rare	Red mudstone, sr-r., size = 0.35 mm or less.
Very rare	Quartz, sa-sr., size = 0.25 mm or less.

Fine Fraction

Few	Quartz.

Sample no.	Vessel shape	Surface treatment
Kon18/125	Pipe	

Microstructure

There are common voids from mega to meso vughs with rare mega to meso planar and channel voids. Close- to single-spaced, weakly align to the margin. The aplastic inclusions are single- to double-spaced and randomly distributed.

Groundmass

Slightly heterogeneous in terms of colour due to amount of calcareous matrix with some areas are more packed with micrite. The colour ranges from brown to light brown in PPL and yellowish brown to brown in XP (x40). The optical activity is slightly to strongly active.

Inclusions

$c{:}f{:}v_{10\mu m}$ ca. 35:50:15
Coarse fraction = 1.68 mm to 0.18 mm
Fine fraction = 0.18 mm or less
The aplastic inclusions are moderately sorted and appear to have a bimodal grain size distribution.

Coarse Fraction

Few	Calcite, a-sr., size = 1.44 mm or less, mode = 0.4 mm. Mostly recrystallised, possibly disaggregated from marble? Very rare are graded into sparite.
	Micrite.
Very few	Marble, sa-r. elongate, size = 0.45-1.2 mm.
	Biotite ± chlorite mica schist, size = 1.3 mm or less, mode = 0.8 mm.
	Chert, sr., size = 0.5 mm or less. Mostly show transition from chalcedony to chert with higher interference colours.
Rare	Muscovite schist, sa., size = 0.6 mm or less, rarely with opaque veins.
	Polycrystalline quartz, a.-sa., size = 0.45 mm or less.
	Quartz, a., size = 0.86 mm or less, mode = 0.18 mm.
	Opaque, red to black, frequently with quartz inclusions.
Very rare	Amphibolite, sa., size = 1.68 mm or less.
	Microfossils (bioclast?).

Fine Fraction

Dominant	Micrite.
Few	Quartz.
Rare	Mica laths (mostly muscovite). Microfossils.

Sample no.	Vessel shape	Surface treatment
Kon18/128	Pedestalled bowl	

Microstructure

This sample contains few macro and meso vughs and meso channel voids. Both voids and aplastic inclusions are close- to single-spaced and have no preferred orientation.

Groundmass

Slightly heterogeneous due to the presences of TCFs. The colour is orange in PPL and red in XP (x40). Optically inactive.

Inclusions

$c:f:v_{10\mu m}$ ca. 15:82:3
Coarse fraction = 2.9 mm to 0.15 mm
Fine fraction = 0.15 mm or less
The aplastic inclusions have a skewed bimodal grain size distribution due to the poor sorting.

Coarse Fraction

Few	Metamorphic rock fragments: Mica schist, sa-sr., equant and elongated, size = 2.9 mm or less, mode = 0.96 mm. Mostly biotite–quartz–muscovite schist and some muscovite schist, few with opaques.
	Calcite, sa-sr., size = 2.2 mm or less, mode = 0.36 mm. Commonly grades into sparite and micrite.
	Polycrystalline quartz, sr., size = 0.85 mm or less, mode = 0.6 mm.
	Quartz, a-sa., size = 1.02 mm or less, mode = 0.2 mm.
Very few	Sandstone, sr-r., size = 1.2 mm or less. Containing sand-to silt-

	sized quartz and mica laths.
	Red siltstone, sa., size = 0.5 mm or less. Containing highly birefringent mica laths, quartz and calcite in red fine matrix.
Rare	Phyllite, sa-sr., size = 0.78 mm or less.
very rare	Opaque.

Fine Fraction

Common	Quartz
Very few	Mica laths.

Textural concentration features

It contains few clay pellets with clear to diffuse boundaries, rounded and equant, high to neutral optical density, concordant. Red to reddish brown in PPL and XP (x40).

Sample no.	Vessel shape	Surface treatment
Kon18/132	Closed vessel	

Microstructure

There are very few macro and meso vughs. Both voids and the aplastic incluisons are close- to single-spaced and randomly distributed.

Groundamss

Homogeneous throughout the section. The colour is brown in PPL and greenish brown in XP (x40) and appears to be optically inactive.

Inclusions

c:f:$v_{10\mu m}$ ca. 13:84:3
Coarse fraction = 1.2 mm to 0.15 mm
Fine fraction = 0.15 mm or less
This sample is well sorted and have a bimodal grain size distribution.

