The Compositional Homogeneity of Potash-Lime-Silica Glasses in Northern Europe from 12th-17th Centuries.

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ABSTRACT

This research investigates the compositional homogeneity of potash-lime-silica glasses from the 12th-17th centuries in Northern Europe, and the significance of this with respect to compositional studies of archaeological glasses. The variables in the glass making process that influence the formation of a homogeneous glass are discussed, and investigated using laboratory replication of beech and bracken ash glasses. The experimental results are compared to archaeological material from glass production sites at Blunden's Wood, Knightons, Sidney Wood, and Little Birches in England, and Hils in Germany.

Backscattered scanning electron microscope (SEM) imaging is used to qualify the extent of inhomogeneity in both the experimental and archaeological samples. It is confirmed that visually homogeneous glasses can contain inhomogeneities that are only visible under backscattered SEM imaging. It is seen that the size and orientation of inhomogeneities is varied, and specific glass artefact types (such as crucible and waste glass) are more prone to inhomogeneity than fully formed glass (such as window and vessel glass). Electron microprobe analysis (EPMA) is used to quantify the extent of elemental variations present in the inhomogeneous archaeological glasses. The results show that a number of elements are significantly influenced by inhomogeneity, including those (such as calcium, magnesium and sodium) which are commonly used to form compositional groupings of medieval glass.

It is concluded that although a number of variables in the glass making process influence the formation of a homogeneous glass, specific variables, such as increased furnace temperature and a high alkali concentration in the ash, appear to be the dominating factors. The presence of large elemental variations in a number of the archaeological glasses analysed confirms that inhomogeneity is a vital consideration in compositional studies of this material, and that particular care must be exercised when using analytical techniques that require only a small sample size.

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ABBREVIATIONS

AAS	Atomic Absorption Spectroscopy
AHIV	Association Internationale pour l'Histoire du Verre
BAR	British Archaeological Reports
Be	Beech Ash Glass
BP	Bagot's Park Glass Site
Br	Bracken Ash Glass
BW	Blunden's Wood Glass Site
CB	Tall Form Crucible
CBA	Council for British Archaeology
CON	Conical Crucible
CYL	Cylindrical Crucible
EDS	Electron Dispersive Spectroscopy
EMPA	Electron Microprobe Analysis
EPMA	Electron Probe Microanalysis
FBe	Beech Ash Frit
FBr	Bracken Ash Frit
G	Hils Glass Sites
H	High
HMG	High Magnesium Glass
ICP-AES	Inductively Coupled Plasma-Atomic Emission Spectroscopy
ICP-MS	Inductively Coupled Plasma Mass Spectroscopy
K	Knightons Glass Site
L	Low
LA-ICP-MS	Laser Ablation Inductively Coupled Plasma Mass Spectroscopy
LBN	Little Birches (North Glass Site)
LBS	Little Birches (South Glass Site)
LLiF	Large Lithium Fluoride
LMG	Low Magnesium Glass
LOI	Loss on Ignition
LPET	Large Pentaerythitrol
M	Medium
n.a.	Not Analysed
NAA	Neutron Activation Analysis
n.d.	Not Detected
NERC	Natural and Environmental Research Council
NV	Not Visible
OES	Optical Emission Spectroscopy
PET	Pentaerythitrol
PIXE	Particle Induced X-Ray Emission
SEM	Scanning Electron Microscopy
SW	Sidney Wood Glasshouse
T	Temperature
t	Time
TAP	Thallium Acid Pthalate
WDS	Wave Dispersive Spectroscopy
XRF	X-ray Fluorescence Spectroscopy

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Ash Type	Location	Na_2O	MgO	K_2O	CaO	MnO	Fe_2O_3	CuO	ZnO	Sum	Total alkali Content (Na_2O+K_2O)
Beech	Weald	3.02	0.65	16.26	13.99	4.00	0.222	0.2754	0.0174	38.44	19.28
Beech	Weald	3.11	0.61	8.59	26.03	0.89	0.299	0.0187	0.0199	39.57	11.70
Beech	Weald	2.80	1.04	12.65	21.27	0.89	0.256	0.0183	0.0311	38.96	15.45
Beech	Weald	2.35	1.49	7.83	26.31	2.93	0.432	0.0192	0.0485	41.40	10.18
Beech	Weald	4.23	0.55	10.20	25.05	1.14	0.343	0.0198	0.0261	41.55	14.44
Beech	Weald	3.17	0.71	8.61	20.57	0.17	0.415	0.0208	0.0000	33.67	11.78
Oak	Weald	0.90	3.53	17.95	22.11	3.34	1.135	0.0318	0.0286	49.03	18.85
Oak	Weald	1.43	4.00	13.85	14.83	2.05	0.635	0.0278	0.0896	36.92	15.28
Oak	Weald	1.32	6.02	19.39	17.49	1.05	0.193	0.0125	0.0187	45.49	20.72
Oak	Weald	1.44	2.21	5.84	19.59	1.81	0.994	0.0303	0.0510	31.96	7.28
Oak	Weald	0.40	2.17	9.72	24.77	1.76	0.176	0.0125	0.0212	39.03	10.13
Oak	Weald	0.73	3.60	9.61	36.10	0.89	0.262	0.0265	0.0087	51.23	10.34

Table II:1 Wealden beech and oak ash compositions (AAS) (Sanderson and Hunter 1981: Table 1) (wt.%)

Ash Type	Location	Na_2O	MgO	K_2O	CaO	MnO	Fe_2O_3	Al_2O_3	SiO_2	P_2O_5	TiO_2	SO_3	Cl	LOI	Sum	Total alkali Content (Na_2O+K_2O)
Bracken	Snake Pass	2.24	4.88	37.28	9.02	0.51	3.55	0.46	15.17	7.55	0.01	3.68	n.a.	15.65	100.00	39.52
Fern	Unknown	4.6	7.6	42.8	14.1	n.a.	n.a.	n.a.	6.1	9.7	n.a.	5.1	10.2	n.a.	100.2	47.4

Table II:2 Snake Pass bracken ash composition (XRF) (Jackson and Smedley 2000: Table 2) and fern composition (unknown location) (Bezborodov 1975: Table V) (wt. %)

Element Measured	Operating Parameter			
	Spectral Line	Analysing Crystal	Machine Standard	Spectrometer Number
Na	Kα	TAP	Jadeite	5
Mg	Kα	TAP	Periclase	5
Al	Kα	TAP	Corundum	4
Si	Kα	TAP	Wollastonite	4
P	Kα	LPET	Apatite	3
S	Kα	PET	Anhydrite	2
Cl	Kα	PET	Halite	2
K	Kα	LPET	Orthoclase	3
Ca	Kα	LPET	Wollastonite	3
Ti	Kα	LPET	Rutile	3
Mn	Kα	LLiF	Tephroite	1
Fe	Kα	LLiF	Fayalite	1
Co	Kα	LLiF	Co	1
Cu	Kα	LLiF	Cu	1
Key				
LLiF = Large Lithium fluoride		PET = Pentaerythitrol		
TAP = Thallium Acid Pthalate		LPET = Large Pentaerythitrol		

Table III:1EPMA operating parameters

Wt.% Oxide														
Na_2O	MgO	Al_2O_3	SiO_2	P_2O_5	SO_2^*	Cl	K_2O	CaO	TiO_2	MnO	FeO^*	CoO	CuO	Total
1.39	4.06	5.42	55.1	3.50	0.22	0.35	11.56	14.99	0.39	0.55	0.46	0.02	0.38	98.39
*The values of SO_2 and FeO have been converted from SO_3 and Fe_2O_3 using the relevant oxide factors														

Table III:2Composition of Corning D glass standard (Brill 1972: Table IV)

Run	Value	Mean Composition and 2sigma /Wt.% Oxide															
		Na_2O	MgO	Al_2O_3	SiO_2	P_2O_5	SO_2	Cl	K_2O	CaO	TiO_2	MnO	FeO	CoO	CuO	Total	n
1	Mean	1.320	3.854	4.881	53.067	3.643	0.182	n.a.	11.112	14.969	0.419	0.560	0.480	n.a.	n.a.	94.511	6
	2sigma	±0.102	±0.070	±0.124	±0.982	±0.244	±0.094	n.a.	±0.072	±0.244	±0.052	±0.094	±0.112	n.a.	n.a.		
2	Mean	1.352	3.823	4.964	55.242	4.089	0.163	0.159	11.079	14.881	0.405	0.542	0.437	n.a.	n.a.	97.138	7
	2sigma	±0.130	±0.068	±0.110	±0.946	±0.238	±0.078	±0.044	±0.312	±0.220	±0.040	±0.066	±0.036	n.a.	n.a.		
3	Mean	1.372	3.846	4.950	55.064	4.096	0.184	0.183	11.121	15.001	0.406	0.538	0.446	n.a.	n.a.	97.206	7
	2sigma	±0.068	±0.070	±0.074	±0.302	±0.248	±0.058	±0.036	±0.170	±0.110	±0.040	±0.070	±0.034	n.a.	n.a.		
4	Mean	1.354	3.921	5.011	55.267	4.217	0.086	0.150	11.185	14.951	0.413	0.538	0.449	0.014	0.398	97.953	7
	2sigma	±0.130	±0.086	±0.074	±0.568	±0.190	±0.058	±0.022	±0.128	±0.216	±0.050	±0.072	±0.118	±0.034	±0.060		
5	Mean	1.329	3.919	4.944	54.112	4.095	0.086	0.163	11.153	15.068	0.421	0.538	0.443	0.022	0.415	96.708	10
	2sigma	±0.090	±0.112	±0.094	±1.202	±0.242	±0.048	±0.064	±0.246	±0.144	±0.042	±0.070	±0.080	±0.038	±0.072		

Table III:3A comparison of the mean compositions and 2sigma values obtained from Corning D standards for each EPMA analysis run

Run	Value	Mean Composition (Wt.% Oxide) and Coefficient of Variation (CV) (%)															
		Na_2O	MgO	Al_2O_3	SiO_2	P_2O_5	SO_2	Cl	K_2O	CaO	TiO_2	MnO	FeO	CoO	CuO	Total	n
1	Mean	1.320	3.854	4.881	53.067	3.643	0.182	n.a.	11.112	14.969	0.419	0.560	0.480	n.a.	n.a.	94.511	6
	CV	3.864	0.908	1.270	0.925	3.349	25.824	n.a.	0.324	0.815	6.205	8.393	11.667	n.a.	n.a.		
2	Mean	1.352	3.823	4.964	55.242	4.089	0.163	0.159	11.079	14.881	0.405	0.542	0.437	n.a.	n.a.	97.138	7
	CV	4.808	0.889	1.108	0.856	2.910	23.926	13.836	1.408	0.739	4.938	6.089	4.119	n.a.	n.a.		
3	Mean	1.372	3.846	4.950	55.064	4.096	0.184	0.183	11.121	15.001	0.406	0.538	0.446	n.a.	n.a.	97.206	7
	CV	2.478	0.910	0.747	0.274	3.027	15.761	9.836	0.764	0.367	4.926	6.506	3.812	n.a.	n.a.		
4	Mean	1.354	3.921	5.011	55.267	4.217	0.086	0.150	11.185	14.951	0.413	0.538	0.449	0.014	0.398	97.953	7
	CV	4.801	1.097	0.738	0.514	2.253	33.721	7.333	0.572	0.722	6.053	6.691	13.140	121.429	7.538		
5	Mean	1.329	3.919	4.944	54.112	4.095	0.086	0.163	11.153	15.068	0.421	0.538	0.443	0.022	0.415	96.708	10
	CV	3.386	1.429	0.951	1.111	2.955	27.907	19.632	1.103	0.478	4.988	6.506	9.029	86.364	8.675		

Table III:4A comparison of the mean compositions and coefficient of variation obtained from the entire data set of Corning D EPMA analyses

Run	Mean Lower Limit of Detection/Wt.% Oxide														
	Na_2O	MgO	Al_2O_3	SiO_2	P_2O_5	SO_2	Cl	K_2O	CaO	TiO_2	MnO	FeO	CoO	CuO	n
1	0.143	0.054	0.095	0.153	0.125	0.231	n.a.	0.036	0.066	0.102	0.169	0.095	n.a.	n.a.	30
2	0.103	0.056	0.068	0.110	0.135	0.246	0.114	0.053	0.063	0.075	0.082	0.122	n.a.	n.a.	30
3	0.091	0.055	0.064	0.109	0.123	0.205	0.106	0.051	0.057	0.049	0.077	0.110	n.a.	n.a.	30
4	0.133	0.075	0.089	0.155	0.133	0.185	0.089	0.054	0.065	0.067	0.113	0.150	0.121	0.211	30
5	0.136	0.075	0.089	0.153	0.131	0.197	0.082	0.054	0.065	0.067	0.113	0.147	0.102	0.187	30
1-5	0.121	0.063	0.081	0.136	0.129	0.213	0.098	0.050	0.063	0.072	0.111	0.125	0.112	0.199	150

Table III:5A comparison of the mean lower limits of detection for the Corning D EPMA analyses for each run and over the entire data set

Run	Mean Composition (Wt.% Oxide) and Standard Deviation of the Coefficient of Variation (%)														
	Na_2O	MgO	Al_2O_3	SiO_2	P_2O_5	SO_2	Cl	K_2O	CaO	TiO_2	MnO	FeO	CoO	CuO	Total
1-5	1.345	3.873	4.950	54.550	4.028	0.140	0.164	11.130	14.974	0.413	0.543	0.451	0.018	0.407	96.703
	±0.990	±0.230	±0.230	±0.337	±0.400	±6.534	±5.365	±0.429	±0.192	±0.648	±0.897	±4.269	±24.795	±0.804	
	n=37	n=37	n=37	n=37	n=37	n=37	n=31	n=37	n=37	n=37	n=37	n=37	n=17	n=17	

Table III:6A comparison of the mean composition and the standard deviation of the coefficients of variation of Corning D EPMA analyses over the entire data set

Burn No.	Weather	Place	Wood Type	Wood Wt./g	Burn time/hr	Rate of Burning /ghr^{-1}	Ash Wt./g	Charcoal Wt./g	Total/g	Wt.% Ash	Wt.% Charcoal	Total Yield%	Ash Yield %	Charcoal Yield %
1*	N/a	Foundry	Brash	109100	Unknown	Unknown	1267.0	220.0	1487.0	85.21	14.79	**1.36**	**1.16**	0.20
1	N/a	Foundry	Trunk	50000	4	12500	273.23	361.80	635.03	43.03	56.97	**1.27**	**0.55**	0.72
2	Dry, calm	Garden	Trunk	25000	1	25000	135.89	224.26	360.15	37.73	62.27	**1.44**	**0.54**	0.90
3	Dry, calm	Garden	Trunk	75000	5	15000	464.40	186.60	651.00	71.34	28.66	**0.87**	**0.62**	0.25
4	Dry, calm	Garden	Trunk	105000	7	15000	646.30	235.90	882.20	73.26	26.74	**0.84**	**0.62**	0.22
5	Dry, light wind	Garden	Trunk	45000	3	15000	397.60	167.57	565.17	70.35	29.65	**1.26**	**0.88**	0.37
Key														
1* Beech ash ((Smedley *et al.* 1998)														
1-5 Beech wood collected during this research (see Section 4.3.1)														

Table IV:1Beech brash and trunk wood burning data

Burn No.	Weather	Place	Green Weight/Kg	Dry Weight/Kg	Total Ash Weight/Kg	Ash Yield %
1	N/a	Foundry	360.6	113.8	5.5	1.53
Key						
1 Bracken ash (Jackson and Smedley 2000: 336)						

Table IV:2Bracken burning data

Oxide	Beech Trunk Ash (Combination of Samples 1-5)	Sheffield Beech Brash (Smedley *et al.* 1998 149)
Na_2O	1.30	0.59
MgO	11.63	6.95
Al_2O_3	1.01	0.92
SiO_2	2.55	18.0
P_2O_5	4.16	15.3
SO_3	1.08	n.a.
Cl_2O	0.72	n.a.
K_2O	22.37	20.0
CaO	46.85	31.1
TiO_2	0.13	0.07
Cr_2O_3	0.01	n.a
MnO	7.23	6.2
Fe_2O_3	0.63	0.94
CoO	0.03	n.a.
NiO	0.03	n.a.
CuO	0.03	n.a.
ZnO	0.20	n.a.
Br_2O	0.01	n.a.
Rb_2O	0.03	n.a.
SrO	0.05	n.a.
ZrO_2	0.01	n.a.
LOI	n.a.	n.a.
Sum	100.00	100.00
Total Alkali Content (Na_2O+K_2O)	23.67	20.59

Not analysed (n.a)
Not detected (n.d)
Loss on Ignition (LOI)

Table IV:3 XRF data for beech trunk and brash ash (Smedley et al. 1998: 149) (Table IV:1)

Sand Particle Size/μm	Wt. Sand /g	Wt. Soda /g	Mixing Time/s	Sample No.	Sample Size/g	Results			
						Wt. Sand/g	Wt. Soda (by difference)/g	Percentage Deviation from Fully Mixed Batch*	Average Percentage Deviation (n=3)
≥425->250	50.00	50.00	0	1	20.00	11.04	8.96	10.4	
				2	20.00	9.33	10.67	6.7	12.5
				3	20.00	7.96	12.04	20.4	
≥425->250	50.00	50.00	30	1	20.00	9.86	10.14	1.4	
				2	20.00	10.16	9.84	1.6	1.8
				3	20.00	10.25	9.75	2.5	
≥425->250	50.00	50.00	60	1	20.00	9.97	10.03	0.3	
				2	20.00	10.26	9.74	2.6	1.1
				3	20.00	10.04	9.96	0.4	
≥425->250	50.00	50.00	300	1	20.00	10.03	9.97	0.3	
				2	20.00	10.12	9.88	1.2	1.6
				3	20.00	10.32	9.68	3.2	
≥425->250	50.00	50.00	600	1	20.00	10.21	9.79	2.1	
				2	20.00	10.32	9.68	3.2	2.9
				3	20.00	10.33	9.67	3.3	
*Fully mixed batch = 50% sand and 50% soda									

Table IV:4Batch mixing, 'end over end' jar mixing method, and variation in mixing time

Sand Particle Size/μm	Wt. Sand /g	Wt. Soda /g	Mixing Time/s	Sample No.	Sample Size/g	Results			
						Wt. Sand/g	Wt. Soda (by difference)/g	Percentage Deviation from Fully Mixed Batch*	Average Percentage Deviation (n=3)
≥425->250	50.00	50.00	0	1	20.00	8.44	11.56	15.6	
				2	20.00	6.71	13.29	32.9	26.4
				3	20.00	13.08	6.92	30.8	
≥425->250	50.00	50.00	30	1	20.00	9.54	10.46	4.6	
				2	20.00	10.55	9.45	5.5	4.8
				3	20.00	9.58	10.42	4.2	
≥425->250	50.00	50.00	60	1	20.00	9.21	10.79	7.9	
				2	20.00	9.84	10.16	1.6	4.8
				3	20.00	9.51	10.49	4.9	
≥425->250	50.00	50.00	300	1	20.00	10.01	9.99	0.1	
				2	20.00	9.84	10.16	1.6	3.1
				3	20.00	9.24	10.76	7.6	
≥425->250	50.00	50.00	600	1	20.00	9.85	10.15	1.5	
				2	20.00	9.87	10.13	1.3	0.9
				3	20.00	9.99	10.01	0.1	
*Fully mixed batch = 50% sand and 50% soda									

Table IV:5Batch mixing, CB1 mixing method, and variation in mixing time

Sand Particle Size/μm	Wt. Sand /g	Wt. Soda /g	Mixing Time/s	Sample No.	Sample Size/g	Results			
						Wt. Sand/g	Wt. Soda (by difference)/g	Percentage Deviation from Fully Mixed Batch*	Average Percentage Deviation (n=3)
≥425->250[+]	50.00	50.00	60	1	20.00	9.97	10.03	0.3	
				2	20.00	10.26	9.74	2.6	1.1
				3	20.00	10.04	9.96	0.4	
≥250->180	50.00	50.00	60	1	20.00	10.02	9.98	0.2	
				2	20.00	9.98	10.02	0.2	1.1
				3	20.00	10.29	9.71	2.9	
≥150->75	50.00	50.00	60	1	20.00	9.99	10.01	0.1	
				2	20.00	10.04	9.96	0.4	0.5
				3	20.00	9.90	10.10	1.0	
Unsieved Loch Aline Sand	50.00	50.00	60	1	20.00	10.00	10.00	0.0	
				2	20.00	10.06	9.94	0.6	0.3
				3	20.00	10.03	9.97	0.3	

*Fully mixed batch = 50% sand and 50% soda
[+]Values obtained from Table IV:4

Table IV:6 Batch mixing, 'end over end' jar mixing method, and variation in sand grain size

Sample Number	Batch Parameters				Fritting Parameters				Fritting Results		
	Sand Size/μm	Sand/g	Ash/g	Batch Weight/g	Mixed Batch	T/°C	t/hr	Crucible	Colour	Reduction in Batch Volume/%	Observations
FBe1	≥425->250	5.0	10.0	15.0	No	900	24	CON9	Grey/green	25	Mainly powder
FBe2	≥425->250	5.0	10.0	15.0	Yes	900	24	CON9	Pale purple	50	Extensive vitrification
FBe3	≤250->180	5.0	10.0	15.0	No	900	24	CON9	Grey/green	25	Mainly powder
FBe4	≤250->180	5.0	10.0	15.0	Yes	900	24	CON9	Pale purple	50	Extensive vitrification
FBe5	≤180->150	5.0	10.0	15.0	No	900	24	CON9	Grey/green	25	Mainly powder
FBe6	≤180->150	5.0	10.0	15.0	Yes	900	24	CON9	Pale purple	50	Extensive vitrification
FBe7	≤150->75	5.0	10.0	15.0	No	900	24	CON9	Grey/green	25	Mainly powder
FBe8	≤150->75	5.0	10.0	15.0	Yes	900	24	CON9	Pale purple	50	Extensive vitrification
FBe9	≤75->63	5.0	10.0	15.0	No	900	24	CON9	Grey/green	25	Mainly powder
FBe10	≤75->63	5.0	10.0	15.0	Yes	900	24	CON9	Pale purple	50	Extensive vitrification
FBe11	≤63->45	5.0	10.0	15.0	No	900	24	CON9	Grey/green	25	Mainly powder
FBe12	≤63->45	5.0	10.0	15.0	Yes	900	24	CON9	Pale purple	50	Extensive vitrification