Coarse Fraction

Few	Serpentinite, sa-sr., size = 1.2 mm or less, mode = 0.8 mm. Showing the typical mesh texture, frequently with relics of olivine, pyroxene and basalt fragments, red in PPL and red-

	orange to orange in XP.
	Quartz, a., size = 0.26 mm or less, mode = 0.15 mm.
Very few	Polycrystalline quartz, a., size = 1.1 mm or less, mode = 0.8 mm.
	Chert, a-sa., size = 1.2 mm or less, mode = 0.4 mm.
	Micrite.
Very rare	Alkali feldspar, sa., size = 0.22 mm or less.
	Plagioclase feldspar, a., size = 0.5 mm or less.
	Quartz-alkali feldspar-biotite mica aggregates, sr., size = 0.35 mm.

Fine Fraction

Few	Quartz. Micrite. Serpentinite. Opaques.

Textural Concentration Features

Few. Clear boundaries, subround to rounded, equant and prolate, neutral optical density, concordant with the host clay, containing phenocrysts of quartz, biotite mica, opaque and possibly plagioclase laths, biotite and musocvite mica laths in the fine groundmass.

Sample no.	Vessel shape	Surface treatment
Kon18/150	Sauceboat	Red slip

Microstructure

There are very few macro and meso vughs and rare macro channel voids, single- to open-spaced, weakly align to the vessel margins. The aplastic inclusions are close- to open-spaced with no clear preferred orientation.

Groundmass

Slightly heterogeneous with respect to the colour due to the presence of red clay. Brown in PPL and reddish brown to brown in XP (x40). Optically moderately active.

Inclusions

c:f:v $_{10\mu m}$ ca. 2:94:4

Coarse fraction = 0.9 mm to 0.45 mm

Fine fraction = 0.45 mm or less

The inclusions are well-sorted and have a bimodal grain size distribution.

Coarse Fraction

Rare	Siltstone, sa., size = 0.9 mm or less, containing coarse silt-sized quartz, mica laths and schist fragment.
	Polycrystalline quartz, sa., size = 0.45 mm or less.
	Micrite.
Very rare	Limestone, sr., size = 0.9 mm. Yellowish brown in PPL, greenish brown in XP.
	Muscovite mica schist, a., size = 0.72 mm.
	Microfossils.

Fine Fraction

Frequent	Red opaque.
Few	Quartz. Mica laths.

Textural concentration features

Very few. Clear boundaries, sr-r., equant and elongated, high optical density, mostly concordant and occasionally discordant with the host fabric, brown in PPL and red in XP.

Sample no.	Vessel shape	Surface treatment
Kon18/153	Closed vessel	Black slip

Microstructure

There are very few macro to meso vughs, open-spaced, no preferred orientation. Partially filled with micrite and recrystallised calcite. The aplastic inclusions are close- to single-spaced, no preferred orientation.

Groundmass

Heterogeneous with respect to colour due to the presence of red speckles but homogenous with respect to inclusion types and voids. The colour grey in PPL and olive green in XP (x40). Optically inactive.

Inclusions

c:f:v $_{10\mu m}$ ca. 6:90:4
Coarse fraction = 0.3 mm to 0.16 mm
Fine fraction = 0.16 mm or less
The inclusions are well-sorted and present a unimodal grain size distribution.

Coarse Fraction

Few	Quartz, a., size = 0.3 mm, mode = 0.16 mm.
Very rare	Microfossils.

Fine Fraction

Few	Quartz.
Very few	Polycrystalline quartz. Calcite.
Very rare	Chert. Mica laths.

Textural concentration features

Very few. Clear boundaries, irregular shapes, high optical density, discordant, brown in PPL and red in XP. Their presence is considered as part of the host clay.

Sample no.	Vessel shape	Surface treatment
Kon18/196	Cooking pot	

Microstructure

There are few macro and meso vughs, very rare mega channel voids. The voids and aplastic inclusions are close- to single-spaced and no preferred orientation.

Groundmass

This sample is homogeneous throughout the section. The groundmass is orange in PPL and yellow-orange in XP (x40). Optical activity is moderate.

Inclusions

c:f:$v_{10\mu m}$ ca.18:75:7
Coarse fraction = 2.48 mm to 0.36 mm
Fine fraction = 0.36 mm or less
This sample has a bimodal grain size distribution with moderate sorting of inclusions.

Coarse Fraction

Common	Serpentinite, sa-sr., size = 2.48 mm or less, mode = 0.9 mm. Typical mesh texture with some relics of basalt fragments (ophitic texture with lath-like plagioclase and pyroxene), orange in PPL and grey in XP may be due to the low firing. Few grains are replaced by talc.
Very few	Muscovite±chlorite±biotite±opaque schist, a., size = 2.32 mm or less, mode = 0.8 mm.
Very rare	Muscovite mica aggregates, sa., size = 0.5 mm or less. Possibly disaggregated from schist fragments.
	Calcite, sa., size = 0.36 mm or less.

Fine Fraction

Few	Serpentinite. Quartz. Muscovite mica laths.
Very rare	Chlorite mica laths.