Table IV:7 Variation in batch mixing and sand grain size, fritting parameters and results, beech ash

Sample Number	Batch Parameters				Fritting Parameters				Melting Parameters			
	Sand Size/µm	Sand/g	Ash/g	Batch Weight/g	Mixed Batch	T/°C	t/hr	Crucible	Mixed Frit	T/°C	t/hr	Crucible
Be1	≥425->250	5.0	10.0	15.0	No	900	No	CON9	No	1300	1	CON9
Be2	≥425->250	5.0	10.0	15.0	No	900	24	CON9	No	1300	1	CON9
Be3	≥425->250	5.0	10.0	15.0	Yes	900	No	CON9	No	1300	1	CON9
Be4	≥425->250	5.0	10.0	15.0	Yes	900	24	CON9	No	1300	1	CON9
Be5	≤250->180	5.0	10.0	15.0	No	900	No	CON9	No	1300	1	CON9
Be6	≤250->180	5.0	10.0	15.0	No	900	24	CON9	No	1300	1	CON9
Be7	≤250->180	5.0	10.0	15.0	Yes	900	No	CON9	No	1300	1	CON9
Be8	≤250->180	5.0	10.0	15.0	Yes	900	24	CON9	No	1300	1	CON9
Be9	≤180->150	5.0	10.0	15.0	No	900	No	CON9	No	1300	1	CON9
Be10	≤180->150	5.0	10.0	15.0	No	900	24	CON9	No	1300	1	CON9
Be11	≤180->150	5.0	10.0	15.0	Yes	900	No	CON9	No	1300	1	CON9
Be12	≤180->150	5.0	10.0	15.0	Yes	900	24	CON9	No	1300	1	CON9
Be13	≤150->75	5.0	10.0	15.0	No	900	No	CON9	No	1300	1	CON9
Be14	≤150->75	5.0	10.0	15.0	No	900	24	CON9	No	1300	1	CON9
Be15	≤150->75	5.0	10.0	15.0	Yes	900	No	CON9	No	1300	1	CON9
Be16	≤150->75	5.0	10.0	15.0	Yes	900	24	CON9	No	1300	1	CON9
Be17	≤75->63	5.0	10.0	15.0	No	900	No	CON9	No	1300	1	CON9
Be18	≤75->63	5.0	10.0	15.0	No	900	24	CON9	No	1300	1	CON9
Be19	≤75->63	5.0	10.0	15.0	Yes	900	No	CON9	No	1300	1	CON9
Be20	≤75->63	5.0	10.0	15.0	Yes	900	24	CON9	No	1300	1	CON9
Be21	≤63->45	5.0	10.0	15.0	No	900	No	CON9	No	1300	1	CON9
Be22	≤63->45	5.0	10.0	15.0	No	900	24	CON9	No	1300	1	CON9
Be23	≤63->45	5.0	10.0	15.0	Yes	900	No	CON9	No	1300	1	CON9
Be24	≤63->45	5.0	10.0	15.0	Yes	900	24	CON9	No	1300	1	CON9

Table IV:8 Variation in batch mixing and sand grain size, beech ash

Sample Number	Visual Results					SEM Results		Overall Result
	Glass Formed	Batch Relics	Colour	Observations	Homogeneous	Silica Relics	Inhomogeneity	
Be1	No	H	Purple/white	Mainly powder, some vitrification	No	No analysis	No analysis	Inhomogeneous
Be2	No	H	Pale grey/green	Mainly powder, some vitrification	No	No analysis	No analysis	Inhomogeneous
Be3	Yes	H	Pale purple	Extensive vitrfication and glass	No	No analysis	No analysis	Inhomogeneous
Be4	No	H	Pale purple	Extensive vitrfication and glass	No	No analysis	No analysis	Inhomogeneous
Be5	No	H	Pale purple	Mainly powder, some vitrification	No	No analysis	No analysis	Inhomogeneous
Be6	No	H	Pale grey/green	Mainly powder, some vitrification	No	No analysis	No analysis	Inhomogeneous
Be7	Yes	H	Pale purple	Extensive vitrfication and glass	No	No analysis	No analysis	Inhomogeneous
Be8	No	H	Pale purple	Extensive vitrfication and glass	No	No analysis	No analysis	Inhomogeneous
Be9	No	H	Pale purple	Mainly powder, some vitrification	No	No analysis	No analysis	Inhomogeneous
Be10	No	H	Pale purple	Mainly powder, some vitrification	No	No analysis	No analysis	Inhomogeneous
Be11	Yes	H	Pale purple	Extensive vitrfication and glass	No	No analysis	No analysis	Inhomogeneous
Be12	No	H	Pale purple	Extensive vitrfication and glass	No	No analysis	No analysis	Inhomogeneous
Be13	No	H	Pale purple	Mainly powder, some vitrification	No	No analysis	No analysis	Inhomogeneous
Be14	No	H	Pale purple	Mainly powder, some vitrification	No	No analysis	No analysis	Inhomogeneous
Be15	Yes	H	Pale purple	Extensive vitrfication and glass	No	No analysis	No analysis	Inhomogeneous
Be16	Yes	H	Pale purple	Extensive vitrfication and glass	No	No analysis	No analysis	Inhomogeneous
Be17	No	H	Pale purple	Mainly powder, some vitrification	No	No analysis	No analysis	Inhomogeneous
Be18	No	H	Pale purple	Mainly powder, some vitrification	No	No analysis	No analysis	Inhomogeneous
Be19	Yes	H	Pale purple	Extensive vitrfication and glass	No	No analysis	No analysis	Inhomogeneous
Be20	Yes	H	Pale purple	Extensive vitrfication and glass	No	No analysis	No analysis	Inhomogeneous
Be21	No	H	Pale purple	Mainly powder, some vitrification	No	No analysis	No analysis	Inhomogeneous
Be22	No	H	Pale purple	Mainly powder, some vitrification	No	No analysis	No analysis	Inhomogeneous
Be23	Yes	H	Pale purple	Extensive vitrfication and glass	No	No analysis	No analysis	Inhomogeneous
Be24	Yes	H	Pale purple	Extensive vitrfication and glass	No	No analysis	No analysis	Inhomogeneous

Table IV:9Results of batch mixing and sand grain size, beech ash (Key in Table 3:3)

Sample Number	Batch Parameters				Fritting Parameters				Fritting Results		
	Sand Size/μm	Sand/g	Ash/g	Batch Weight/g	Mixed Batch	T/°C	t/hr	Crucible	Colour	Reduction in Batch Volume/%	Observations
FBr1	≥425->250	5.0	10.0	15.0	No	900	24	CON9	Dark grey, purple (ash/sand interface)	30	Mainly powder
FBr2	≥425->250	5.0	10.0	15.0	Yes	900	24	CON9	Dark green (surface), purple (body)	50	Extensive vitrification
FBr3	≤250->180	5.0	10.0	15.0	No	900	24	CON9	Dark grey, purple (ash/sand interface)	30	Mainly powder
FBr4	≤250->180	5.0	10.0	15.0	Yes	900	24	CON9	Dark green (surface), purple (body)	50	Extensive vitrification
FBr5	≤180->150	5.0	10.0	15.0	No	900	24	CON9	Dark grey, purple (ash/sand interface)	30	Mainly powder
FBr6	≤180->150	5.0	10.0	15.0	Yes	900	24	CON9	Dark green (surface), purple (body)	50	Extensive vitrification
FBr7	≤150->75	5.0	10.0	15.0	No	900	24	CON9	Dark grey, purple (ash/sand interface)	30	Mainly powder
FBr8	≤150->75	5.0	10.0	15.0	Yes	900	24	CON9	Dark green (surface), purple (body)	50	Extensive vitrification
FBr9	≤75->63	5.0	10.0	15.0	No	900	24	CON9	Dark grey, purple (ash/sand interface)	30	Mainly powder
FBr10	≤75->63	5.0	10.0	15.0	Yes	900	24	CON9	Dark green (surface), purple (body)	50	Extensive vitrification
FBr11	≤63->45	5.0	10.0	15.0	No	900	24	CON9	Dark grey, purple (ash/sand interface)	30	Mainly powder
FBr12	≤63->45	5.0	10.0	15.0	Yes	900	24	CON9	Dark green (surface), purple (body)	50	Extensive vitrification

Table IV:10 Variation in batch mixing and sand grain size, fritting parameters and results, bracken ash

Sample Number	Batch Parameters				Fritting Parameters				Melting Parameters			
	Sand Size/μm	Sand/g	Ash/g	Batch Weight/g	Mixed Batch	T/°C	t/ht	Crucible	Mixed Frit	T/°C	t/ht	Crucible
Br1	≥425->250	5.0	10.0	15.0	No	900	No	CON9	No	1300	1	CON9
Br2	≥425->250	5.0	10.0	15.0	No	900	24	CON9	No	1300	1	CON9
Br3	≥425->250	5.0	10.0	15.0	Yes	900	No	CON9	No	1300	1	CON9
Br4	≥425->250	5.0	10.0	15.0	Yes	900	24	CON9	No	1300	1	CON9
Br5	≤250->180	5.0	10.0	15.0	No	900	No	CON9	No	1300	1	CON9
Br6	≤250->180	5.0	10.0	15.0	No	900	24	CON9	No	1300	1	CON9
Br7	≤250->180	5.0	10.0	15.0	Yes	900	No	CON9	No	1300	1	CON9
Br8	≤250->180	5.0	10.0	15.0	Yes	900	24	CON9	No	1300	1	CON9
Br9	≤180->150	5.0	10.0	15.0	No	900	No	CON9	No	1300	1	CON9
Br10	≤180->150	5.0	10.0	15.0	No	900	24	CON9	No	1300	1	CON9
Br11	≤180->150	5.0	10.0	15.0	Yes	900	No	CON9	No	1300	1	CON9
Br12	≤180->150	5.0	10.0	15.0	Yes	900	24	CON9	No	1300	1	CON9
Br13	≤150->75	5.0	10.0	15.0	No	900	No	CON9	No	1300	1	CON9
Br14	≤150->75	5.0	10.0	15.0	No	900	24	CON9	No	1300	1	CON9
Br15	≤150->75	5.0	10.0	15.0	Yes	900	No	CON9	No	1300	1	CON9
Br16	≤150->75	5.0	10.0	15.0	Yes	900	24	CON9	No	1300	1	CON9
Br17	≤75->63	5.0	10.0	15.0	No	900	No	CON9	No	1300	1	CON9
Br18	≤75->63	5.0	10.0	15.0	No	900	24	CON9	No	1300	1	CON9
Br19	≤75->63	5.0	10.0	15.0	Yes	900	No	CON9	No	1300	1	CON9
Br20	≤75->63	5.0	10.0	15.0	Yes	900	24	CON9	No	1300	1	CON9
Br21	≤63->45	5.0	10.0	15.0	No	900	No	CON9	No	1300	1	CON9
Br22	≤63->45	5.0	10.0	15.0	No	900	24	CON9	No	1300	1	CON9
Br23	≤63->45	5.0	10.0	15.0	Yes	900	No	CON9	No	1300	1	CON9
Br24	≤63->45	5.0	10.0	15.0	Yes	900	24	CON9	No	1300	1	CON9

Table IV:11 Variation in batch mixing and sand grain size, bracken ash

Sample Number	Visual Results						SEM Results		Overall Result
	Glass Formed	Batch Relics	Colour	Crystalline Substance	Opacity	Homogeneous	Silica Relics	Inhomogeneity	
Br1	Yes	NV	Dark Green	H	NV	Yes	NV	NV	Homogeneous
Br2	No	H	Brown	NV	H	No	H	H	Inhomogeneous
Br3	Yes	NV	Dark Green	H	NV	Yes	NV	NV	Homogeneous
Br4	No	H	Brown	NV	H	No	H	H	Inhomogeneous
Br5	Yes	NV	Dark Green	H	NV	Yes	NV	NV	Homogeneous
Br6	No	H	Brown	NV	H	No	H	H	Inhomogeneous
Br7	Yes	NV	Dark Green	H	NV	Yes	NV	NV	Homogeneous
Br8	No	H	Brown	NV	H	No	H	H	Inhomogeneous
Br9	Yes	NV	Dark Green	H	NV	Yes	NV	NV	Homogeneous
Br10	No	H	Brown	NV	H	No	M	M	Inhomogeneous
Br11	Yes	NV	Dark Green	H	NV	Yes	NV	NV	Homogeneous
Br12	No	H	Brown	NV	H	No	L	M	Inhomogeneous
Br13	Yes	NV	Dark Green	H	NV	Yes	NV	NV	Homogeneous
Br14	No	H	Brown	NV	H	No	L	M	Inhomogeneous
Br15	Yes	NV	Dark Green	H	NV	Yes	NV	NV	Homogeneous
Br16	No	H	Brown	NV	H	No	L	L	Inhomogeneous
Br17	Yes	NV	Dark Green	H	NV	Yes	NV	NV	Homogeneous
Br18	No	H	Brown	NV	H	No	L	L	Inhomogeneous
Br19	Yes	NV	Dark Green	H	NV	Yes	NV	NV	Homogeneous
Br20	Yes	NV	Pale Green	H	H	Yes	NV	NV	Homogeneous
Br21	Yes	NV	Dark Green	H	NV	Yes	NV	NV	Homogeneous
Br22	No	H	Brown	NV	H	No	L	L	Inhomogeneous
Br23	Yes	NV	Dark Green	H	NV	Yes	NV	NV	Homogeneous
Br24	Yes	NV	Pale Green	H	H	Yes	NV	NV	Homogeneous

Table IV:12 Results of batch mixing and sand grain size, bracken ash (Key in Table 3:3)

Sample Number	Batch Parameters				Fritting Parameters	Melting Parameters		
	Sand (≤250->180µm)/g	Beech Ash/g	Batch Weight/g	Mixed Batch		T/°C	t/min	Crucible
Be25	3.0	6.0	9.0	Yes	None	1200	5	CON9
Be26	3.0	6.0	9.0	Yes	None	1200	10	CON9
Be27	3.0	6.0	9.0	Yes	None	1200	15	CON9
Be28	3.0	6.0	9.0	Yes	None	1200	20	CON9
Be29	3.0	6.0	9.0	Yes	None	1200	30	CON9
Be30	3.0	6.0	9.0	Yes	None	1200	45	CON9
Be31	3.0	6.0	9.0	Yes	None	1200	60	CON9
Be32	3.0	6.0	9.0	Yes	None	1200	120	CON9
Be33	3.0	6.0	9.0	Yes	None	1200	180	CON9
Be34	3.0	6.0	9.0	Yes	None	1200	480	CON9
Be35	3.0	6.0	9.0	Yes	None	1200	1440	CON9
Be36	3.0	6.0	9.0	Yes	None	1200	3960	CON9

Table IV:13 Stages of melting, beech brash wood ash (Smedley *etal.* 1998: Table 1) (1200°C)

Sample Number	Visual Results					SEM Results		Overall Result
	Glass Formed	Batch Relics	Colour	Observations	Homogeneous	Silica Relics	Inhomogeneity	
Be25	No	H	Pale grey/green	Powder still present	No	No analysis	No analysis	Inhomogeneous
Be26	No	H	Pale grey/green	Powder still present	No	No analysis	No analysis	Inhomogeneous
Be27	No	H	Pale grey/green	Powder still present	No	No analysis	No analysis	Inhomogeneous
Be28	No	H	Pale grey/green	Powder still present	No	No analysis	No analysis	Inhomogeneous
Be29	No	H	Pale grey/purple	Semi-vitrified but very friable	No	No analysis	No analysis	Inhomogeneous
Be30	No	H	Pale grey/purple	Semi-vitrified but very friable	No	No analysis	No analysis	Inhomogeneous
Be31	No	H	Pale grey/purple	Semi-vitrified but very friable	No	No analysis	No analysis	Inhomogeneous
Be32	No	H	Pale grey/purple	Semi-vitrified but very friable	No	No analysis	No analysis	Inhomogeneous
Be33	No	H	Pale grey/purple	Semi-vitrified but very friable	No	No analysis	No analysis	Inhomogeneous
Be34	No	H	Pale grey/purple	Semi-vitrified but very friable	No	No analysis	No analysis	Inhomogeneous
Be35	No	H	Pale grey/purple	Semi-vitrified but very friable	No	No analysis	No analysis	Inhomogeneous
Be36	No	H	Pale grey/purple	Semi-vitrified but very friable	No	No analysis	No analysis	Inhomogeneous

Table IV:14 Results of stages of melting, beech brash wood ash (Smedley *etal.* 1998: Table 1) (1200°C) (Key in Table 3:3)

Sample Number	Batch Parameters				Fritting Parameters	Melting Parameters		
	Sand (≤250->180µm)/g	Beech Ash/g	Batch Weight/g	Mixed Batch		T/°C	t/min	Crucible
Be37	3.0	6.0	9.0	Yes	None	1200	5	CON9
Be38	3.0	6.0	9.0	Yes	None	1200	10	CON9
Be39	3.0	6.0	9.0	Yes	None	1200	15	CON9
Be40	3.0	6.0	9.0	Yes	None	1200	20	CON9
Be41	3.0	6.0	9.0	Yes	None	1200	30	CON9
Be42	3.0	6.0	9.0	Yes	None	1200	45	CON9
Be43	3.0	6.0	9.0	Yes	None	1200	60	CON9
Be44	3.0	6.0	9.0	Yes	None	1200	120	CON9
Be45	3.0	6.0	9.0	Yes	None	1200	180	CON9
Be46	3.0	6.0	9.0	Yes	None	1200	480	CON9
Be47	3.0	6.0	9.0	Yes	None	1200	1440	CON9
Be48	3.0	6.0	9.0	Yes	None	1200	3960	CON9

Table IV:15 Stages of melting, beech trunk wood ash (1200°C)

Sample Number	Visual Results				SEM Results		Overall Result
	Glass Formed	Batch Relics	Colour	Homogeneous	Silica Relics	Inhomogeneity	
Be37	Yes	H	Dark Purple	No	H	H	Inhomogeneous
Be38	Yes	H	Dark Purple	No	H	H	Inhomogeneous
Be39	Yes	H	Dark Purple	No	H	H	Inhomogeneous
Be40	Yes	H	Dark Purple	No	H	H	Inhomogeneous
Be41	Yes	H	Dark Purple	No	H	H	Inhomogeneous
Be42	Yes	H	Dark Purple	No	H	H	Inhomogeneous
Be43	Yes	M	Dark Purple	No	M	M	Inhomogeneous
Be44	Yes	M	Dark Purple	No	M	M	Inhomogeneous
Be45	Yes	M	Dark Purple	No	M	M	Inhomogeneous
Be46	Yes	M	Dark Purple	No	M	L	Inhomogeneous
Be47	Yes	M	Dark Purple	No	L	L	Inhomogeneous
Be48	Yes	M	Dark Purple	No	L	L	Inhomogeneous

Table IV:16 Results of stages of melting, beech trunk wood ash (1200°C) (Key in Table 3:3)

Sample Number	Batch Parameters				Fritting Parameters	Melting Parameters		
	Sand (≤250->180µm)/g	Beech Ash/g	Batch Weight/g	Mixed Batch		T/ °C	t/min	Crucible
Be49	3.0	6.0	9.0	Yes	None	1300	5	CON9
Be50	3.0	6.0	9.0	Yes	None	1300	10	CON9
Be51	3.0	6.0	9.0	Yes	None	1300	15	CON9
Be52	3.0	6.0	9.0	Yes	None	1300	20	CON9
Be53	3.0	6.0	9.0	Yes	None	1300	25	CON9
Be54	3.0	6.0	9.0	Yes	None	1300	30	CON9
Be55	3.0	6.0	9.0	Yes	None	1300	35	CON9
Be56	3.0	6.0	9.0	Yes	None	1300	40	CON9
Be57	3.0	6.0	9.0	Yes	None	1300	45	CON9
Be58	3.0	6.0	9.0	Yes	None	1300	50	CON9
Be59	3.0	6.0	9.0	Yes	None	1300	55	CON9
Be60	3.0	6.0	9.0	Yes	None	1300	60	CON9
Be61	3.0	6.0	9.0	Yes	None	1300	90	CON9
Be62	3.0	6.0	9.0	Yes	None	1300	120	CON9
Be63	3.0	6.0	9.0	Yes	None	1300	150	CON9
Be64	3.0	6.0	9.0	Yes	None	1300	180	CON9
Be65	3.0	6.0	9.0	Yes	None	1300	210	CON9
Be66	3.0	6.0	9.0	Yes	None	1300	330	CON9
Be67	3.0	6.0	9.0	Yes	None	1300	480	CON9
Be68	3.0	6.0	9.0	Yes	None	1300	1200	CON9
Be69	3.0	6.0	9.0	Yes	None	1300	2760	CON9

Table IV:17 Stages of melting, beech brash wood ash (Smedley *etal.* 1998: Table 1) (1300°C)

Sample Number	Visual Results					SEM Results		Overall Result
	Glass Formed	Batch Relics	Colour	Observations	Homogeneous	Silica Relics	Inhomogeneity	
Be49	No	H	Pale purple	Core of semi-vitrified material, very friable	No	No analysis	No analysis	Inhomogeneous
Be50	No	H	Pale purple	Core of semi-vitrified material, very friable	No	No analysis	No analysis	Inhomogeneous
Be51	No	H	Pale purple	Core has become less friable and almost completely vitrified	No	No analysis	No analysis	Inhomogeneous
Be52	Yes	H	Pale purple	The core has shrunk in size and contains a glassy substance	No	No analysis	No analysis	Inhomogeneous
Be53	Yes	H	Pale purple	Semi-vitrified material now completely covers the bottom of the crucible	No	No analysis	No analysis	Inhomogeneous
Be54	Yes	H	Pale purple	Semi-vitrified material now completely covers the bottom of the crucible	No	No analysis	No analysis	Inhomogeneous
Be55	Yes	H	Pale purple	Loose batch has now all disappeared and there is extensive glass formation around core of partially vitrified material	No	No analysis	No analysis	Inhomogeneous
Be56	Yes	H	Pale purple	Extensive glass formation around core of partially vitrified material	No	No analysis	No analysis	Inhomogeneous
Be57	Yes	H	Pale purple	Gradual increase in quantity of glass around the central core	No	No analysis	No analysis	Inhomogeneous
Be58	Yes	H	Pale purple	Gradual increase in quantity of glass around the central core	No	No analysis	No analysis	Inhomogeneous
Be59	Yes	H	Pale purple	Gradual increase in quantity of glass around the central core	No	No analysis	No analysis	Inhomogeneous
Be60	Yes	H	Pale purple	Gradual increase in quantity of glass around the central core	No	No analysis	No analysis	Inhomogeneous
Be61	Yes	H	Pale purple	Gradual increase in quantity of glass around the central core	No	No analysis	No analysis	Inhomogeneous
Be62	Yes	H	Pale purple	Gradual increase in quantity of glass around the central core	No	No analysis	No analysis	Inhomogeneous
Be63	Yes	H	Pale purple	Gradual increase in quantity of glass around the central core	No	No analysis	No analysis	Inhomogeneous
Be64	Yes	H	Pale purple	Gradual increase in quantity of glass around the central core	No	No analysis	No analysis	Inhomogeneous
Be65	Yes	H	Pale purple	Gradual increase in quantity of glass around the central core	No	No analysis	No analysis	Inhomogeneous
Be66	Yes	H	Pale purple	Gradual increase in quantity of glass around the central core	No	No analysis	No analysis	Inhomogeneous
Be67	Yes	H	Pale purple	Gradual increase in quantity of glass around the central core	No	No analysis	No analysis	Inhomogeneous
Be68	Yes	H	Pale purple	Gradual increase in quantity of glass around the central core	No	No analysis	No analysis	Inhomogeneous
Be69	Yes	H	Pale purple	Gradual increase in quantity of glass around the central core	No	No analysis	No analysis	Inhomogeneous

Table IV:18 Results of stages of melting, beech brash wood ash (Smedley *etal.* 1998: Table 1)(1300°C) (Key in Table 3:3)

Sample Number	Batch Parameters				Fritting Parameters	Melting Parameters		
	Sand (≤250->180µm)/g	Beech Ash/g	Batch Weight/g	Mixed Batch		T/°C	t/min	Crucible
Be70	3.0	6.0	9.0	Yes	None	1300	5	CON9
Be71	3.0	6.0	9.0	Yes	None	1300	10	CON9
Be72	3.0	6.0	9.0	Yes	None	1300	15	CON9
Be73	3.0	6.0	9.0	Yes	None	1300	20	CON9
Be74	3.0	6.0	9.0	Yes	None	1300	25	CON9
Be75	3.0	6.0	9.0	Yes	None	1300	30	CON9
Be76	3.0	6.0	9.0	Yes	None	1300	35	CON9
Be77	3.0	6.0	9.0	Yes	None	1300	40	CON9
Be78	3.0	6.0	9.0	Yes	None	1300	45	CON9
Be79	3.0	6.0	9.0	Yes	None	1300	50	CON9
Be80	3.0	6.0	9.0	Yes	None	1300	55	CON9
Be81	3.0	6.0	9.0	Yes	None	1300	60	CON9
Be82	3.0	6.0	9.0	Yes	None	1300	90	CON9
Be83	3.0	6.0	9.0	Yes	None	1300	120	CON9
Be84	3.0	6.0	9.0	Yes	None	1300	180	CON9
Be85	3.0	6.0	9.0	Yes	None	1300	240	CON9

Table IV:19 Stages of melting, beech trunk wood ash (1300°C)

Sample Number	Visual Results				SEM Results		Overall Result
	Glass Formed	Batch Relics	Colour	Homogeneous	Silica Relics	Inhomogeneity	
Be70	Yes	H	Dark Purple	No	H	H	Inhomogeneous
Be71	Yes	H	Dark Purple	No	H	H	Inhomogeneous
Be72	Yes	H	Dark Purple	No	H	H	Inhomogeneous
Be73	Yes	H	Dark Purple	No	H	H	Inhomogeneous
Be74	Yes	H	Dark Purple	No	H	H	Inhomogeneous
Be75	Yes	H	Dark Purple	No	H	H	Inhomogeneous
Be76	Yes	M	Dark Purple	No	M	H	Inhomogeneous
Be77	Yes	M	Dark Purple	No	M	M	Inhomogeneous
Be78	Yes	NV	Dark Purple	No	L	M	Inhomogeneous
Be79	Yes	NV	Dark Purple	No	L	L	Inhomogeneous
Be80	Yes	NV	Dark Purple	No	L	L	Inhomogeneous
Be81	Yes	NV	Dark Purple	No	L	L	Inhomogeneous
Be82	Yes	NV	Dark Purple	No	L	L	Inhomogeneous
Be83	Yes	NV	Dark Purple	No	L	L	Inhomogeneous
Be84	Yes	NV	Dark Purple	No	NV	L	Inhomogeneous
Be85	Yes	NV	Dark Purple	No	NV	NV	Inhomogeneous

Table IV:20 Results of stages of melting, beech trunk wood ash (1300°C) (Key in Table 3:3)

Sample Number	Batch Parameters				Fritting Parameters	Melting Parameters		
	Sand (≤250->180µm)/g	Beech Ash/g	Batch Weight/g	Mixed Batch		T/°C	t/min	Crucible
Br25	3.0	6.0	9.0	Yes	None	1200	5	CON9
Br26	3.0	6.0	9.0	Yes	None	1200	10	CON9
Br27	3.0	6.0	9.0	Yes	None	1200	15	CON9
Br28	3.0	6.0	9.0	Yes	None	1200	20	CON9
Br29	3.0	6.0	9.0	Yes	None	1200	30	CON9
Br30	3.0	6.0	9.0	Yes	None	1200	45	CON9
Br31	3.0	6.0	9.0	Yes	None	1200	60	CON9
Br32	3.0	6.0	9.0	Yes	None	1200	120	CON9
Br33	3.0	6.0	9.0	Yes	None	1200	180	CON9
Br34	3.0	6.0	9.0	Yes	None	1200	240	CON9
Br35	3.0	6.0	9.0	Yes	None	1200	300	CON9
Br36	3.0	6.0	9.0	Yes	None	1200	315	CON9
Br37	3.0	6.0	9.0	Yes	None	1200	330	CON9

Table IV:21 Stages of melting, bracken ash (1200°C)

Sample Number	Visual Results						SEM Results		Overall verdict
	Glass Formed	Batch Relics	Colour	Crystalline Substance	Opacity	Homogeneous	Silica Relics	Inhomogeneity	
Br25	Yes	H	Green/brown	H	H	No	H	H	Inhomogeneous
Br26	Yes	H	Green/brown	H	H	No	H	H	Inhomogeneous
Br27	Yes	H	Green/brown	H	H	No	H	H	Inhomogeneous
Br28	Yes	H	Green/brown	H	H	No	H	H	Inhomogeneous
Br29	Yes	H	Green/brown	H	H	No	H	H	Inhomogeneous
Br30	Yes	H	Dark green	H	H	No	H	H	Inhomogeneous
Br31	Yes	M	Dark green	H	L	No	M	M	Inhomogeneous
Br32	Yes	L	Dark green	NV	NV	No	L	M	Inhomogeneous
Br33	Yes	L	Dark green	NV	NV	No	L	M	Inhomogeneous
Br34	Yes	NV	Dark green	NV	NV	Yes	NV	L	Inhomogeneous
Br35	Yes	NV	Dark green	NV	NV	Yes	NV	L	Inhomogeneous
Br36	Yes	NV	Dark green	L	NV	Yes	NV	L	Inhomogeneous
Br37	Yes	NV	Dark green	NV	NV	Yes	NV	NV	Homogeneous

Table IV:22 Results of stages of melting, bracken (1200°C) (Key in Table 3:3)

Sample Number	Batch Parameters				Fritting Parameters	Melting Parameters		
	Sand (≤250->180µm)/g	Beech Ash/g	Batch Weight/g	Mixed Batch		T/°C	t/min	Crucible
Br38	3.0	6.0	9.0	Yes	None	1300	5	CON9
Br39	3.0	6.0	9.0	Yes	None	1300	10	CON9
Br40	3.0	6.0	9.0	Yes	None	1300	15	CON9
Br41	3.0	6.0	9.0	Yes	None	1300	20	CON9
Br42	3.0	6.0	9.0	Yes	None	1300	25	CON9
Br43	3.0	6.0	9.0	Yes	None	1300	30	CON9
Br44	3.0	6.0	9.0	Yes	None	1300	35	CON9
Br45	3.0	6.0	9.0	Yes	None	1300	40	CON9
Br46	3.0	6.0	9.0	Yes	None	1300	45	CON9
Br47	3.0	6.0	9.0	Yes	None	1300	50	CON9
Br48	3.0	6.0	9.0	Yes	None	1300	55	CON9
Br49	3.0	6.0	9.0	Yes	None	1300	60	CON9
Br50	3.0	6.0	9.0	Yes	None	1300	90	CON9

Table IV:23 Stages of melting, bracken ash (1300°C)

Sample Number	Visual Results						SEM Results		Overall verdict
	Glass Formed	Batch Relics	Colour	Crystalline Substance	Opacity	Homogeneous	Silica Relics	Inhomogeneity	
Br38	Yes	H	Green/brown	H	H	No	H	H	Inhomogeneous
Br39	Yes	H	Green/brown	M	H	No	H	H	Inhomogeneous
Br40	Yes	H	Green/brown	M	H	No	H	H	Inhomogeneous
Br41	Yes	H	Green/brown	M	H	No	H	H	Inhomogeneous
Br42	Yes	H	Green/brown	M	H	No	H	H	Inhomogeneous
Br43	Yes	NV	Dark green	L	NV	Yes	NV	M	Inhomogeneous
Br44	Yes	NV	Dark green	L	NV	Yes	NV	M	Inhomogeneous
Br45	Yes	NV	Dark green	L	NV	Yes	NV	M	Inhomogeneous
Br46	Yes	NV	Dark green	M	NV	Yes	NV	L	Inhomogeneous
Br47	Yes	NV	Dark green	M	NV	Yes	NV	L	Inhomogeneous
Br48	Yes	NV	Dark green	NV	NV	Yes	NV	L	Inhomogeneous
Br49	Yes	NV	Dark green	NV	NV	Yes	NV	L	Inhomogeneous
Br50	Yes	NV	Dark green	NV	NV	Yes	NV	NV	Homogeneous

Table IV:24 Results of stages of melting, bracken (1300°C) (Key in Table 3:3)

Sample Number	Batch Parameters				Fritting Parameters		
	~~Sand (≤250->180 µm)/g~~ Beech Ash /g ~~Beech Ash /g~~ Sand (≤250->180 µm)/g		Batch Weight/g	Mixed Batch	T/°C	t/hr	Crucible
FBe12	3.0	6.0	9.0	Yes	500	1	CON9
FBe13	3.0	6.0	9.0	Yes	500	24	CON9
FBe14	3.0	6.0	9.0	Yes	600	1	CON9
FBe15	3.0	6.0	9.0	Yes	600	24	CON9
FBe16	3.0	6.0	9.0	Yes	700	1	CON9
FBe17	3.0	6.0	9.0	Yes	700	24	CON9
FBe18	3.0	6.0	9.0	Yes	750	1	CON9
FBe19	3.0	6.0	9.0	Yes	750	24	CON9
FBe20	3.0	6.0	9.0	Yes	800	1	CON9
FBe21	3.0	6.0	9.0	Yes	800	24	CON9
FBe22	3.0	6.0	9.0	Yes	900	1	CON9
FBe23	3.0	6.0	9.0	Yes	900	24	CON9
FBe24	3.0	6.0	9.0	Yes	1000	1	CON9
FBe25	3.0	6.0	9.0	Yes	1000	24	CON9

Table V:1 Experimental parameters: fritting temperature and time experiments, beech ash

Sample Number	Appearance		
	Colour	Reduction in Batch Volume/%	Observations
FBe12	Pale grey/brown	0	Slightly paler than original batch
FBe13	Pale grey/brown	0	Slightly paler than original batch
FBe14	Pale grey/brown	5	Slightly paler than 500°C 1 hour
FBe15	Grey/brown	5	Slightly darker than 600°C 1 hour
FBe16	Darker brown/grey	10	Slightly darker than 600°C 24 hours
FBe17	Darker brown/grey	10	Slightly darker than 700°C 1 hour
FBe18	Darker brown/grey	20	Slightly sintered but very friable
FBe19	Darker brown/grey	20	Slightly sintered but very friable
FBe20	Darker brown/black with tiny green/blue specks	30	Slightly more sintered than 750°C 1 hour
FBe21	Darker brown/black with tiny green/blue specks	30	Slightly more sintered than 750°C 1 hour
FBe22	Darker frit with more green specks and white bits showing	45	Much more sintered but still very friable
FBe23	Darker frit with more green specks and white bits showing	50	Much more sintered but still very friable
FBe24	Darker frit with more green specks and white bits showing	55	Much more sintered but still very friable
FBe25	Shiny dark purple, on crushing white specks, purple and black	60	Hard sintered material but difficult to break with spatula

Table V:2 Results of fritting temperature and time experiments, beech ash

Sample Number	Batch Parameters				Fritting Parameters		
	Bracken Ash/g	Sand (≤250->180 μm)/g	Batch Weight/g	Mixed Batch	T/°C	t/hr	Crucible
FBr12	6.0	3.0	9.0	Yes	500	1	CON9
FBr13	6.0	3.0	9.0	Yes	500	24	CON9
FBr14	6.0	3.0	9.0	Yes	600	1	CON9
FBr15	6.0	3.0	9.0	Yes	600	24	CON9
FBr16	6.0	3.0	9.0	Yes	700	1	CON9
FBr17	6.0	3.0	9.0	Yes	700	24	CON9
FBr18	6.0	3.0	9.0	Yes	750	1	CON9
FBr19	6.0	3.0	9.0	Yes	750	5	CON9
FBr20	6.0	3.0	9.0	Yes	750	16	CON9
FBr21	6.0	3.0	9.0	Yes	750	24	CON9
FBr22	6.0	3.0	9.0	Yes	800	1	CON9
FBr23	6.0	3.0	9.0	Yes	800	5	CON9
FBr24	6.0	3.0	9.0	Yes	800	16	CON9
FBr25	6.0	3.0	9.0	Yes	800	24	CON9
FBr26	6.0	3.0	9.0	Yes	850	1	CON9
FBr27	6.0	3.0	9.0	Yes	850	5	CON9
FBr28	6.0	3.0	9.0	Yes	850	16	CON9
FBr29	6.0	3.0	9.0	Yes	850	24	CON9
FBr30	6.0	3.0	9.0	Yes	900	1	CON9
FBr31	6.0	3.0	9.0	Yes	900	5	CON9
FBr32	6.0	3.0	9.0	Yes	900	16	CON9
FBr33	6.0	3.0	9.0	Yes	900	24	CON9
FBr34	6.0	3.0	9.0	Yes	1000	1	CON9
FBr35	6.0	3.0	9.0	Yes	1000	5	CON9
FBr36	6.0	3.0	9.0	Yes	1000	16	CON9
FBr37	6.0	3.0	9.0	Yes	1000	24	CON9

Table V:3 Experimental parameters: fritting temperature and time experiments, bracken ash

Sample Number	Visual Results			
	Colour		Reduction in Batch Volume/%	Friability
	Surface	Body		
FBr12	Pale grey	Pale grey	0	Slightly paler than original batch
FBr13	Pale grey	Pale grey	0	Visually identical to 500°C 1 hr
FBr14	Pale grey	Pale grey	0	Visually identical to 500°C 1 hr
FBr15	Pale grey	Pale grey	0	Visually identical to 500°C 1 hr
FBr16	Pale blue/green	Pale blue/green	0	Very friable
FBr17	Pale blue/green	Pale blue/green	0	Very friable
FBr18	Bright blue/green	Bright blue green	0	Very friable
FBr19	Bright blue/green	Pale purple	0	Very friable
FBr20	Bright blue/green	Pale purple	5	Very friable
FBr21	Bright blue/green	Pale purple	5	Very friable
FBr22	Bright blue/green	Blue/green/pale purple	5	Very friable
FBr23	Bright blue/green	Pale purple	5	Very friable
FBr24	Bright blue/green	Pale purple	5	Very friable but harder than 1 and 5 hours
FBr25	Bright blue/green	Pale purple	10	Very friable but harder than 16 hours
FBr26	Bright blue/green	Pale purple	40	Very friable
FBr27	Bright blue/green	Pale purple	40	Very friable
FBr28	Bright blue/green	Pale purple	40	Very friable but harder than 1 and 5 hours
FBr29	Bright blue/green	Pale purple	40	Very friable but harder than 16 hours
FBr30	Bright blue/green	Pale purple	45	Top layer none, bottom layer extensive vitrification
FBr31	Green	Purple	45	Top layer none, bottom layer extensive vitrification
FBr32	Dark green	Purple	50	Extensive vitrification
FBr33	Dark green,	Purple	50	Extensive vitrification
FBr34	Dark green	Purple	75	Heavily vitrified
FBr35	Purple/white	Purple/white	75	Heavily vitrified
FBr36	Purple/white	Purple/white	75	Heavily vitrified
FBr37	Purple/white	Purple/white	75	Heavily vitrified

Table V:4 Results of fritting temperature and time experiments, bracken ash

Oxide	Sample Number							
	FBe12	FBe13	FBe16	FBe17	FBe20	FBe21	FBe24	FBe25
Na_2O	0.00	0.00	0.00	0.00	0.00	0.36	0.00	0.00
MgO	9.01	11.12	13.47	15.00	11.9	20.17	11.13	6.13
Al_2O_3	0.00	0.00	0.09	0.00	0.00	0.00	0.00	0.00
SiO_2	24.11	13.19	7.03	4.58	21.03	6.19	23.38	43.29
P_2O_5	3.83	4.26	3.73	4.77	3.99	5.43	3.27	2.25
SO_3	0.96	1.18	1.02	0.98	1.32	0.77	0.88	0.9
Cl_2O	0.6	0.56	0.46	0.47	0.46	0.36	0.62	0.45
K_2O	18.14	21.82	24.6	16.47	21.58	7.68	9.12	16.88
CaO	34.94	39.48	41.63	49.04	33.04	48.14	42.59	23.58
TiO_2	0.09	0.04	0.1	0.15	0.09	0.11	0.13	0.08
Cr_2O_3	0.05	0.02	0.02	0.03	0.03	0.03	0.02	0.03
MnO	6.06	5.99	7.19	7.05	5.41	8.99	7.02	4.44
Fe_2O_3	1.08	1.71	0.39	1.15	0.67	1.11	1.22	1.44
CoO	0.03	0.04	0.01	0.02	0.01	0.01	0.01	0.02
NiO	0.00	0.02	0.01	0.02	0.03	0.03	0.01	0.02
CuO	0.02	0.02	0.03	0.03	0.02	0.02	0.03	0.02
ZnO	1.03	0.51	0.16	0.16	0.36	0.54	0.52	0.4
Br_2O	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rb_2O	0.02	0.01	0.03	0.03	0.02	0.01	0.02	0.02
SrO	0.03	0.03	0.03	0.04	0.03	0.04	0.03	0.03
ZrO_2	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.01
Sum	100.01	100.01	100.00	99.99	99.99	99.99	100.00	99.99
Total Alkali Content (Na_2O+K_2O)	18.14	21.82	24.6	16.47	21.58	8.04	9.12	16.88

Table V:5 XRF results, beech ash frit

Oxide	Sample Number							
	FBr12	FBr13	FBr18	FBr19	FBr20	FBr21	FBr30	FBr31
Na_2O	0.00	0.00	0.00	0.00	0.00	0.48	0.00	0.00
MgO	5.62	2.95	3.98	5.52	4.52	5.68	2.79	2.58
Al_2O_3	0.53	0.41	0.2	0.73	0.36	0.48	0.09	1.14
SiO_2	13.57	19.73	25.79	14.22	22.09	23.82	30.41	39.57
P_2O_5	5.85	3.96	4.56	5.04	4.76	4.66	4.08	7.94
SO_3	2.49	2.37	2.99	2.44	2.39	2.35	3.51	3.66
Cl_2O	5.02	5.79	4.34	4.7	4.3	3.5	5.63	2.54
K_2O	55.36	51.57	48.16	54.89	49.81	48.73	44.61	32.55
CaO	9.13	7.41	7.29	11.04	9.51	7.71	6.67	8.02
TiO_2	0.03	0.00	0.03	0.03	0.01	0.04	0.01	0.03
Cr_2O_3	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MnO	0.58	0.41	0.51	0.56	0.45	0.45	0.36	0.34
Fe_2O_3	1.28	4.8	1.75	0.51	1.25	1.59	1.42	1.21
CoO	0.02	0.12	0.04	0.02	0.02	0.05	0.03	0.02
NiO	0.02	0.00	0.01	0.01	0.00	0.00	0.00	0.01
CuO	0.02	0.01	0.03	0.02	0.02	0.02	0.03	0.02
ZnO	0.43	0.42	0.32	0.25	0.48	0.42	0.34	0.34
Br_2O	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rb_2O	0.02	0.02	0.01	0.01	0.01	0.01	0.02	0.01
SrO	0.01	0.01	0.00	0.01	0.00	0.01	0.01	0.01
ZrO_2	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00
Sum	99.99	99.99	100.01	100.00	99.98	100.00	100.01	99.99
Total Alkali Content (Na_2O+K_2O)	55.36	51.57	48.16	54.89	49.81	49.21	44.61	32.55

Table V:6 XRF results, bracken ash frit

Sample Number	Batch Parameters				Fritting Parameters				
	Ash Type Beech Ash Weight/g	Sand (≤250->180 µm)/g	Total Batch Weight/g	Mixed Batch	T/°C	t/hr	Crucible	No. of stirs per hour	Total No. of Stirs
FBe26	6.0	3.0	9.0	Yes	500	1	CON9	6	6
FBe27	6.0	3.0	9.0	Yes	800	1	CON9	6	6
FBe28	6.0	3.0	9.0	Yes	1000	1	CON9	6	6

Table V:7 Experimental parameters: stirring the batch during fritting experiments, beech ash

Sample Number	Appearance			
	Colour		Average Granule Diameter/cm	Friability
	Surface	Body		
FBe26	Pale grey/brown	Pale grey/brown	None Present	Very friable, the same as the identical unstirred frit (FBe12)
FBe27	Black/purple	Black/purple	0.5-1.0	Very friable, darker in colour than the identical unstirred frit (FBe20)
FBe28	Black/purple	Black/purple	0.5	Much harder and much darker in colour than the identical unstirred frit (FBe24)

Table V:8 Results of stirring the batch during fritting experiments, beech ash

Sample Number	Batch Parameters				Fritting Parameters				
	Bracken Ash Weight/g	Sand (≤250->180 µm)/g	Total Batch Weight/g	Mixed Batch	T/°C	t/hr	Crucible	No. of stirs per hour	Total No. of Stirs
FBr38	6.0	3.0	9.0	Yes	500	1	CON9	6	6
FBr39	6.0	3.0	9.0	Yes	600	1	CON9	6	6
FBr40	6.0	3.0	9.0	Yes	700	1	CON9	6	6
FBr41	6.0	3.0	9.0	Yes	800	1	CON9	6	6
FBr42	6.0	3.0	9.0	Yes	800	5	CON9	6	30
FBr43	6.0	3.0	9.0	Yes	800	24	CON9	6	42 (first 7 hours)
FBr44	6.0	3.0	9.0	Yes	850	1	CON9	6	6
FBr45	6.0	3.0	9.0	Yes	850	5	CON9	6	30
FBr46	6.0	3.0	9.0	Yes	900	1	CON9	6	6
FBr47	6.0	3.0	9.0	Yes	1000	1	CON9	6	6

Table V:9 Experimental parameters: stirring the batch during fritting experiments, bracken ash

Sample Number	Appearance		
	Colour	Average Granule Diameter/cm	Observations
FBr38	Pale grey	None Present	The same as the identical unstirred frit FBr12
FBr39	Pale grey	None Present	The same as the identical unstirred frit FBr14
FBr40	Pale blue/green	None Present	The same as the identical unstirred frit FBr16
FBr41	Pale purple	0.2	Very friable, more purple in colour than FBr22
FBr42	Pale purple	0.2	Very friable, more purple in colour than FBr23
FBr43	Pale purple	0.2	Very friable, more purple in colour than FBr25
FBr44	Pale purple	0.2	Very friable, more purple in colour than FBr26
FBr45	Pale purple	1.0	Much harder and more purple in colour than FBr27
FBr46	Pale purple	0.5	Much harder and more purple in colour than FBr30
FBr47	Purple	None Present	Same appearance as FBr34 unstirred frit, very sticky and difficult to stir.

Table V:10 Results of stirring the batch during fritting experiments, bracken ash

Sample Number	Batch Parameters				Fritting Parameters		
	Beech Ash Weight /g	Sand (≤250->180 µm)/g	Total Batch Weight/g	Mixed Batch	T/°C	t/hr	Crucible
FBe29	6.0	3.0	9.0	Yes	500	1	Small Tray
FBe30	6.0	3.0	9.0	Yes	500	24	Small Tray
FBe31	6.0	3.0	9.0	Yes	800	1	Small Tray
FBe32	6.0	3.0	9.0	Yes	800	24	Small Tray
FBe33	6.0	3.0	9.0	Yes	1000	1	Small Tray
FBe34	6.0	3.0	9.0	Yes	1000	24	Small Tray

Table V:11 Experimental parameters: fritting crucible dimension experiments, beech ash

Sample Number	Appearance	
	Colour	Observations
FBe29	Pale grey/brown	The same as the identical unstirred frit FBe12
FBe30	Pale grey/brown	The same as the identical unstirred frit FBe13
FBe31	Black	Very friable, darker in colour than the identical CON 9 frit (FBe20)
FBe32	Black	Very friable, darker in colour than the identical CON 9 frit (FBe21)
FBe33	Black/purple	Very friable, darker in colour than the identical CON 9 frit (FBe24)
FBe34	Black/purple	Very friable, darker in colour than the identical CON 9 frit (FBe25)

Table V:12 Results of fritting crucible dimension experiments, beech ash

Sample Number	Batch Parameters				Fritting Parameters		
	Bracken Ash Weight /g	Sand (≤250->180 μm)/g	Total Batch Weight/g	Mixed Batch	T/°C	t/hr	Crucible
FBr48	6.0	3.0	9.0	Yes	500	1	Small Tray
FBr49	6.0	3.0	9.0	Yes	500	24	Small Tray
FBr50	6.0	3.0	9.0	Yes	600	1	Small Tray
FBr51	6.0	3.0	9.0	Yes	600	24	Small Tray
FBr52	6.0	3.0	9.0	Yes	700	1	Small Tray
FBr53	6.0	3.0	9.0	Yes	750	1	Small Tray
FBr54	6.0	3.0	9.0	Yes	800	1	Small Tray
FBr55	6.0	3.0	9.0	Yes	850	1	Small Tray
FBr56	6.0	3.0	9.0	Yes	900	1	Small Tray
FBr57	6.0	3.0	9.0	Yes	1000	1	Small Tray

Table V:13 Experimental parameters: fritting crucible dimension experiments, bracken ash

Sample Number	Appearance		
	Colour		Observations
	Surface	Body	
FBr48	Pale grey	Pale grey	The same as the identical unstirred frit FBr12
FBr49	Pale grey	Pale grey	The same as the identical unstirred frit FBr13
FBr50	Pale green	Pale green	Very friable, darker green in colour than FBr14
FBr51	Pale green	Pale green	Very friable, darker green in colour than FBr15
FBr52	Bright blue/green	Pale purple	Very friable, more purple in colour than FBr16
FBr53	Bright blue/green	Increasing pale purple colour in the body	Very friable, more purple in colour than FBr18
FBr54	Bright blue/green	Increasing pale purple colour in the body	Very friable, more purple in colour than FBr22
FBr55	Bright blue/green	Increasing pale purple colour in the body	Very friable, more purple in colour than FBr26
FBr56	Dark green	Purple	Heavily vitrified, more purple in colour than FBr30
FBr57	Purple mass with white specks	Purple mass with white specks	Heavily vitrified, more purple in colour than FBr34

Table V:14 Results of fritting crucible dimension experiments, bracken ash

Sample Number	Fritting Parameters			Melting Parameters		
	T/°C	t/hr	Crucible	T/°C	t/hr	Mixed Frit
Be86	500	1	CON9	1200	5	Yes
Be87	500	24	CON9	1200	5	Yes
Be88	600	1	CON9	1200	5	Yes
Be89	600	24	CON9	1200	5	Yes
Be90	800	1	CON9	1200	5	Yes
Be91	800	24	CON9	1200	5	Yes
Be92	1000	1	CON9	1200	5	Yes
Be93	1000	24	CON9	1200	5	Yes
Be94	500	1	CON9	1200	5	No
Be95	500	24	CON9	1200	5	No
Be96	600	1	CON9	1200	5	No
Be97	600	24	CON9	1200	5	No
Be98	800	1	CON9	1200	5	No
Be99	800	24	CON9	1200	5	No
Be100	1000	1	CON9	1200	5	No
Be101	1000	24	CON9	1200	5	No

Table V:15 Melting fritting temperature and time, beech ash (1200°C)

Sample Number	Visual Results				SEM Results		Overall Result
	Glass Formed	Batch Relics	Colour	Homogeneous	Silica Relics	Inhomogeneity	
Be86	Yes	L	Dark purple	No	L	L	Inhomogeneous
Be87	Yes	L	Dark purple	No	L	L	Inhomogeneous
Be88	Yes	H	Dark purple	No	M	M	Inhomogeneous
Be89	Yes	H	Dark purple	No	H	M	Inhomogeneous
Be90	Yes	H	Dark purple	No	M	L	Inhomogeneous
Be91	Yes	H	Dark purple	No	H	M	Inhomogeneous
Be92	Yes	H	Dark purple	No	H	H	Inhomogeneous
Be93	Yes	H	Dark purple	No	H	H	Inhomogeneous
Be94	Yes	L	Dark purple	No	M	L	Inhomogeneous
Be95	Yes	L	Dark purple	No	L	L	Inhomogeneous
Be96	Yes	M	Dark purple	No	M	M	Inhomogeneous
Be97	Yes	M	Dark purple	No	H	M	Inhomogeneous
Be98	Yes	M	Dark purple	No	L	L	Inhomogeneous
Be99	Yes	M	Dark purple	No	M	M	Inhomogeneous
Be100	Yes	M	Dark purple	No	M	L	Inhomogeneous
Be101	Yes	M	Dark purple	No	M	M	Inhomogeneous

Table V:16 Results of melting fritting temperature and time, beech ash (1200°C) (Key in Table 3:3)

Sample Number	Fritting Parameters			Melting Parameters		
	T/°C	t/hr	Crucible	T/°C	t/hr	Mixed Frit
Be102	500	1	CON9	1300	5	Yes
Be103	500	24	CON9	1300	5	Yes
Be104	600	1	CON9	1300	5	Yes
Be105	800	1	CON9	1300	5	Yes
Be106	1000	1	CON9	1300	5	Yes
Be107	1000	24	CON9	1300	5	Yes
Be108	500	1	CON9	1300	5	No
Be109	500	24	CON9	1300	5	No
Be110	600	1	CON9	1300	5	No
Be111	600	24	CON9	1300	5	No
Be112	800	1	CON9	1300	5	No
Be113	800	24	CON9	1300	5	No
Be114	1000	1	CON9	1300	5	No
Be115	1000	24	CON9	1300	5	No

Table V:17 Melting fritting temperature and time, beech ash (1300°C)

Sample Number	Visual Results				SEM Results		Overall verdict
	Glass Formed	Batch Relics	Colour	Homogeneous	Silica Relics	Inhomogeneity	
Be102	Yes	NV	Dark purple	Yes	NV	NV	Homogeneous
Be103	Yes	NV	Dark purple	Yes	NV	NV	Homogeneous
Be104	Yes	NV	Dark purple	Yes	NV	NV	Homogeneous
Be105	Yes	NV	Dark purple	Yes	NV	NV	Homogeneous
Be106	Yes	NV	Dark purple	Yes	NV	NV	Homogeneous
Be107	Yes	NV	Dark purple	Yes	NV	NV	Homogeneous
Be108	Yes	NV	Dark purple	Yes	NV	NV	Homogeneous
Be109	Yes	NV	Dark purple	Yes	NV	L	Inhomogeneous
Be110	Yes	NV	Dark purple	Yes	NV	L	Inhomogeneous
Be111	Yes	NV	Dark purple	Yes	NV	L	Inhomogeneous
Be112	Yes	NV	Dark purple	Yes	NV	NV	Homogeneous
Be113	Yes	NV	Dark purple	Yes	NV	L	Inhomogeneous
Be114	Yes	NV	Dark purple	Yes	NV	L	Inhomogeneous
Be115	Yes	NV	Dark purple	Yes	NV	NV	Homogeneous

Table V:18 Results of melting fritting temperature and time, beech ash (1300°C) (Key in Table 3:3)

Sample Number	Fritting Parameters			Melting Parameters		
	T/°C	t/hr	Crucible	T/°C	t/hr	Mixed Frit
Br51	500	1	CON9	1200	5	Yes
Br52	500	24	CON9	1200	5	Yes
Br53	600	1	CON9	1200	5	Yes
Br54	700	1	CON9	1200	5	Yes
Br55	750	1	CON9	1200	5	Yes
Br56	750	5	CON9	1200	5	Yes
Br57	750	16	CON9	1200	5	Yes
Br58	750	24	CON9	1200	5	Yes
Br59	800	1	CON9	1200	5	Yes
Br60	800	5	CON9	1200	5	Yes
Br61	800	16	CON9	1200	5	Yes
Br62	800	24	CON9	1200	5	Yes
Br63	850	1	CON9	1200	5	Yes
Br64	850	5	CON9	1200	5	Yes
Br65	850	16	CON9	1200	5	Yes
Br66	850	24	CON9	1200	5	Yes
Br67	900	1	CON9	1200	5	Yes
Br68	900	5	CON9	1200	5	Yes
Br69	900	16	CON9	1200	5	Yes
Br70	900	24	CON9	1200	5	Yes

Table V:19 Melting fritting temperature and time, bracken ash (1200°C)

Sample Number	Fritting Parameters			Melting Parameters		
	T/°C	t/hr	Crucible	T/°C	t/hr	Mixed Frit
Br71	500	1	CON9	1200	5	No
Br72	600	1	CON9	1200	5	No
Br73	700	1	CON9	1200	5	No
Br74	800	16	CON9	1200	5	No
Br75	850	5	CON9	1200	5	No
Br76	850	16	CON9	1200	5	No
Br77	900	1	CON9	1200	5	No
Br78	900	5	CON9	1200	5	No
Br79	900	16	CON9	1200	5	No
Br80	900	24	CON9	1200	5	No
Br81	1000	1	CON9	1200	5	No
Br82	1000	5	CON9	1200	5	No
Br83	1000	16	CON9	1200	5	No
Br84	1000	24	CON9	1200	5	No

Table V:19 (continued) **Melting fritting and time, bracken ash (1200°C)**

Sample Number	Visual Results						SEM Results		Overall Result
	Glass Formed	Batch Relics	Colour	Crystalline Substance	Opacity	Homogeneous	Silica Relics	Inhomogeneity	
Br51	Yes	NV	Dark green/brown	NV	NV	Yes	NV	L	Inhomogeneous
Br52	Yes	NV	Brown/green	NV	NV	Yes	NV	L	Inhomogeneous
Br53	Yes	L	Brown/green	NV	L	No	L	L	Inhomogeneous
Br54	Yes	L	Brown/green	NV	L	No	L	L	Inhomogeneous
Br55	Yes	NV	Brown/green	NV	NV	Yes	NV	L	Inhomogeneous
Br56	Yes	NV	Brown/green	NV	NV	Yes	NV	L	Inhomogeneous
Br57	Yes	L	Brown/green	NV	L	No	L	L	Inhomogeneous
Br58	Yes	L	Brown/green	NV	L	No	L	L	Inhomogeneous
Br59	Yes	NV	Brown/green	NV	NV	Yes	NV	L	Inhomogeneous
Br60	Yes	NV	Brown/green	NV	L	No	L	M	Inhomogeneous
Br61	Yes	L	Brown/green	NV	L	No	M	M	Inhomogeneous
Br62	Yes	L	Brown/green	NV	L	No	M	H	Inhomogeneous
Br63	Yes	NV	Brown/green	NV	NV	Yes	L	L	Inhomogeneous
Br64	Yes	L	Brown/green	NV	L	No	L	L	Inhomogeneous
Br65	Yes	L	Brown/green	NV	L	No	M	M	Inhomogeneous
Br66	Yes	L	Brown/green	NV	L	No	M	H	Inhomogeneous
Br67	Yes	NV	Brown/green	NV	NV	Yes	L	L	Inhomogeneous
Br68	Yes	L	Brown/green	NV	L	No	L	M	Inhomogeneous
Br69	Yes	M	Brown/green	NV	L	No	M	M	Inhomogeneous
Br70	Yes	M	Brown/green	NV	L	No	M	H	Inhomogeneous

Table V:20 Results of melting fritting temperature and time, bracken ash (1200°C) (Key in Table 3:3)

Sample Number	Visual Results						SEM Results		Overall Result
	Glass Formed	Batch Relics	Colour	Crystalline Substance	Opacity	Homogeneous	Silica Relics	Inhomogeneity	
Br71	Yes	M	Dark green/brown	NV	L	No	M	M	Inhomogeneous
Br72	Yes	M	Brown/green	NV	L	No	H	M	Inhomogeneous
Br73	Yes	M	Brown/green	NV	L	No	H	M	Inhomogeneous
Br74	Yes	M	Brown/green	NV	M	No	H	M	Inhomogeneous
Br75	Yes	M	Brown/green	H	H	No	M	M	Inhomogeneous
Br76	Yes	M	Brown/green	H	H	No	H	M	Inhomogeneous
Br77	Yes	M	Brown/green	NV	H	No	M	M	Inhomogeneous
Br78	Yes	M	Brown/green	H	H	No	H	M	Inhomogeneous
Br79	Yes	M	Brown/green	H	H	No	H	H	Inhomogeneous
Br80	Yes	H	Brown/green	H	H	No	H	H	Inhomogeneous
Br81	Yes	M	Brown/green	NV	M	No	M	H	Inhomogeneous
Br82	Yes	H	Brown/green	H	M	No	M	H	Inhomogeneous
Br83	Yes	H	Brown/green	H	M	No	H	H	Inhomogeneous
Br84	Yes	H	Brown/green	H	M	No	H	H	Inhomogeneous

Table V:20 (continued) **Results of melting fritting temperature and time, bracken ash (1200°C) (Key in Table 3:3)**

Sample Number	Fritting Parameters			Melting Parameters		
	T/°C	t/hr	Crucible	T/°C	t/hr	Mixed Frit
Br85	600	1	CON9	1250	5	Yes
Br86	750	1	CON9	1250	5	Yes
Br87	750	5	CON9	1250	5	Yes
Br88	750	16	CON9	1250	5	Yes
Br89	750	24	CON9	1250	5	Yes
Br90	800	1	CON9	1250	5	Yes
Br91	800	5	CON9	1250	5	Yes
Br92	800	16	CON9	1250	5	Yes
Br93	800	24	CON9	1250	5	Yes
Br94	850	1	CON9	1250	5	Yes
Br95	850	5	CON9	1250	5	Yes
Br96	850	16	CON9	1250	5	Yes
Br97	850	24	CON9	1250	5	Yes
Br98	900	1	CON9	1250	5	Yes
Br99	900	5	CON9	1250	5	Yes
Br100	900	16	CON9	1250	5	Yes
Br101	900	24	CON9	1250	5	Yes
Br102	600	1	CON9	1250	5	No
Br103	700	1	CON9	1250	5	No
Br104	900	1	CON9	1250	5	No
Br105	1000	1	CON9	1250	5	No
Br106	1000	5	CON9	1250	5	No
Br107	1000	16	CON9	1250	5	No
Br108	1000	24	CON9	1250	5	No

Table V:21 Melting fritting temperature and time, bracken ash (1250°C)

Sample Number	Visual Results						SEM Results		Overall Result
	Glass Formed	Batch Relics	Colour	Crystalline Substance	Opacity	Homogeneous	Silica Relics	Homogeneous	
Br85	Yes	NV	Dark green/brown	NV	NV	Yes	NV	NV	Homogeneous
Br86	Yes	NV	Brown/green	NV	NV	Yes	NV	NV	Homogeneous
Br87	Yes	NV	Brown/green	NV	NV	Yes	NV	NV	Homogeneous
Br88	Yes	NV	Brown/green	NV	NV	Yes	NV	L	Inhomogeneous
Br89	Yes	NV	Brown/green	NV	NV	Yes	NV	NV	Homogeneous
Br90	Yes	NV	Brown/green	NV	NV	Yes	NV	NV	Homogeneous
Br91	Yes	NV	Brown/green	NV	NV	Yes	NV	L	Inhomogeneous
Br92	Yes	NV	Brown/green	NV	NV	Yes	NV	NV	Homogeneous
Br93	Yes	NV	Brown/green	NV	NV	Yes	NV	L	Inhomogeneous
Br94	Yes	NV	Brown/green	NV	NV	Yes	NV	L	Inhomogeneous
Br95	Yes	NV	Brown/green	NV	NV	Yes	NV	L	Inhomogeneous
Br96	Yes	NV	Brown/green	NV	NV	Yes	NV	L	Inhomogeneous
Br97	Yes	NV	Brown/green	NV	NV	Yes	NV	L	Inhomogeneous
Br98	Yes	NV	Brown/green	NV	NV	Yes	NV	NV	Homogeneous
Br99	Yes	NV	Brown/green	NV	NV	Yes	NV	NV	Homogeneous
Br100	Yes	NV	Brown/green	NV	NV	Yes	NV	NV	Homogeneous
Br101	Yes	NV	Brown/green	NV	NV	Yes	NV	L	Inhomogeneous
Br102	Yes	L	Dark green/brown	NV	NV	No	L	L	Inhomogeneous
Br103	Yes	L	Dark green/brown	NV	NV	No	L	L	Inhomogeneous
Br104	Yes	L	Brown/green	NV	NV	No	L	L	Inhomogeneous
Br105	Yes	NV	Brown/green	NV	NV	Yes	L	L	Inhomogeneous
Br106	Yes	NV	Brown/green	NV	L	No	NV	L	Inhomogeneous
Br107	Yes	NV	Brown/green	NV	NV	Yes	NV	NV	Homogeneous
Br108	Yes	M	Brown/green	NV	NV	No	M	M	Inhomogeneous

Table V:22 Results of melting fritting temperature and time, bracken ash (1250°C) (Key in Table 3:3)

Sample Number	Fritting Parameters			Melting Parameters		
	T/°C	t/hr	Crucible	T/°C	t/hr	Mixed Frit
Br109	500	1	CON9	1300	5	Yes
Br110	500	24	CON9	1300	5	Yes
Br111	700	1	CON9	1300	5	Yes
Br112	750	1	CON9	1300	5	Yes
Br113	750	5	CON9	1300	5	Yes
Br114	750	16	CON9	1300	5	Yes
Br115	750	24	CON9	1300	5	Yes
Br116	800	1	CON9	1300	5	Yes
Br117	800	5	CON9	1300	5	Yes
Br118	800	16	CON9	1300	5	Yes
Br119	800	24	CON9	1300	5	Yes
Br120	850	1	CON9	1300	5	Yes
Br121	850	5	CON9	1300	5	Yes
Br122	850	16	CON9	1300	5	Yes
Br123	850	24	CON9	1300	5	Yes
Br124	900	1	CON9	1300	5	Yes
Br125	900	5	CON9	1300	5	Yes
Br126	900	16	CON9	1300	5	Yes
Br127	900	24	CON9	1300	5	Yes

Table V:23 Melting fritting temperature and time, bracken ash (1300°C)

Sample Number	Fritting Parameters			Melting Parameters		
	T/°C	t/hr	Crucible	T/°C	t/hr	Mixed Frit
Br128	500	1	CON9	1300	5	No
Br129	500	24	CON9	1300	5	No
Br130	600	1	CON9	1300	5	No
Br131	700	1	CON9	1300	5	No
Br132	800	1	CON9	1300	5	No
Br133	850	5	CON9	1300	5	No
Br134	900	1	CON9	1300	5	No
Br135	900	24	CON9	1300	5	No
Br136	1000	1	CON9	1300	5	No
Br137	1000	5	CON9	1300	5	No
Br138	1000	16	CON9	1300	5	No
Br139	1000	24	CON9	1300	5	No

Table V:23 (continued) **Melting fritting and time, bracken ash (1300°C)**

Sample Number	Visual Results						SEM Results		Overall Results
	Glass Formed	Batch Relics	Colour	Crystalline Substance	Opacity	Homogeneous	Silica Relics	Homogeneous	
Br109	Yes	NV	Dark green/blue	NV	NV	Yes	NV	NV	Homogeneous
Br110	Yes	NV	Dark green/brown	NV	NV	Yes	NV	NV	Homogeneous
Br111	Yes	NV	Brown/green	NV	NV	Yes	NV	NV	Homogeneous
Br112	Yes	NV	Brown/green	NV	NV	Yes	NV	L	Inhomogeneous
Br113	Yes	NV	Brown/green	NV	NV	Yes	NV	NV	Homogeneous
Br114	Yes	NV	Brown/green	NV	NV	Yes	NV	L	Inhomogeneous
Br115	Yes	NV	Brown/green	NV	NV	Yes	NV	L	Inhomogeneous
Br116	Yes	NV	Brown/green	NV	NV	Yes	NV	L	Inhomogeneous
Br117	Yes	NV	Brown/green	NV	NV	Yes	NV	L	Inhomogeneous
Br118	Yes	NV	Brown/green	NV	NV	Yes	NV	L	Inhomogeneous
Br119	Yes	NV	Brown/green	NV	NV	Yes	NV	M	Inhomogeneous
Br120	Yes	NV	Brown/green	NV	NV	Yes	NV	NV	Homogeneous
Br121	Yes	NV	Brown/green	NV	NV	Yes	NV	NV	Homogeneous
Br122	Yes	NV	Brown/green	NV	NV	Yes	NV	NV	Homogeneous
Br123	Yes	NV	Brown/green	NV	NV	Yes	NV	NV	Homogeneous
Br124	Yes	NV	Brown/green	NV	NV	Yes	NV	NV	Homogeneous
Br125	Yes	NV	Brown/green	NV	NV	Yes	NV	NV	Homogeneous
Br126	Yes	NV	Brown/green	NV	NV	Yes	NV	L	Inhomogeneous
Br127	Yes	NV	Brown/green	NV	NV	Yes	NV	NV	Homogeneous

Table V:24 Results of melting fritting temperature and time, bracken ash (1300°C) (Key in Table 3:3)

Sample Number	Visual Results						SEM Results		Overall Results
	Glass Formed	Batch Relics	Colour	Crystalline Substance	Opacity	Homogeneous	Silica Relics	Homogeneous	
Br128	Yes	NV	Dark green/blue	NV	NV	Yes	NV	NV	Homogeneous
Br129	Yes	NV	Dark green/brown	NV	NV	Yes	NV	NV	Homogeneous
Br130	Yes	NV	Brown/green	NV	NV	Yes	NV	L	Inhomogeneous
Br131	Yes	NV	Brown/green	NV	NV	Yes	NV	L	Inhomogeneous
Br132	Yes	NV	Brown/green	NV	NV	Yes	NV	NV	Homogeneous
Br133	Yes	NV	Brown/green	NV	NV	Yes	L	L	Inhomogeneous
Br134	Yes	L	Brown/green	NV	L	No	L	L	Inhomogeneous
Br135	Yes	NV	Brown/green	NV	NV	Yes	NV	L	Inhomogeneous
Br136	Yes	H	Brown/green	NV	L	No	NV	L	Inhomogeneous
Br137	Yes	NV	Brown/green	NV	NV	Yes	NV	NV	Homogeneous
Br138	Yes	L	Brown/green	NV	M	No	NV	L	Inhomogeneous
Br139	Yes	NV	Brown/green	NV	NV	Yes	NV	L	Inhomogeneous

Table V:24 (continued) **Results of melting fritting temperature and time, bracken ash (1300°C) (Key in Table 3:3)**

Sample Number	Fritting Parameters				Melting Parameters		
	T/°C	t/hr	Stirred Frit	Crucible	T/°C	t/hr	Mixed Frit
Be116	500	1	Yes	CON9	1200	5	No
Be117	800	1	Yes	CON9	1200	5	No
Be118	1000	1	Yes	CON9	1200	5	No
Be119	500	1	Yes	CON9	1300	5	No
Be120	800	1	Yes	CON9	1300	5	No
Be121	1000	1	Yes	CON9	1300	5	No

Table V:25 Melting frit stirred during fritting, beech ash

Sample Number	Visual Results				SEM Results		Overall Result
	Glass Formed	Batch Relics	Colour	Homogeneous	Silica Relics	Homogeneous	
Be116	Yes	L	Dark purple	No	L	L	Inhomogeneous
Be117	Yes	L	Dark purple	No	L	L	Inhomogeneous
Be118	Yes	L	Dark purple	No	L	L	Inhomogeneous
Be119	Yes	NV	Dark purple	Yes	NV	NV	Homogeneous
Be120	Yes	NV	Dark purple	Yes	NV	L	Inhomogeneous
Be121	Yes	NV	Dark purple	Yes	NV	L	Inhomogeneous

Table V:26 Results of melting frit stirred during fritting, beech ash (Key in Table 3:3)

Sample Number	Fritting Parameters				Melting Parameters		
	T/°C	t/hr	Stirred Frit	Crucible	T/°C	t/hr	Mixed Frit
Br140	500	1	Yes	CON9	5	1200	No
Br141	600	1	Yes	CON9	5	1200	No
Br142	700	1	Yes	CON9	5	1200	No
Br143	800	1	Yes	CON9	5	1200	No
Br144	800	5	Yes	CON9	5	1200	No
Br145	800	24	Yes	CON9	5	1200	No
Br146	850	1	Yes	CON9	5	1200	No
Br147	1000	1	Yes	CON9	5	1200	No
Br148	500	1	Yes	CON9	5	1300	No
Br149	600	1	Yes	CON9	5	1300	No
Br150	700	1	Yes	CON9	5	1300	No
Br151	1000	1	Yes	CON9	5	1300	No

Table V:27 Melting frit stirred during fritting, bracken ash

Sample Number	Visual Results						SEM Results		Overall Result
	Glass Formed	Batch Relics	Colour	Observations	Opacity	Homogeneous	Silica Relics	Homogeneity	
Br140	Yes	NV	Dark green/blue	NV	NV	Yes	NV	L	Inhomogeneous
Br141	Yes	NV	Dark green/brown	NV	NV	Yes	L	L	Inhomogeneous
Br142	Yes	NV	Brown/green	L	L	No	NV	L	Inhomogeneous
Br143	Yes	NV	Brown/green	NV	NV	Yes	NV	L	Inhomogeneous
Br144	Yes	NV	Brown/green	NV	NV	Yes	NV	L	Inhomogeneous
Br145	Yes	NV	Brown/green	NV	NV	Yes	NV	NV	Homogeneous
Br146	Yes	NV	Brown/green	NV	NV	Yes	NV	NV	Homogeneous
Br147	Yes	NV	Brown/green	NV	H	No	L	H	Inhomogeneous
Br148	Yes	NV	Dark green/blue	NV	NV	Yes	NV	NV	Homogeneous
Br149	Yes	NV	Dark green/brown	NV	NV	Yes	NV	NV	Homogeneous
Br150	Yes	NV	Brown/green	NV	NV	Yes	NV	L	Inhomogeneous
Br151	Yes	NV	Brown/green	NV	L	No	NV	L	Inhomogeneous

Table V:28 Results of melting frit stirred during fritting, bracken ash (Key in Table 3:3)

Sample Number	Fritting Parameters			Melting Parameters		
	T/°C	t/hr	Crucible	T/°C	t/hr	Mixed Frit
Be122	500	1	Small Tray	1200	5	Yes
Be123	500	24	Small Tray	1200	5	Yes
Be124	800	1	Small Tray	1200	5	Yes
Be125	800	24	Small Tray	1200	5	Yes
Be126	1000	1	Small Tray	1200	5	Yes
Be127	500	1	Small Tray	1300	5	Yes
Be128	500	24	Small Tray	1300	5	Yes
Be129	800	1	Small Tray	1300	5	Yes
Be130	800	24	Small Tray	1300	5	Yes
Be131	1000	1	Small Tray	1300	5	Yes

Table V:29 Melting frit made in variable crucible dimensions, beech ash

Sample Number	Visual Results				SEM Results		Overall Result
	Glass Formed	Batch Relics	Colour	Homogeneous	Silica Relics	Homogeneous	
Be122	Yes	M	Dark purple	No	L	M	Inhomogeneous
Be123	Yes	M	Dark purple	No	L	M	Inhomogeneous
Be124	Yes	M	Dark purple	No	M	L	Inhomogeneous
Be125	Yes	H	Dark purple	No	H	H	Inhomogeneous
Be126	Yes	H	Dark purple	No	H	H	Inhomogeneous
Be127	Yes	NV	Dark purple	Yes	NV	L	Inhomogeneous
Be128	Yes	NV	Dark purple	Yes	NV	L	Inhomogeneous
Be129	Yes	NV	Dark purple	Yes	NV	NV	Homogeneous
Be130	Yes	NV	Dark purple	Yes	NV	L	Inhomogeneous
Be131	Yes	NV	Dark purple	Yes	NV	L	Inhomogeneous

Table V:30 Results of melting frit made in variable crucible dimensions, beech ash (Key in Table 3:3)

Sample Number	Fritting Parameters			Melting Parameters		
	T/°C	t/hr	Crucible	T/°C	t/hr	Mixed Frit
Br152	500	24	Small Tray	1200	5	Yes
Br153	600	24	Small Tray	1200	5	Yes
Br154	700	1	Small Tray	1200	5	Yes
Br155	750	1	Small Tray	1200	5	Yes
Br156	800	1	Small Tray	1200	5	Yes
Br157	850	1	Small Tray	1200	5	Yes
Br158	900	1	Small Tray	1200	5	Yes
Br159	1000	1	Small Tray	1200	5	Yes
Br160	500	1	Small Tray	1300	5	Yes
Br161	500	24	Small Tray	1300	5	Yes
Br162	600	1	Small Tray	1300	5	Yes
Br163	700	1	Small Tray	1300	5	Yes
Br164	800	1	Small Tray	1300	5	Yes

Table V:31 Melting frit made in variable crucible dimensions, bracken ash

Sample Number	Visual Results						SEM Results		Overall Result
	Glass Formed	Batch Relics	Colour	Crystalline Substance	Opacity	Homogeneous	Silica Relics	Inhomogeneity	
Br152	Yes	H	Brown/green	NV	NV	Yes	H	M	Inhomogeneous
Br153	Yes	H	Brown/green	NV	NV	Yes	H	M	Inhomogeneous
Br154	Yes	L	Brown/green	NV	L	Yes	L	M	Inhomogeneous
Br155	Yes	L	Brown/green	NV	L	Yes	L	M	Inhomogeneous
Br156	Yes	L	Brown/green	NV	L	Yes	L	M	Inhomogeneous
Br157	Yes	L	Brown/green	NV	L	Yes	L	M	Inhomogeneous
Br158	Yes	L	Brown/green	NV	L	Yes	H/M	M	Inhomogeneous
Br159	Yes	H	Brown/green	NV	M	Yes	H	H	Inhomogeneous
Br160	Yes	NV	Dark green/blue	NV	NV	No	NV	NV	Homogeneous
Br161	Yes	NV	Brown/green	NV	NV	No	NV	NV	Homogeneous
Br162	Yes	NV	Brown/green	NV	NV	No	NV	NV	Homogeneous
Br163	Yes	NV	Brown/green	NV	NV	No	NV	L	Inhomogeneous
Br164	Yes	NV	Brown/green	NV	NV	No	NV	L	Inhomogeneous

Table V:32 Results of melting frit made in variable crucible dimensions, bracken ash (Key in Table 3:3)

Sample Number	Batch Parameters					Fritting Parameters	Melting Parameters			
	Ash Type	Ash Weight/g	Sand (≤250->180 µm)/g	Total Batch Weight/g	Mixed Batch		T/°C	t/hr	Crucible Fabric	Crucible
Be132	Beech	6.0	3.0	9.0	Yes	None	1200	5	Alumina	CON9
Be133	Beech	6.0	3.0	9.0	Yes	None	1200	5	Mullite	CON9
Be134	Beech	6.0	3.0	9.0	Yes	None	1300	5	Alumina	CON9
Be135	Beech	6.0	3.0	9.0	Yes	None	1300	5	Mullite	CON9

Table VI:1 Melting crucible fabric, beech ash

Sample Number	Visual Results				SEM Results		Overall Result
	Glass Formed	Batch Relics	Colour	Homogeneous	Silica Relics	Inhomogeneity	
Be132	Yes	M	Dark Purple	No	M	M	Inhomogeneous
Be133	Yes	M	Dark Purple	No	M	M	Inhomogeneous
Be134	Yes	NV	Dark Purple	Yes	NV	L	Inhomogeneous
Be135	Yes	NV	Dark Purple	Yes	NV	L	Inhomogeneous

Table VI:2 Results of variations in melting crucible fabric, beech ash (Key in Table 3:3)

Sample Number	Batch Parameters					Fritting Parameters	Melting Parameters			
	Ash Type	Ash Weight/g	Sand (≤250->180 µm)/g	Total Batch Weight/g	Mixed Batch		T/°C	t/hr	Crucible Fabric	Crucible
Br165	Bracken	6.0	3.0	9.0	Yes	None	1200	5	Alumina	CON9
Br166	Bracken	6.0	3.0	9.0	Yes	None	1200	5	Mullite	CON9
Br167	Bracken	6.0	3.0	9.0	Yes	None	1300	5	Alumina	CON9
Br168	Bracken	6.0	3.0	9.0	Yes	None	1300	5	Mullite	CON9

Table VI:3 Melting crucible fabric, bracken ash

Sample Number	Visual Results						SEM Results		Overall Result
	Glass Formed	Batch Relics	Colour	Crystalline Substance	Opacity	Homogeneous	Silica Relics	Inhomogeneity	
Br165	Yes	NV	Green/brown/blue	NV	NV	Yes	NV	L	Inhomogeneous
Br166	Yes	NV	Dark green	NV	NV	Yes	NV	L	Inhomogeneous
Br167	Yes	NV	Green/brown/blue	NV	NV	Yes	NV	NV	Homogeneous
Br168	Yes	NV	Dark green	NV	NV	Yes	NV	NV	Homogeneous

Table VI:4 Results of variations in melting crucible fabric, bracken ash (Key in Table 3:3)

Sample Number	Batch Parameters					Fritting Parameters			Melting Parameters		
	Ash Type	Ash Weight/g	Sand (≤250->180 µm)/g	Total Batch Weight/g	Mixed Batch	T/°C	t/hr	Crucible	T/°C	t/hr	Crucible
Be136	Beech	6.0	3.0	9.0	Yes	None	None	None	1200	5	CON7
Be137	Beech	6.0	3.0	9.0	Yes	None	None	None	1200	5	CYL7
Be138	Beech	6.0	3.0	9.0	Yes	500	1	CON9	1200	5	CON7
Be139	Beech	6.0	3.0	9.0	Yes	500	1	CON9	1200	5	CYL7
Be140	Beech	6.0	3.0	9.0	Yes	500	24	CON9	1200	5	CON7
Be141	Beech	6.0	3.0	9.0	Yes	500	24	CON9	1200	5	CYL7
Be142	Beech	6.0	3.0	9.0	Yes	1000	1	CON9	1200	5	CON7
Be143	Beech	6.0	3.0	9.0	Yes	1000	1	CON9	1200	5	CYL7
Be144	Beech	6.0	3.0	9.0	Yes	1000	24	CON9	1200	5	CON7
Be145	Beech	6.0	3.0	9.0	Yes	1000	24	CON9	1200	5	CYL7
Be146	Beech	6.0	3.0	9.0	Yes	None	None	None	1300	5	CON7
Be147	Beech	6.0	3.0	9.0	Yes	None	None	None	1300	5	CYL7
Be148	Beech	6.0	3.0	9.0	Yes	500	1	CON9	1300	5	CON7
Be149	Beech	6.0	3.0	9.0	Yes	500	1	CON9	1300	5	CYL7
Be150	Beech	6.0	3.0	9.0	Yes	500	24	CON9	1300	5	CON7
Be151	Beech	6.0	3.0	9.0	Yes	500	24	CON9	1300	5	CYL7
Be152	Beech	6.0	3.0	9.0	Yes	1000	1	CON9	1300	5	CON7
Be153	Beech	6.0	3.0	9.0	Yes	1000	1	CON9	1300	5	CYL7
Be154	Beech	6.0	3.0	9.0	Yes	1000	24	CON9	1300	5	CON7
Be155	Beech	6.0	3.0	9.0	Yes	1000	24	CON9	1300	5	CYL7

Table VI:5Melting crucible dimensions, beech ash

Sample Number	Visual Results				SEM Results		Overall verdict
	Glass Formed	Batch Relics	Colour	Homogeneous	Silica Relics	Inhomogeneity	
Be136	Yes	M	Dark purple	No	M	M	Inhomogeneous
Be137	Yes	M	Dark purple	No	M	M	Inhomogeneous
Be138	Yes	L	Dark purple	No	L	L	Inhomogeneous
Be139	Yes	L	Dark purple	No	L	L	Inhomogeneous
Be140	Yes	L	Dark purple	No	L	L	Inhomogeneous
Be141	Yes	L	Dark purple	No	L	L	Inhomogeneous
Be142	Yes	H	Dark purple	No	H	H	Inhomogeneous
Be143	Yes	H	Dark purple	No	H	H	Inhomogeneous
Be144	Yes	H	Dark purple	No	H	H	Inhomogeneous
Be145	Yes	H	Dark purple	No	H	H	Inhomogeneous
Be146	Yes	NV	Dark purple	Yes	NV	NV	Homogeneous
Be147	Yes	NV	Dark purple	Yes	NV	NV	Homogeneous
Be148	Yes	NV	Dark purple	Yes	NV	NV	Homogeneous
Be149	Yes	NV	Dark purple	Yes	NV	NV	Homogeneous
Be150	Yes	NV	Dark purple	Yes	NV	NV	Homogeneous
Be151	Yes	NV	Dark purple	Yes	NV	NV	Homogeneous
Be152	Yes	NV	Dark purple	Yes	NV	NV	Homogeneous
Be153	Yes	NV	Dark purple	Yes	NV	NV	Homogeneous
Be154	Yes	NV	Dark purple	Yes	NV	NV	Homogeneous
Be155	Yes	NV	Dark purple	Yes	NV	NV	Homogeneous

Table VI:6 Results of variations in melting crucible dimensions, beech ash (Key in Table 3:3)

Sample Number	Batch Parameters					Fritting Parameters			Melting Parameters		
	Ash Type	Ash Weight/g	Sand (≤250->180 µm)/g	Total Batch Weight/g	Mixed Batch	T/°C	t/hr	Crucible	T/°C	t/hr	Crucible
Br169	Bracken	6.0	3.0	9.0	Yes	None	None	None	1200	5	CON7
Br170	Bracken	6.0	3.0	9.0	Yes	None	None	None	1200	5	CYL7
Br171	Bracken	6.0	3.0	9.0	Yes	500	1	CON9	1200	5	CON7
Br172	Bracken	6.0	3.0	9.0	Yes	500	1	CON9	1200	5	CYL7
Br173	Bracken	6.0	3.0	9.0	Yes	1000	1	CON9	1200	5	CON7
Br174	Bracken	6.0	3.0	9.0	Yes	1000	1	CON9	1200	5	CYL7
Br175	Bracken	6.0	3.0	9.0	Yes	None	None	None	1300	5	CON7
Br176	Bracken	6.0	3.0	9.0	Yes	None	None	None	1300	5	CYL7
Br177	Bracken	6.0	3.0	9.0	Yes	500	1	CON9	1300	5	CON7
Br178	Bracken	6.0	3.0	9.0	Yes	500	1	CON9	1300	5	CYL7
Br179	Bracken	6.0	3.0	9.0	Yes	1000	1	CON9	1300	5	CON7
Br180	Bracken	6.0	3.0	9.0	Yes	1000	1	CON9	1300	5	CYL7

Table VI:7Melting crucible dimensions, bracken ash

Sample Number	Visual Results						SEM Results		Overall Results
	Glass Formed	Batch Relics	Colour	Crystalline Substance	Opacity	Homogeneous	Silica Relics	Inhomogeneity	
Br169	Yes	NV	Green/brown/blue	NV	NV	Yes	NV	L	Inhomogeneous
Br170	Yes	NV	Green/brown/blue	NV	NV	Yes	NV	L	Homogeneous
Br171	Yes	NV	Dark green/brown	NV	NV	Yes	NV	L	Inhomogeneous
Br172	Yes	NV	Dark green/brown	NV	NV	Yes	NV	L	Inhomogeneous
Br173	Yes	M	Brown/green	H	M	No	M	H	Inhomogeneous
Br174	Yes	M	Brown/green	H	M	No	M	H	Inhomogeneous
Br175	Yes	NV	Green/brown/blue	NV	NV	Yes	NV	NV	Homogeneous
Br176	Yes	NV	Green/brown/blue	NV	NV	Yes	NV	NV	Homogeneous
Br177	Yes	NV	Dark green/blue	NV	NV	Yes	NV	NV	Homogeneous
Br178	Yes	NV	Dark green/blue	NV	NV	Yes	NV	NV	Homogeneous
Br179	Yes	H	Brown/green	NV	L	No	NV	L	Homogeneous
Br180	Yes	H	Brown/green	NV	L	No	NV	L	Homogeneous

Table VI:8Results of variations in melting crucible dimensions, bracken ash (Key in Table 3:3)

Sample Number	Batch Parameters					Fritting Parameters	Melting Parameters			
	Ash Type	Ash Weight/g	Sand (≤250->180 µm)/g	Total Batch Weight/g	Mixed Batch		T/°C	t/hr	Crucible Fabric	Crucible
Be156	Beech	12.0	6.0	18.0	Yes	None	1200	5	Mullite	CON9
Be157	Beech	24.0	12.0	36.0	Yes	None	1200	5	Mullite	CON9
Be158	Beech	12.0	6.0	18.0	Yes	None	1300	5	Mullite	CON9
Be159	Beech	24.0	12.0	36.0	Yes	None	1300	5	Mullite	CON9

Table VI:9 Variation in batch size, beech ash

Sample Number	Visual Results				SEM Results		Overall Result
	Glass Formed	Batch Relics	Colour	Homogeneous	Silica Relics	Inhomogeneity	
Be156	Yes	M	Dark Purple	No	M	M	Inhomogeneous
Be157	Yes	M	Dark Purple	No	M	M	Inhomogeneous
Be158	Yes	NV	Dark Purple	Yes	NV	NV	Homogeneous
Be159	Yes	NV	Dark Purple	Yes	NV	NV	Homogeneous

Table VI:10 Results of variation in batch size, beech ash (Key in Table 3:3)

Sample Number	Batch Parameters					Fritting Parameters	Melting Parameters			
	Ash Type	Ash Weight/g	Sand (≤250->180 µm)/g	Total Batch Weight/g	Mixed Batch		T/°C	t/hr	Crucible Fabric	Crucible
Br181	Bracken	12.0	6.0	18.0	Yes	None	1200	5	Mullite	CON9
Br182	Bracken	24.0	12.0	36.0	Yes	None	1200	5	Mullite	CON9
Br183	Bracken	12.0	6.0	18.0	Yes	None	1300	5	Mullite	CON9
Br184	Bracken	24.0	12.0	36.0	Yes	None	1300	5	Mullite	CON9

Table VI:11 Variation in batch size, bracken ash

Sample Number	Visual Results						SEM Results		Overall Result
	Glass Formed	Batch Relics	Colour	Crystalline Substance	Opacity	Homogeneous	Silica Relics	Homogeneous	
Br181	Yes	NV	Dark Green	NV	NV	Yes	NV	L	Inhomogeneous
Br182	Yes	NV	Dark Green	NV	NV	Yes	NV	L	Homogeneous
Br183	Yes	NV	Dark Green	NV	NV	Yes	NV	NV	Homogeneous
Br184	Yes	NV	Dark Green	NV	NV	Yes	NV	NV	Homogeneous

Table VI:12 Results of variation in batch size, bracken ash (Key in Table 3:3)

Sample Number	Batch Parameters					Fritting Parameters			Melting Parameters			
	Ash Type	Ash Weight/g	Sand (≤250->180 µm)/g	Batch Weight/g	Mixed Batch	T/°C	t/hr	Crucible	T/°C	t/hr	Crucible Fabric	Crucible
Be160	Beech	6.0	3.0	9.0	Yes	None	None	CON9	1200	5	Mullite	CON9
Be161	Beech	6.0	3.0	9.0	Yes	500	1	CON9	1200	5	Mullite	CON9
Be162	Beech	6.0	3.0	9.0	Yes	1000	1	CON9	1200	5	Mullite	CON9
Be163	Beech	6.0	3.0	9.0	Yes	None	None	CON9	1300	5	Mullite	CON9
Be164	Beech	6.0	3.0	9.0	Yes	500	1	CON9	1300	5	Mullite	CON9
Be165	Beech	6.0	3.0	9.0	Yes	1000	1	CON9	1300	5	Mullite	CON9

Table VI:13 Melting furnace atmosphere, beech ash

Sample Number	Visual Results				SEM Results		Overall verdict
	Glass Formed	Batch Relics	Colour	Homogeneous	Silica Relics	Homogeneous	
Be160	Yes	M	Dark purple	No	L	M	Inhomogeneous
Be161	Yes	H	Dark purple	No	M	M	Inhomogeneous
Be162	Yes	H	Dark purple	No	M	M	Inhomogeneous
Be163	Yes	NV	Dark purple	Yes	NV	NV	Homogeneous
Be164	Yes	NV	Dark purple	Yes	NV	L	Inhomogeneous
Be165	Yes	NV	Dark purple	Yes	NV	NV	Homogeneous

Table VI:14 Results in variation in melting furnace atmosphere, beech ash (Key in Table 3:3)

Sample Number	Batch Parameters					Fritting Parameters			Melting Parameters			
	Ash Type	Ash Weight/g	Sand (≤250->180 µm)/g	Batch Weight/g	Mixed Batch	T/°C	t/hr	Crucible	T/°C	t/hr	Crucible Fabric	Crucible
Br185	Bracken	6.0	3.0	9.0	Yes	None	None	CON9	1200	5	Mullite	CON9
Br186	Bracken	6.0	3.0	9.0	Yes	500	1	CON9	1200	5	Mullite	CON9
Br187	Bracken	6.0	3.0	9.0	No	1000	1	CON9	1200	5	Mullite	CON9
Br188	Bracken	6.0	3.0	9.0	Yes	None	None	CON9	1300	5	Mullite	CON9
Br189	Bracken	6.0	3.0	9.0	Yes	500	1	CON9	1300	5	Mullite	CON9
Br190	Bracken	6.0	3.0	9.0	No	1000	1	CON9	1300	5	Mullite	CON9

Table VI:15 Melting furnace atmosphere, bracken ash

Sample Number	Visual Results						SEM Results		Overall Result
	Glass Formed	Batch Relics	Colour	Crystalline Substance	Opacity	Homogeneous	Silica Relics	Homogeneous	
Br185	Yes	NV	Dark green/brown	NV	NV	Yes	L	L	Inhomogeneous
Br186	Yes	NV	Dark green/brown	NV	NV	Yes	NV	L	Inhomogeneous
Br187	Yes	NV	Dark green/brown	NV	NV	Yes	NV	L	Inhomogeneous
Br188	Yes	NV	Dark green/brown	NV	NV	Yes	NV	NV	Homogeneous
Br189	Yes	NV	Green/brown	NV	NV	Yes	L	M	Inhomogeneous
Br190	Yes	NV	Dark green/brown	NV	NV	Yes	NV	L	Inhomogeneous

Table VI:16 Results of variations in melting furnace atmosphere, bracken ash (Key in Table 3:3)

Site Number	Site Name	Period
1	Bowbrooks, Chiddingfold	Unknown
2	Broomfield Hanger (Gostrode I), Chiddingfold	E
3	Chaleshurst Upper, Chiddingfold	E
4	Chaleshurst Lower, Chiddingfold	L
5	Fromes Copse, Chiddingfold	E
6	Gostrode II, Chiddingfold	E
7	Hazelbridge Hanger, Chiddingfold	E
8	Imbhams, Chiddingfold	L
9	Pickhurst, Chiddingfold	L
10	Prestwick Manor, Chiddingfold	E
11	Redwood, Chiddingfold	E
12	Crouchland, Kirdford	E
13	Frithfold Copse, Kirdford	T
14	Glasshouse Lane, Kirdford	L
15	Hog Wood, Kirdford	E
16	Idehurst Copse, North Kirdford	T
17	Idehurst Copse, South Kirdford	T
18	Little Slifehurst, Kirdford	E
19	Lyons Farm, Kirdford	Unknown
20	Shortlands Copse, Kirdford	Unknown
21	Wephurst, Kirdford	E
KEY		
E = Early (*c.*1330-*c.*1550)	T = Transitional between Early and Late	L = Late (*c.*1567-*c.*1618)

Table VII:1 (Kenyon 1967) key to glass furnace sites in the Weald (Figure 7:1)

Site Number	Site Name	Period
22	Barnfold, Wisbrough Green	L
23	Brookland Farm, I and II, Wisbrough Green	L
24	Burchetts, Wisbrough Green	L
25	Fernfold, Wisbrough Green	L
26	Horsebridge, Wisbrough Green	L
27	Gunshot, Wisbrough Green	L
28	Malham Farm, Wisbrough Green	Unknown
29	Malham Ashfold, Wisbrough Green	E
30	Songhurst Farm, Wisbrough Green	L
31	Sparr Farm, Wisbrough Green	Unknown
32	Woodhouse Farm, Wisbrough Green	L
33	**Blunden's Wood, Hambledon**	E
34	Gunter's Wood, Hambledon	E
35	Vann Copse (Burgate), Hambledon	L
36	Ellen's Green, Ewhurst	L
37	Somersbury, Ewhurst	L
38	**Sidney Wood, Alford**	16/17
39	Lower Roundhurst, Lurgashall	Unknown
40	Petworth Park, Lurgashall	L
41	Lordings Farm, Billingshurst	Unknown
42	**Knightons, Alford**	16
KEY		
E = Early (*c.*1330-*c.*1550)	T = Transitional between Early and Late	L = Late (*c.*1567-*c.*1618)

Table VII:1 (continued) (Kenyon 1967) key to glass furnace sites in the Weald (Figure 7:1)

Sample Number	Sample Description	Na_2O	MgO	Al_2O_3	SiO_2	P_2O_5	SO_3	Cl	K_2O	CaO	TiO_2	MnO	Fe_2O_3	Total	Total Alkali Content ($K_2O + Na_2O$)
1	Average glass composition	3.4	6.95	4.78	57	n.a.	n.a.	n.a.	9	17.5	0.8	0.2	1.32	100.95	12.40
2	Vessel glass	2.12	6.29	0.83	60.51	2.97	n.a.	n.a.	10.42	12.85	0.07	1.13	0.75	97.94	12.54
3	Vessel glass	2.16	5.91	0.87	60.80	3.02	n.a.	n.a.	10.59	13.14	0.09	1.15	0.81	98.54	12.75
4	Vessel glass	2.15	6.11	0.89	61.12	3.00	n.a.	n.a.	10.35	12.56	0.09	1.05	0.74	98.06	12.50
5	Vessel glass	3.09	7.15	1.01	56.43	3.27	n.a.	n.a.	10.60	14.50	0.09	1.34	0.58	98.06	13.69
6	Vessel glass	3.03	7.17	0.99	56.16	3.27	n.a.	n.a.	10.75	14.53	0.11	1.21	0.56	97.78	13.78
7	Vessel glass	2.15	6.05	0.85	60.25	3.10	n.a.	n.a.	10.79	12.81	0.09	1.17	0.78	98.04	12.94
8	Vessel glass	2.27	6.29	2.37	63.18	2.21	n.a.	n.a.	10.19	11.57	0.03	1.08	0.81	100.00	12.46
9	Vessel glass	0.00	4.70	4.63	64.58	2.03	n.a.	n.a.	10.27	11.22	0.00	1.19	1.39	100.01	10.27

Key

Sample Number	Data Source
1	Waterton (Wood 1965: 67)
2-7	(Merchant 1998: Table 6.10)
8-9	(Merchant 1998: Table 6.12)

Table VII:2 Blunden's Wood glass analyses (Waterton (Wood 1965: 67), Merchant 1998: Tables 6.10 and 6.12)

Sample Number	Context Number	Description			
		Sample Origin	Glass Colour	Sample Condition	Opacity
BW1	AS3542	Bottle glass (9N9)	Green	Good	NV
BW2	AS3550	Waste glass or cullet (6N6)	Green	Good	NV
BW3	AS3560	Waste glass or cullet with extensive devitrification (31N31)	Green	Heavily weathered	NV
BW4	AS3575	Waste glass or cullet (possibly crown glass) (2N5) (Kiln C)	Green/yellow	Good	Yes
BW5	AS207	Crucible with 1-2mm of glass on inner surface (1N1)	Green	Good	NV
BW6	AS3469	Crucible with 1-2mm of glass on inner surface	Pale blue/purple	Good	Yes
BW7	AS3469	Crucible with 1-2mm of glass on inner surface	Pale blue/purple	Good	Yes
BW8	AS3501	Crucible with 1-2mm of glass on inner surface	Pale green/white	Good	Yes
BW9	AS3468	Crucible fragment with 2mm of glass on inners surface	Green	Good	NV
BW10	AS3474	Bucket shaped crucible fragment with 1-2mm of glass on inner surface (1ON)	Pale blue	Good	Yes
BW11	AS3554	Glass waste and scum mixed with earth (10N10)	Green	Lightly weathered	Yes
BW12	AS3578	Glass waste with devitrification on surface	Green	Good	Yes
BW13	AS3581	Glass waste, slag and scum (21N21)	Green	Good	NV
BW14	AS3585	Glass waste mixed with earth (3N3)	Green	Lightly weathered	Yes

Table VII:3 Blunden's Wood glass samples selected for analysis (Key in Table 3:3)

Sample No.	Sample Description	Na_2O	MgO	Al_2O_3	SiO_2	P_2O_5	SO_3	Cl	K_2O	CaO	TiO_2	MnO	Fe_2O_3	Total	Total Alkali Content ($K_2O + Na_2O$)
1	Window glass	1.92	6.06	1.77	57.26	3.62	n.a.	n.a.	10.28	16.08	0.18	0.94	0.72	98.83	12.20
2	Window glass	1.92	5.92	1.75	56.80	3.48	n.a.	n.a.	10.57	15.85	0.20	0.96	0.72	98.17	12.49
3	Window glass	1.97	5.97	1.74	56.32	3.61	n.a.	n.a.	10.20	15.56	0.18	0.91	0.80	97.26	12.17
4	Window glass	1.80	5.50	2.07	58.20	3.51	n.a.	n.a.	10.15	16.26	0.22	0.93	0.81	99.45	11.95
5	Window glass	1.76	5.37	2.16	57.23	3.40	n.a.	n.a.	10.18	16.30	0.20	0.96	0.74	98.30	11.94
6	Window glass	1.60	4.04	4.40	60.65	2.21	n.a.	n.a.	9.85	14.56	0.23	1.00	0.85	99.39	11.45
7	Window glass	1.43	5.74	3.66	59.47	2.70	n.a.	n.a.	10.01	14.93	0.22	0.95	0.80	99.91	11.44
8	Window glass	1.40	7.58	2.54	58.03	3.65	n.a.	n.a.	10.37	15.53	0.22	0.94	0.78	101.04	11.77
9	Window glass	1.98	7.32	3.18	57.47	3.52	n.a.	n.a.	9.73	14.49	0.24	0.89	0.83	99.65	11.71
10	Window glass	2.10	6.64	3.15	58.07	3.44	n.a.	n.a.	9.97	15.27	0.22	0.89	0.80	100.55	12.07
11	Window glass	1.90	6.03	3.09	58.71	3.47	n.a.	n.a.	10.29	15.99	0.22	0.94	0.85	101.49	12.19

Key

Sample Number	Data Source
1-5	Merchant (1998: Table 6.10)
6-11	Merchant (1998: Table 6.12)

Table VII:4 Knightons glass analyses (Merchant 1998: Tables 6.10 and 6.12)

Sample Number	Context Number	Description			
		Sample Origin	Glass Colour	Sample Condition	Opacity
K1	AS4838	Crown glass	Dark green	Weathered surface layer	NV
K2	AS4931	Crown glass	Green	Good	NV
K3	AS4934	Crown glass	Green	Slightly weathered surface layer	NV
K4	AS4928	Crown glass rims	Green	Good	NV
K5	AS4928	Crown glass rims	Green	Good	NV
K6	AS4928	Crown glass rims	Green	Good	NV
K7	AS4932	Crown glass	Green	Good	NV
K8	AS4827	Crown glass	Green	Good	NV
K9	AS4827	Crown glass	Green	Good	NV
K10	AS4827	Crown glass	Green	Good	NV
K11	AS4827	Crown glass	Green	Good	NV
K12	AS4843	Cullet, strike offs	Dark green	Slightly weathered surface layer	NV
K13	AS4843	Cullet, strike offs	Dark green	Slightly weathered surface layer	NV
K14	AS4843	Cullet, strike offs	Dark green	Slightly weathered surface layer	NV
K15	AS4922	Cullet or waste glass	Dark green	Weathered surface layer	NV
K16	AG4952	Cullet or waste glass	Transparent dark green and opaque pale blue/green	Weathered surface layer	Yes
K17	AS4848	Crucible fragment with approximately 5 cm of glass and scum	Dark green	Heavily weathered in places	NV
K18	AS4921	Large crucible base with glass attached to inner surface	Dark green	Heavily weathered	NV
K19	AS4958	Crucible base with approximately 1cm of glass attached to inner surface	Dark green	Weathered surface layer	NV
K20	AS4797	Glass waste	Transparent dark green and opaque pale blue/green	Weathered surface layer	Yes
K21	AS4779	Glass waste	Green/brown	Heavily weathered surface layer	NV

Table VII:5 Knightons glass samples selected for analysis (Key in Table 3:3)

Sample Number	Sample Description	Na_2O	MgO	Al_2O_3	SiO_2	P_2O_5	SO_3	Cl	K_2O	CaO	TiO_2	MnO	Fe_2O_3	Total	Total Alkali Content ($K_2O + Na_2O$)
1	Glass	1.2	2.7	n.d.	59.5	n.d.	n.d.	n.d.	4.4	24.9	n.d.	n.d.	0.96	93.66	5.60
2	Vessel glass	2.32	2.49	3.23	59.32	1.91	n.a.	n.a.	4.15	22.40	0.31	0.67	1.25	98.05	6.47
3	Vessel glass	2.35	2.60	3.46	58.84	1.86	n.a.	n.a.	4.06	22.72	0.31	0.80	1.14	98.14	6.41
4	Vessel glass	2.25	2.50	3.24	58.71	1.88	n.a.	n.a.	3.11	23.45	0.26	0.69	1.11	97.20	5.36
5	Vessel glass	2.29	2.49	3.33	58.73	1.83	n.a.	n.a.	3.05	23.46	0.26	0.66	1.19	97.29	5.34
6	Vessel glass	1.20	2.55	2.56	61.06	1.83	n.a.	n.a.	4.90	21.40	0.35	0.61	1.08	97.54	6.10
7	Crucible glass	1.39	1.09	3.74	64.63	0.32	n.a.	n.a.	20.76	2.54	0.26	0.35	1.98	97.06	22.15
8	Crucible glass	2.69	1.44	13.60	60.54	0.72	n.a.	n.a.	5.90	10.44	0.65	0.37	1.11	97.46	8.59
9	Vessel glass	1.38	2.61	3.52	60.14	2.04	n.a.	n.a.	4.77	21.33	0.32	0.60	1.17	97.88	6.15
10	Vessel glass	1.20	2.44	2.97	59.55	2.56	n.a.	n.a.	5.01	21.64	0.35	0.43	1.09	97.24	6.21

Key

Sample Number	Data Source
1	(Kenyon 1967: 39)
2-8	(Merchant 1998: Table 6.10)
9-10	(Merchant 1998: Table 6.12)

Table VII:6 Sidney Wood glass analyses (Kenyon 1967: 39, Merchant 1998: Tables 6.10 and 6.12)

Sample Number	Context Number	Description			
		Sample Origin	Glass Colour	Sample Condition	Opacity
SW1	AS4966	Glass, ribbed bottle neck	Dark green	Good	NV
SW2	AS4967	Glass, oval ribbed flask, bubbles and seed visible	Dark blue/green	Good	NV
SW3	AS4977	Glass, curcurbit rim, bubbles and seed visible	Dark blue/green	Good	NV
SW4	AS4998	Crucible fragment with a broken up glass layer (approximately 0.5cm) on inner surface	Dark green	Heavily weathered	NV
SW5	AS4982	Crucible fragment with glass attached	Transparent dark green and opaque blue	Heavily weathered	Yes
SW6	AS4982	Crucible fragment with glass attached	Transparent dark green and opaque blue	Heavily weathered	Yes
SW7	AS4981	Furnace fragment with very thin layer of glass	Purple	Good	NV

Table VII:7 Sidney Wood glass samples selected for analysis (Key in Table 3:3)

Sample Number	Sample Description	Na_2O	MgO	Al_2O_3	SiO_2	P_2O_5	SO_3	Cl	K_2O	CaO	TiO_2	MnO	Fe_2O_3	Total	Total Alkali Content ($K_2O + Na_2O$)
1	116 (North site)	1.1	6.3	1.9	47.3	4.9	0.3	n.a.	19.6	15.9	0.2	1.8	0.7	100.0	20.7
2	North Tip (North site)	1.1	7.4	2.0	56.3	3.5	0.4	n.a.	9.9	17.4	0.2	1.2	0.5	99.9	11.0
3	North Tip (North site)	1.2	6.9	2.1	55.5	3.7	0.3	n.a.	10.9	17.0	0.2	1.3	0.8	99.9	12.1
4	North site crucible	1.8	6.9	1.8	52.2	4.5	0.1	0.1	12.9	16.6	0.2	1.6	0.7	99.4	14.7

Key

Sample Number	Data Source
1-4	Mortimer in Welch (1997: Table 1)

Table VII:8 North Site, Little Birches glass analyses (Mortimer in Welch (1997: Table 1))

Sample Number	Context	Description			
		Sample Origin	Glass Colour	Sample Condition	Opacity
LBN1	LBW 91 (116) Box 38	Waste glasspot glass	Dark green	Heavily weathered surface layer	NV
LBN2	LBW 91 (116) Box 38	Glasspot glass	Dark green	Heavily weathered surface layer	NV
LBN3	LBW 91 (116) Box 38	Glasspot glass	Dark green	Heavily weathered surface layer	NV
LBN4	LBW 91 (116) Box 38	Glasspot glass	Dark green	Heavily weathered surface layer	NV
LBN5	LBW 91 (-1240-) Box 38	Crucible glass/Glass pot glass from inner bottom	Dark green	Heavily weathered surface layer	NV
LBN6	LBW 91 (-1240-) Box 38	Crucible glass/Glass pot glass from inner bottom	Dark green	Heavily weathered surface layer	NV
LBN7	LBW 91 (-1240-) Box 38	Crucible glass/Glass pot glass from inner bottom	Dark green	Heavily weathered surface layer	NV

Table VII:9 North Site, Little Birches glass samples selected for analysis (Key in Table 3:3)

Sample Number	Sample Description	Na_2O	MgO	Al_2O_3	SiO_2	P_2O_5	SO_3	Cl	K_2O	CaO	TiO_2	MnO	Fe_2O_3	Total	Total Alkali Content ($K_2O + Na_2O$)
1	East Tip glass waste	3.1	7.8	0.9	60.3	4.1	0.1	0.2	14.5	16.5	0.1	1.9	0.5	110.0	17.6
2	East tip distorted flat or vessel glass	2.0	7.9	0.9	55.0	3.9	0.3	n.a.	13.8	14.2	0.1	1.5	0.3	99.9	15.8
3	East tip hard 'bright' glass	2.0	7.6	1.5	58.3	3.2	0.3	n.a.	12.9	12.1	0.2	1.4	0.5	100.0	14.9
4	East tip crown glass thick green	2.8	5.6	1.6	58.0	3.4	0.3	n.a.	7.7	18.6	0.2	1.1	0.8	100.1	10.5
5	East tip moil	2.3	8.0	1.0	55.8	3.4	0.3	n.a.	12.8	14.1	0.2	1.6	0.4	99.9	15.1
6	West tip distorted flat or vessel glass	2.1	7.6	1.5	57.0	3.5	0.2	n.a.	13.8	12.0	0.1	1.6	0.5	99.9	15.9
7	West tip hard 'bright' glass	2.1	7.6	1.4	57.2	3.5	0.1	n.a.	13.8	11.9	0.3	1.4	0.6	99.9	15.9
8	West tip moil	2.0	8.0	1.3	56.5	3.2	0.2	n.a.	12.8	13.9	0.2	1.4	0.5	100.0	14.8
9	West tip crown glass thick green	2.1	8.3	1.4	56.1	3.6	0.2	n.a.	13.7	12.4	0.1	1.5	0.7	100.1	15.8
10	90 distorted flat or vessel glass	2.0	7.6	0.9	58.1	3.5	0.4	n.a.	11.6	13.8	0.1	1.6	0.3	99.9	13.6
11	90 hard 'bright' glass	1.9	7.6	1.7	62.2	3.0	0.1	n.a.	10.2	11.3	0.1	1.4	0.5	100.0	12.1
12	90 moil	3.1	8.4	1.2	54.4	3.7	0.4	n.a.	14.0	12.6	0.2	1.7	0.4	100.1	17.1
13	90 crown glass thick green	1.9	7.7	0.9	57.4	3.5	0.3	n.a.	11.7	14.5	0.1	1.5	0.5	100.0	13.6
14	101 distorted flat or vessel glass	1.8	8.7	1.2	56.3	3.1	0.1	n.a.	11.8	14.9	0.2	1.4	0.5	100.0	13.6
15	101 hard 'bright' glass	1.7	7.6	1.6	62.0	3.0	0.1	n.a.	10.4	11.4	0.2	1.4	0.7	100.1	12.1
16	101 crown glass thick green	2.2	8.5	1.0	55.0	3.1	0.2	n.a.	13.2	14.7	0.2	1.6	0.4	100.1	15.4
17	101 crown glass thin pale green	2.2	7.3	1.5	59.9	3.1	0.2	n.a.	12.0	11.7	0.2	1.4	0.6	100.1	14.2
18	101 crown glass thin greenish	2.6	8.1	1.4	54.5	3.5	0.1	n.a.	14.7	12.8	0.2	1.4	0.6	99.9	17.3

Key	
Sample Number	Data Source
1-18	Mortimer in Welch (1997: Table 1)

Table VII:10 Published Little Birches glass analyses (Mortimer in Welch (1997: Table 1))

Sample Number	Context	Description			
		Sample Origin	Glass Colour	Sample Condition	Opacity
LBS1	LBW 91 (11) Box 21 Type 101	Crucible glass	Dark green	Heavily weathered surface layer	NV
LBS2	LBW 91 (11) Box 21 Type 101	Crucible glass	Dark green	Heavily weathered surface layer	NV
LBS3	LBW 91 (11) Box 21 Type 101	Crucible glass	Dark green	Heavily weathered surface layer	NV
LBS4	LBW 91 (45) 263/GW3 S1/4 West Tip	Glass waste, lump	Dark green	Heavily weathered surface layer	NV
LBS5	LBW 91 (45) 263/GW3 S1/4 West Tip	Glass waste, lump	Dark green	Heavily weathered surface layer	NV
LBS6	LBW 91 (45) 264/GW3 S1/4 West Tip	Glass waste, lump	Dark green	Heavily weathered surface layer	NV
LBS7	LBW 91 (45) 264/GW3 S1/4 West Tip	Glass waste, lump	Dark green	Heavily weathered surface layer	NV
LBS8	LBW 91 (45) S1/4 West Tip	Glass waste	Dark green	Heavily weathered surface layer	NV
LBS9	LBW 91 (45) S1/4 West Tip	Glass waste	Dark green	Heavily weathered surface layer	NV

Table VII:11 South Site, Little Birches glass samples selected for analysis (Key in Table 3:3)

Glass house Number (Six 1976)	Name
A1	Glashütte Forstort 'Hüttenkeil'
A2	Glashütte Forstort 'Lehmkenbrink', unter
A3	**Glashütte Forstort 'Langer Grund'**
A4	**Glashütte Forstort 'Köhlergrund'**
A5	**Glashütte Forstort 'Aschengrund'**
A6	**Glashütte unterhalb des Hilsbornteiches**
A7	**Glashütte am Unterlauf des kleinen Glasebaches**
A8	Glashütte an der Ochsenwiesenquelle
A9	Glashütte Forstort 'Lehmkenbrink', Mitte
A10	**Glashütte unterhalb des Michaelisborns**
A11	**Glashütte Forstort 'Wellenspring'**
A12	**Glashütte Forstort 'Fangköhlergrund'**
A13	**Glashütte Forstort 'Haken'**
A14	Glashütte Forstort 'Burggrund'
A15	**Glashütte Forstort 'Horst' unten**
A16	**Glashütte Forstort 'Horst' oben**
A17	**Glashütte Forstort 'Talsköpfe'**
A18	**Glashütte Forstort 'Wellenspring', unterhalb der Teiche**
The glasshouses from which material is used in this research are highlighted in bold	

Table VII:12 Key to Hils glasshouses (A2-18) in Figure 7:10) (after Leiber 1999/2000: Figure 1)

Sample Number	Sample Description	Na_2O	MgO	Al_2O_3	SiO_2	P_2O_5	SO_3	Cl	K_2O	CaO	TiO_2	MnO	Fe_2O_3	Total	Total Alkali Content ($K_2O + Na_2O$)
1	Window glass (1400)	3.2	5.7	1.1	54.4	4.9	0.5	n.d.	6.3	21.6	0.3	1.2	0.8	100.0	9.5
2	Window glass (1400)	3.2	4.5	1.2	56.4	4.6	0.3	n.d.	5.2	22.2	0.2	0.6	0.7	99.1	8.4
3	A2 blue glass drop	0.6	1.8	2.5	70.6	1.3	n.d.	n.d.	13.4	9.0	0.4	0.6	1.1	101.3	14.0
4	A4 blue/green glass drop	0.5	1.0	2.8	81.5	n.d.	n.d.	n.d.	12.8	3.1	0.3	0.2	1.0	103.2	13.3
5	A4 purple glass drop	0.3	2.3	0.7	61.8	1.9	0.4	n.d.	16.6	16.6	0.2	0.8	n.d.	101.6	16.9
6	A7 glass	0.4	2.7	0.4	58.9	1.7	0.2	n.d.	16.0	19.7	<0.1	1.2	<0.1	101.3	16.4
7	A11 glass	0.7	3.3	1.6	51.0	4.8	0.3	n.d.	18.9	21.2	0.2	0.5	0.4	102.9	19.6

Key

Sample Number	Data Source
1-2	(Kuisma-Kursula et al. 1997: 66)
3-7	(Six and Madder 1989: 73)

Table VII:13 Hils glass analyses ((Kuisma-Kursula et al. 1997: 66)

Sample Number	Context Number	Glass Hut	Date	Description			
				Sample Origin	Glass Colour	Sample Condition	Opacity
G1	Gr A3/20	A3	12/13	Glass drop	Green	Good	Yes
G2	Gr A4/1	A4	12/13	Glass drop	Green	Good	NV
G3	Gr A6/136	A6	12/13	Glass drop	Green	Good	NV
G4	Gr A6/137	A6	12/13	Glass drop	Blue	Good	NV
G5	Gr A6/138	A6	12/13	Glass drop	Blue	Lightly weathered	NV
G6	Gr A7/267	A7	12/13	Glass	Yellow green	Good	NV
G7	Gr A10/1	A10	12/13	Glass drop	Pale blue	Good	NV
G8	Gr A10/2	A10	12/13	Glass drop	Green	Good	NV
G9	Gr A11/2	A11	12/13	Glass drop	Green/blue	Good	NV
G10	Gr A11/1	A11	12/13	Glass drop	Blue/green	Lightly weathered	Yes
G11	Gr A12/1	A12	12/13	Glass drop	Green	Good	NV
G12	Gr A12/2	A12	12/13	Glass drop	Green	Good	Yes
G13	Gr A13/2	A13	12/13	Glass drop	Green/yellow	Good	NV
G14	Gr A13/3	A13	12/13	Glass drop	Blue/green	Good	NV
G15	Gr A15/1	A15	12/13	Glass drop	Green	Good	NV
G16	Gr A17/28	A17	12/13	Glass drop	Green/yellow	Good	Yes
G17	Gr A17/27	A17	12/13	Glass drop	Colourless	Good	NV
G18	Gr A18/12	A18	1400	Glass drop	Light blue	Good	NV
G19	Gr A18/7	A18	1400	Window glass	Blue	Heavily weathered	NV
G20	Gr A18/90	A18	1400	Window glass	Green	Heavily weathered	NV
G21	Gr A4/3	A4	12/13	Glass waste	Blue	Good	NV
G22	Gr A5/321	A5	12/13	Glass waste	Green	Good	Yes
G23	Gr A5/284	A5	12/13	Glass waste	Blue	Lightly weathered	NV
G24	Gr A7/269	A7	12/13	Glass waste	Green	Good	NV
G25	Gr A8/21	A8	12/13	Glass waste	Green	Good	Yes
G26	Gr A9/3	A9	12/13	Glass waste	Green	Good	Yes
G27	Gr A16/38	A16	12/13	Glass waste	Green	Good	Yes

Table VII:14 Hils glass samples selected for analysis (Key in Table 3:3)

Sample Number	SEM Results			Overall Result
	Silica Relics	Devitrification	Inhomogeneity	
Bottle glass				
BW1	NV	NV	NV	Homogeneous
Cullet or waste glass				
BW2	NV	NV	NV	Homogeneous
BW3	NV	Yes	NV	Homogeneous
BW4	NV	NV	M	Inhomogeneous
Crucible glass				
BW5	NV	NV	L	Inhomogeneous
BW6	NV	NV	M at crucible/glass interface	Inhomogeneous
BW7	NV	NV	L	Inhomogeneous
BW8	NV	NV	NV	Homogeneous
BW9	NV	NV	NV	Homogeneous
BW10	NV	NV	L at crucible/glass interface	Inhomogeneous
Glass waste				
BW11	NV	NV	NV	Homogeneous
BW12	NV	Yes	M	Inhomogeneous
BW13	NV	NV	L inhomogeneity at inclusion/glass interface	Inhomogeneous
BW14	NV	Yes	NV	Homogeneous

Table VIII:1 Results of backscattered SEM imaging of Blunden's Wood glass (Key in Table 3:3)

Sample Number	SEM Results			Overall Result
	Silica Relics	Devitrification	Inhomogeneity	
Crown glass				
K1	NV	NV	NV	Homogeneous
K2	NV	NV	NV	Homogeneous
K3	NV	NV	NV	Homogeneous
K4	NV	NV	NV	Homogeneous
K5	NV	NV	NV	Homogeneous
K6	NV	NV	NV	Homogeneous
K7	NV	NV	NV	Homogeneous
K8	NV	NV	NV	Homogeneous
K9	NV	NV	NV	Homogeneous
K10	NV	NV	NV	Homogeneous
K11	NV	NV	NV	Homogeneous
Cullet or waste glass				
K12	NV	NV	NV	Homogeneous
K13	NV	NV	NV	Homogeneous
K14	NV	NV	NV	Homogeneous
K15	NV	NV	M	Inhomogeneous
K16	NV	Yes	H	Inhomogeneous
Crucible glass				
K17	NV	NV	L to M inhomogeneity near rock inclusions	Inhomogeneous
K18	NV	NV	NV	Homogeneous
K19	NV	Yes	M	Inhomogeneous
Glass waste				
K20	NV	Yes	H	Inhomogeneous
K21	NV	NV	M	Inhomogeneous

Table VIII:2 Results of backscattered SEM imaging of Knightons glass (Key in Table 3:3)

Sample Number	SEM Results			Overall Result
	Silica Relics	Devitrification	Inhomogeneity	
Vessel glass				
SW1	NV	NV	NV	Homogeneous
SW2	NV	NV	NV	Homogeneous
SW3	NV	NV	NV	Homogeneous
Crucible glass				
SW4	NV	NV	H	Inhomogeneous
SW5	NV	NV	M	Inhomogeneous
SW6	NV	NV	H	Inhomogeneous
Glass attached to furnace fragment				
SW7	NV	NV	L inhomogeneity at crucible/glass interface	Inhomogeneous

Table VIII:3 Results of backscattered SEM imaging of Sidney Wood glass (Key in Table 3:3)

Sample Number	SEM Results			Overall Result
	Silica Relics	Devitrification	Inhomogeneity	
Crucible glass				
LBN1	NV	NV	L inhomogeneity especially at top of sample	Inhomogeneous
LBN2	NV	NV	NV	Homogeneous
LBN3	NV	Yes	L	Inhomogeneous
LBN4	NV	NV	NV	Inhomogeneous
LBN5	NV	NV	M inhomogeneity near inclusions	Inhomogeneous
LBN6	NV	NV	NV	Homogeneous
LBN7	NV	NV	NV	Homogeneous

Table VIII:4 Results of backscattered SEM imaging of Little Birches glass, North Site (Key in Table 3:3)

Sample Number	SEM Results			Overall Result
	Silica Relics	Devitrification	Inhomogeneity	
Crucible glass				
LBS1	NV	NV	M	Inhomogeneous
LBS2	NV	NV	NV	Homogeneous
LBS3	NV	NV	NV	Homogeneous
Glass waste				
LBS4	NV	NV	L inhomogeneity especially visible near inclusions	Inhomogeneous
LBS5	L	NV	L inhomogeneity especially near silica relics	Inhomogeneous
LBS6	M	NV	L inhomogeneity especially near silica relics	Inhomogeneous
LBS7	NV	NV	L inhomogeneity at inclusion/glass interface	Inhomogeneous
LBS8	NV	NV	NV	Homogeneous
LBS9	NV	NV	NV	Homogeneous

Table VIII:5 Results of backscattered SEM imaging of Little Birches glass, South Site (Key in Table 3:3)

Sample Number	SEM Results			Overall Result
	Silica Relics	Devitrification	Inhomogeneity	
Glass drops				
G1	NV	NV	H	Inhomogeneous
G2	NV	NV	NV	Homogeneous
G3	NV	NV	H	Inhomogeneous
G4	NV	NV	H	Inhomogeneous
G5	NV	NV	H	Inhomogeneous
G6	NV	NV	NV	Homogeneous
G7	NV	NV	H	Inhomogeneous
G8	NV	Yes	H	Inhomogeneous
G9	NV	NV	H	Inhomogeneous
G10	NV	NV	H	Inhomogeneous
G11	NV	NV	H	Inhomogeneous
G12	NV	Yes	H	Inhomogeneous
G13	NV	Yes	H	Inhomogeneous
G14	NV	Yes	H	Inhomogeneous
G15	NV	NV	H	Inhomogeneous
G16	NV	Yes	H	Inhomogeneous
G17	NV	NV	H	Inhomogeneous
G18	NV	NV	H	Inhomogeneous
Window glass				
G19	NV	NV	NV	Homogeneous
G20	NV	NV	H	Inhomogeneous
Glass waste				
G21	NV	NV	H	Inhomogeneous
G22	NV	Yes	H	Inhomogeneous
G23	NV	Yes	H	Inhomogeneous
G24	NV	NV	L	Inhomogeneous
G25	NV	NV	L	Inhomogeneous
G26	NV	Yes	H	Inhomogeneous
G27	NV	Yes	H	Inhomogeneous

Table VIII:6 Results of backscattered SEM imaging of Hils glass (Key in Table 3:3)

Analysis Number	Na_2O	MgO	Al_2O_3	SiO_2	P_2O_5	SO_2	Cl	K_2O	CaO	TiO_2	MnO	FeO	CoO	CuO	Total	Distance from first analysis/ µm	Distance between analysis points/µm
1	0.455	1.870	3.842	67.105	0.476	0.018	0.051	16.166	7.913	0.252	0.341	0.686	0.003	0.141	99.321	0	0
2	0.544	2.231	2.749	64.070	0.778	0.170	0.030	15.774	11.462	0.198	0.387	0.635	0.000	0.091	99.119	122	122
3	0.441	2.401	3.225	63.240	0.678	0.057	0.017	15.850	11.730	0.224	0.402	0.538	0.000	0.119	98.922	244	122
4	0.483	2.212	3.121	64.399	0.631	0.183	0.000	15.653	10.762	0.269	0.431	0.579	0.007	0.135	98.866	366	122
5	0.307	1.685	3.368	66.558	0.431	0.121	0.011	15.507	7.774	0.234	0.338	0.790	0.041	0.103	97.267	489	122
6	0.326	1.568	3.724	68.510	0.427	0.129	0.034	15.029	7.186	0.272	0.303	0.673	0.000	0.079	98.259	612	123
7	0.388	1.680	2.931	67.695	0.494	0.082	0.000	14.734	7.694	0.216	0.354	0.746	0.000	0.148	97.162	734	122
8	0.355	1.682	2.792	68.004	0.537	0.121	0.021	15.252	7.953	0.235	0.336	0.646	0.000	0.114	98.048	856	122
9	0.438	2.054	3.254	64.081	0.544	0.100	0.017	15.609	9.576	0.252	0.416	0.613	0.030	0.127	97.113	978	122
10	0.475	2.188	2.815	64.852	0.668	0.126	0.000	15.704	10.217	0.215	0.378	0.621	0.011	0.130	98.399	1100	122
11	0.416	2.321	2.479	63.752	0.736	0.152	0.058	15.481	11.617	0.234	0.444	0.599	0.007	0.081	98.376	1222	122
12	0.475	2.235	2.850	63.070	0.568	0.152	0.032	15.890	11.000	0.263	0.394	0.550	0.000	0.062	97.541	1344	122
13	0.513	2.327	2.788	62.926	0.684	0.152	0.015	16.087	11.898	0.234	0.404	0.598	0.000	0.132	98.759	1467	122
14	0.547	2.351	3.177	61.336	0.623	0.044	0.032	16.120	11.397	0.252	0.437	0.507	0.000	0.083	96.907	1589	122
15	0.455	2.329	2.923	61.894	0.603	0.075	0.015	16.174	11.535	0.246	0.505	0.610	0.033	0.119	97.515	1711	122
16	0.565	2.437	2.900	61.985	0.703	0.062	0.032	15.744	12.492	0.275	0.484	0.406	0.000	0.107	98.192	1834	123
17	0.517	2.109	2.668	64.965	0.593	0.139	0.002	16.126	10.104	0.203	0.439	0.561	0.001	0.103	98.531	1956	122
18	0.451	2.286	2.537	61.759	0.750	0.131	0.000	15.743	11.635	0.216	0.452	0.647	0.032	0.034	96.674	2078	122
19	0.465	2.001	2.796	64.586	0.601	0.064	0.002	15.943	9.617	0.203	0.410	0.619	0.002	0.068	97.377	2200	122
20	0.431	1.549	2.382	66.739	0.388	0.160	0.054	16.509	7.366	0.190	0.328	0.414	0.002	0.211	96.722	2323	122
Average	0.452	2.076	2.966	64.576	0.596	0.112	0.021	15.755	10.047	0.234	0.399	0.602	0.008	0.109	97.954		
Maximum	0.565	2.437	3.842	68.510	0.778	0.183	0.058	16.509	12.492	0.275	0.505	0.790	0.041	0.211	99.321		
Minimum	0.307	1.549	2.382	61.336	0.388	0.018	0.000	14.734	7.186	0.190	0.303	0.406	0.000	0.034	96.674		
Range	0.258	0.888	1.460	7.173	0.390	0.165	0.058	1.775	5.306	0.085	0.202	0.384	0.041	0.177	2.646		

Table VIII:7 EPMA line scan data for inhomogeneous Hils glass sample G13, glass drop $12^{th}/13^{th}$ centuries (Table VII:14, EPMA run 5)

Analysis Number	Na_2O	MgO	Al_2O_3	SiO_2	P_2O_5	SO_2	Cl	K_2O	CaO	TiO_2	MnO	FeO	CoO	CuO	Total	Distance from first analysis/ µm	Distance between analysis points/ µm
1	0.501	2.723	3.012	60.737	0.668	0.051	0.026	15.121	15.425	0.217	0.848	0.331	0.015	0.124	99.800	0	0
2	0.472	2.730	3.196	60.613	0.588	0.056	0.016	15.228	15.249	0.209	0.880	0.417	0.000	0.078	99.732	96	96
3	0.441	2.687	3.147	59.952	0.618	0.082	0.068	15.223	15.296	0.223	0.929	0.343	0.011	0.097	99.118	191	95
4	0.461	2.701	3.251	59.809	0.643	0.190	0.051	15.211	15.105	0.206	0.857	0.405	0.000	0.146	99.036	287	96
5	0.407	2.708	3.147	60.818	0.611	0.144	0.000	15.196	15.256	0.195	0.905	0.459	0.000	0.058	99.902	383	96
6	0.504	2.630	3.108	60.093	0.574	0.121	0.005	15.205	15.327	0.209	0.910	0.410	0.024	0.102	99.222	479	95
7	0.451	2.723	3.004	60.027	0.597	0.064	0.033	14.959	15.277	0.217	0.918	0.376	0.032	0.133	98.810	575	96
8	0.501	2.660	2.875	59.641	0.666	0.064	0.016	15.180	15.692	0.189	0.880	0.428	0.000	0.123	98.914	670	95
9	0.434	2.740	2.863	59.852	0.626	0.221	0.014	14.866	15.669	0.187	0.872	0.443	0.045	0.093	98.925	766	96
10	0.494	2.680	2.896	60.150	0.624	0.087	0.000	15.084	15.568	0.170	0.898	0.376	0.000	0.097	99.124	862	96
11	0.404	2.598	2.912	60.332	0.681	0.164	0.000	15.059	15.337	0.247	0.863	0.447	0.000	0.118	99.161	957	95
12	0.505	2.601	2.986	60.564	0.637	0.138	0.047	15.011	15.378	0.209	0.860	0.380	0.011	0.130	99.457	1053	96
13	0.411	2.651	3.035	60.547	0.660	0.208	0.002	14.978	15.226	0.264	0.828	0.335	0.054	0.113	99.313	1149	96
14	0.454	2.667	3.061	59.867	0.628	0.169	0.009	15.118	15.310	0.239	0.860	0.372	0.000	0.118	98.871	1245	95
15	0.508	2.679	3.043	60.690	0.597	0.113	0.000	15.134	15.321	0.238	0.926	0.434	0.004	0.116	99.801	1340	96
16	0.574	2.689	3.157	59.813	0.597	0.203	0.000	15.134	14.933	0.239	0.922	0.398	0.004	0.137	98.800	1532	192
17	0.439	2.601	3.223	59.579	0.652	0.100	0.086	15.179	14.996	0.211	0.905	0.417	0.000	0.156	98.543	1628	96
18	0.411	2.584	3.253	59.986	0.582	0.138	0.000	15.207	14.953	0.230	0.868	0.398	0.000	0.160	98.770	1723	95
19	0.473	2.579	3.323	60.532	0.571	0.144	0.000	15.279	14.961	0.187	0.807	0.444	0.021	0.122	99.442	1819	96
Average	0.465	2.665	3.078	60.190	0.622	0.129	0.020	15.125	15.278	0.215	0.881	0.401	0.012	0.117	99.197		
Maximum	0.574	2.740	3.323	60.818	0.681	0.221	0.086	15.279	15.692	0.264	0.929	0.459	0.054	0.160	99.902		
Minimum	0.404	2.579	2.863	59.579	0.571	0.051	0.000	14.866	14.933	0.170	0.807	0.331	0.000	0.058	98.543		
Range	0.170	0.161	0.460	1.239	0.110	0.169	0.086	0.413	0.759	0.094	0.122	0.128	0.054	0.102	1.359		

Table VIII:8 EPMA line scan data for homogeneous Hils glass sample G6, glass 12th/13th centuries (Table VII:14, EPMA run 4)

Analysis Number	Na_2O	MgO	Al_2O_3	SiO_2	P_2O_5	SO_2	Cl	K_2O	CaO	TiO_2	MnO	FeO	CoO	CuO	Total	Distance from first analysis/ µm	Distance between analysis points/ µm
1	0.340	1.938	2.628	65.540	0.668	0.121	0.000	16.461	9.258	0.221	0.343	0.510	0.000	0.237	98.265	0	0
2	0.447	1.903	3.026	65.146	0.511	0.000	0.002	16.095	9.150	0.227	0.370	0.646	0.000	0.070	97.594	98	98
3	0.517	2.300	2.672	63.634	0.740	0.170	0.032	16.085	11.357	0.167	0.404	0.677	0.000	0.030	98.785	197	98
4	0.458	2.099	2.916	63.739	0.580	0.121	0.000	16.110	10.172	0.221	0.346	0.623	0.000	0.056	97.442	295	98
5	0.514	2.295	2.701	63.397	0.687	0.087	0.000	15.875	11.560	0.215	0.465	0.537	0.022	0.135	98.491	393	98
6	0.531	2.262	2.755	63.005	0.580	0.208	0.000	15.813	11.069	0.227	0.417	0.549	0.006	0.049	97.471	492	98
7	0.516	2.001	2.852	64.963	0.578	0.082	0.045	15.924	9.376	0.243	0.402	0.597	0.007	0.073	97.659	590	98
8	0.517	1.977	3.016	64.944	0.539	0.147	0.019	16.020	9.260	0.230	0.383	0.655	0.003	0.053	97.764	689	98
9	0.437	1.905	3.428	66.079	0.492	0.069	0.021	16.237	8.914	0.280	0.359	0.666	0.041	0.054	98.982	787	98
10	0.409	1.817	3.239	65.281	0.523	0.108	0.000	16.201	8.506	0.212	0.334	0.739	0.030	0.100	97.500	886	98
11	0.486	1.913	3.005	66.427	0.495	0.082	0.034	16.109	9.234	0.215	0.382	0.631	0.010	0.101	99.126	984	98
12	0.544	2.465	2.647	60.713	0.744	0.118	0.000	15.832	12.736	0.221	0.482	0.610	0.005	0.119	97.237	1082	98
13	0.527	2.308	3.059	61.460	0.633	0.170	0.000	16.087	11.835	0.244	0.461	0.559	0.030	0.110	97.485	1181	98
14	0.547	2.302	3.208	61.423	0.713	0.118	0.009	15.787	11.616	0.247	0.439	0.691	0.011	0.042	97.153	1279	98
15	0.440	1.963	3.749	65.865	0.546	0.152	0.026	15.697	8.833	0.281	0.408	0.675	0.005	0.092	98.732	1378	98
16	0.454	1.817	3.602	66.961	0.513	0.082	0.019	15.291	8.716	0.302	0.367	0.724	0.009	0.096	98.953	1476	98
17	0.362	1.780	3.399	68.178	0.525	0.013	0.013	14.727	8.338	0.247	0.412	0.830	0.000	0.111	98.935	1574	98
18	0.276	1.716	3.258	67.747	0.548	0.103	0.024	14.915	8.112	0.237	0.340	0.711	0.000	0.042	98.029	1673	98
19	0.326	1.742	3.395	67.625	0.501	0.190	0.030	15.534	8.090	0.268	0.365	0.780	0.000	0.073	98.918	1771	98
20	0.406	1.869	2.699	65.983	0.499	0.069	0.000	16.608	8.708	0.184	0.395	0.581	0.000	0.256	98.257	1870	98
Average	0.453	2.019	3.063	64.906	0.581	0.111	0.014	15.870	9.742	0.235	0.394	0.650	0.009	0.095	98.139		
Maximum	0.547	2.465	3.749	68.178	0.744	0.208	0.045	16.608	12.736	0.302	0.482	0.830	0.041	0.256	99.126		
Minimum	0.276	1.716	2.628	60.713	0.492	0.000	0.000	14.727	8.090	0.167	0.334	0.510	0.000	0.030	97.153		
Range	0.271	0.749	1.121	7.465	0.253	0.208	0.045	1.882	4.646	0.135	0.148	0.320	0.041	0.226	1.973		

Table VIII:9 Repeat EPMA line scan data for inhomogeneous Hils glass sample G13, glass drop $12^{th}/13^{th}$ centuries (Table VII:14, EPMA run 5)

Analysis Number	Na_2O	MgO	Al_2O_3	SiO_2	P_2O_5	SO_2	Cl	K_2O	CaO	TiO_2	MnO	FeO	CoO	CuO	Total	Distance from first analysis/ µm	Distance between analysis points/µm
1	0.748	2.399	3.143	63.691	0.658	0.072	0.012	12.460	8.027	0.256	0.955	2.730	0.009	0.030	95.190	0	0
2	0.730	2.491	3.429	63.512	0.763	0.051	0.058	12.147	8.100	0.268	1.048	3.222	0.036	0.000	95.855	186	186
3	0.688	2.421	3.167	64.320	0.785	0.051	0.019	11.912	7.605	0.307	0.958	3.366	0.000	0.000	95.598	370	184
4	0.656	2.460	3.257	64.798	0.740	0.097	0.026	11.985	7.549	0.285	0.927	3.415	0.000	0.000	96.195	556	186
5	0.617	2.474	3.372	65.075	0.753	0.051	0.007	12.038	7.918	0.304	1.062	3.015	0.030	0.000	96.715	740	184
6	0.591	2.521	3.325	64.299	0.633	0.033	0.026	12.115	7.766	0.286	1.127	2.657	0.026	0.072	95.475	926	186
7	0.574	3.007	3.292	63.068	0.810	0.038	0.002	11.902	9.117	0.316	1.255	2.162	0.000	0.026	95.570	1111	186
8	0.717	3.025	3.294	62.403	0.928	0.038	0.000	11.931	9.392	0.315	1.256	2.320	0.021	0.000	95.639	1295	184
9	0.664	2.646	2.889	64.380	0.723	0.000	0.040	11.693	9.233	0.247	1.003	2.424	0.028	0.025	95.995	1481	186
10	0.672	2.179	2.297	66.807	0.574	0.000	0.000	11.518	9.901	0.247	0.943	1.494	0.028	0.038	96.699	1666	185
11	0.713	2.091	2.317	67.370	0.502	0.090	0.007	11.603	10.339	0.239	0.956	1.355	0.028	0.000	97.610	1851	185
12	0.690	2.426	2.679	66.250	0.709	0.085	0.014	11.765	9.263	0.280	0.988	1.838	0.000	0.035	97.022	2036	185
13	0.580	2.534	2.924	66.090	0.706	0.064	0.000	11.923	8.989	0.263	1.081	2.357	0.028	0.032	97.571	2221	185
14	0.606	2.752	3.016	65.333	0.839	0.038	0.021	11.845	8.880	0.283	1.120	2.600	0.000	0.008	97.342	2407	186
15	0.631	2.785	2.977	64.582	0.791	0.000	0.000	11.746	8.999	0.302	1.207	2.479	0.049	0.021	96.570	2591	185
16	0.635	2.940	3.239	64.211	0.867	0.033	0.012	11.967	9.009	0.305	1.186	2.384	0.000	0.000	96.787	2777	185
17	0.645	2.907	3.178	65.256	0.869	0.000	0.044	11.940	9.201	0.294	1.193	2.374	0.009	0.068	97.979	2961	185
18	0.647	2.888	3.294	63.893	0.835	0.077	0.000	11.827	9.113	0.305	1.215	2.340	0.007	0.014	96.457	3147	186
19	0.535	2.670	2.873	66.171	0.774	0.085	0.002	11.937	8.846	0.255	1.118	2.605	0.000	0.000	97.871	3332	185
20	0.707	2.397	2.597	66.911	0.785	0.077	0.000	11.576	9.884	0.249	1.032	2.026	0.045	0.011	98.297	3517	185
21	0.570	2.380	2.471	67.033	0.645	0.021	0.009	11.801	10.424	0.258	0.989	1.664	0.007	0.004	98.276	3702	185
22	0.623	2.436	2.479	66.412	0.639	0.103	0.000	11.775	10.285	0.227	1.089	1.652	0.030	0.021	97.770	3887	185
23	0.668	2.313	2.932	66.035	0.694	0.008	0.002	11.789	9.807	0.264	0.995	1.707	0.000	0.036	97.250	4072	186
24	0.634	2.404	2.452	67.389	0.591	0.059	0.000	12.041	9.923	0.236	1.008	1.699	0.002	0.000	98.439	4257	184
25	0.672	2.450	2.454	67.123	0.569	0.077	0.000	12.120	9.908	0.206	1.059	1.659	0.000	0.000	98.297	4442	186
26	0.688	2.241	2.407	66.830	0.559	0.046	0.000	11.955	9.863	0.227	1.017	1.649	0.011	0.069	97.563	4628	186
27	0.678	2.182	2.430	67.910	0.527	0.000	0.028	12.071	9.741	0.212	0.942	1.554	0.000	0.031	98.306	4812	184
28	0.660	2.086	2.550	68.112	0.616	0.013	0.000	12.133	10.305	0.203	0.913	1.326	0.015	0.053	98.986	4998	186
29	0.600	1.959	2.189	69.232	0.561	0.033	0.007	12.011	10.001	0.206	0.898	1.085	0.015	0.004	98.801	5182	184
30	0.701	2.205	2.407	68.308	0.576	0.033	0.000	12.450	9.658	0.228	0.927	1.304	0.000	0.047	98.845	5368	186
Average	0.651	2.489	2.844	65.760	0.701	0.046	0.011	11.932	9.235	0.262	1.049	2.149	0.014	0.022	97.166		
Maximum	0.748	3.025	3.429	69.232	0.928	0.103	0.058	12.460	10.424	0.316	1.256	3.415	0.049	0.072	98.986		
Minimum	0.535	1.959	2.189	62.403	0.502	0.000	0.000	11.518	7.549	0.203	0.898	1.085	0.000	0.000	95.190		
Range	0.213	1.066	1.240	6.829	0.426	0.103	0.058	0.941	2.876	0.113	0.358	2.330	0.049	0.072	3.796		

Table VIII:10EPMA line scan data for inhomogeneous Hils glass sample G1, glass drop $12^{th}/13^{th}$ centuries (Table VII:14, EPMA run 4)

Analysis Number	Na_2O	MgO	Al_2O_3	SiO_2	P_2O_5	SO_2	Cl	K_2O	CaO	TiO_2	MnO	FeO	CoO	CuO	Total	Distance from first analysis/ µm	Distance between analysis points/µm
1	0.481	2.423	1.923	61.485	0.871	0.164	0.005	18.452	11.329	0.186	0.844	0.741	0.097	0.340	99.341	0	0
2	0.347	2.436	1.904	61.882	0.715	0.169	0.023	18.252	10.741	0.189	0.877	0.796	0.039	0.265	98.639	412	412
3	0.445	2.548	2.172	60.295	0.814	0.195	0.000	18.236	10.673	0.192	0.848	0.667	0.116	0.303	97.505	517	105
4	0.475	2.639	1.757	59.973	0.957	0.144	0.012	18.311	12.280	0.175	0.872	0.746	0.151	0.254	98.746	720	203
5	0.425	2.644	1.712	59.978	0.919	0.177	0.037	18.231	12.310	0.164	0.931	0.626	0.075	0.269	98.498	721	1
6	0.400	2.496	1.994	60.643	0.804	0.233	0.000	18.582	11.197	0.201	0.935	0.808	0.097	0.272	98.666	725	24
7	0.426	2.644	1.686	59.905	0.751	0.069	0.077	18.354	11.872	0.143	0.888	0.653	0.095	0.306	97.870	732	7
8	0.448	2.433	1.878	61.703	0.829	0.087	0.042	18.179	11.222	0.165	0.963	0.633	0.075	0.284	98.942	963	204
9	0.401	2.462	1.819	61.545	0.820	0.282	0.005	18.247	11.328	0.187	0.826	0.786	0.142	0.374	99.223	975	12
10	0.448	2.397	1.886	61.445	0.749	0.095	0.000	18.257	11.183	0.171	0.909	0.726	0.075	0.296	98.639	1031	56
11	0.421	2.406	1.880	61.846	0.797	0.144	0.000	18.347	11.089	0.189	0.942	0.798	0.094	0.334	99.285	1066	25
12	0.480	2.534	2.189	60.818	0.864	0.159	0.000	18.133	10.910	0.223	0.810	0.775	0.101	0.270	98.265	1076	10
13	0.499	2.474	1.909	61.616	0.808	0.264	0.000	18.448	11.084	0.208	0.885	0.733	0.019	0.297	99.244	1089	13
14	0.426	2.411	1.939	61.125	0.886	0.303	0.000	18.300	11.011	0.187	0.892	0.645	0.101	0.308	98.533	1158	69
15	0.434	2.491	2.135	60.696	0.761	0.195	0.056	18.183	11.025	0.181	0.886	0.758	0.136	0.251	98.189	1165	7
16	0.450	2.502	1.745	60.767	0.869	0.082	0.002	18.157	11.231	0.197	0.865	0.828	0.151	0.315	98.161	1187	22
Average	0.438	2.496	1.908	60.983	0.826	0.173	0.016	18.292	11.280	0.185	0.886	0.732	0.098	0.296	98.609		
Maximum	0.499	2.644	2.189	61.882	0.957	0.303	0.077	18.582	12.310	0.223	0.963	0.828	0.151	0.374	99.341		
Minimum	0.347	2.397	1.686	59.905	0.715	0.069	0.000	18.133	10.673	0.143	0.810	0.626	0.019	0.251	97.505		
Range	0.152	0.247	0.503	1.977	0.242	0.233	0.077	0.449	1.637	0.080	0.153	0.202	0.133	0.123	1.836		

Table VIII:11EPMA line scan data for inhomogeneous Hils glass sample G5, glass drop 12th/13th centuries (Table VII:14, EPMA run 4)

Analysis Number	Na_2O	MgO	Al_2O_3	SiO_2	P_2O_5	SO_2	Cl	K_2O	CaO	TiO_2	MnO	FeO	CoO	CuO	Total	Distance from first analysis/ µm	Distance between analysis points/ µm
1	0.283	0.874	2.666	76.683	0.131	0.072	0.017	13.041	3.048	0.260	0.141	1.212	0.000	0.037	98.466	0	0
2	0.295	0.871	2.591	77.404	0.096	0.000	0.000	13.354	3.236	0.238	0.122	1.255	0.000	0.000	99.461	375	375
3	0.385	0.869	2.409	77.593	0.137	0.000	0.036	13.527	2.748	0.216	0.103	1.061	0.000	0.045	99.130	889	514
4	0.251	0.716	2.775	76.624	0.071	0.000	0.004	12.708	2.617	0.286	0.135	1.324	0.017	0.030	97.558	977	88
5	0.331	0.816	2.655	77.521	0.212	0.000	0.000	12.922	3.013	0.261	0.139	1.395	0.026	0.000	99.292	1090	113
Average	0.309	0.829	2.619	77.165	0.129	0.014	0.012	13.110	2.933	0.252	0.128	1.249	0.009	0.022	98.781		
Maximum	0.385	0.874	2.775	77.593	0.212	0.072	0.036	13.527	3.236	0.286	0.141	1.395	0.026	0.045	99.461		
Minimum	0.251	0.716	2.409	76.624	0.071	0.000	0.000	12.708	2.617	0.216	0.103	1.061	0.000	0.000	97.558		
Range	0.134	0.158	0.367	0.969	0.141	0.072	0.036	0.819	0.619	0.070	0.038	0.334	0.026	0.045	1.904		

Table VIII:12EPMA line scan data for inhomogeneous Hils glass sample G7, glass drop $12^{th}/13^{th}$ centuries (Table VII:14, EPMA run 5)

Analysis Number	Na_2O	MgO	Al_2O_3	SiO_2	P_2O_5	SO_2	Cl	K_2O	CaO	TiO_2	MnO	FeO	CoO	CuO	Total	Distance from first analysis/ µm	Distance between analysis points/µm
1	0.621	2.300	2.879	67.976	0.733	0.090	0.000	14.027	7.657	0.274	0.773	1.011	0.038	0.143	98.521	0	0
2	0.708	2.001	2.771	68.891	0.548	0.108	0.036	13.497	6.741	0.246	0.657	0.900	0.005	0.162	97.270	932	932
3	0.629	2.163	2.380	69.832	0.668	0.090	0.000	13.484	8.119	0.238	0.740	0.936	0.011	0.051	99.340	1539	607
4	0.720	2.485	2.038	66.403	0.703	0.190	0.017	14.247	8.553	0.216	0.713	0.804	0.020	0.117	97.229	2073	534
5	0.447	1.989	3.786	64.571	0.548	0.121	0.000	15.218	9.146	0.305	0.439	1.296	0.016	0.208	98.090	2169	96
6	0.664	2.223	2.817	69.939	0.599	0.134	0.000	13.503	7.518	0.244	0.609	0.949	0.030	0.264	99.492	2247	78
7	0.521	2.365	3.154	63.569	0.774	0.121	0.000	14.215	12.242	0.264	0.502	0.954	0.051	0.062	98.795	2348	101
8	0.575	2.388	3.146	60.994	0.758	0.069	0.017	14.506	12.388	0.235	0.510	0.893	0.018	0.233	96.730	2530	182
9	0.595	2.367	3.200	61.012	0.793	0.139	0.000	14.589	12.698	0.241	0.478	0.933	0.005	0.288	97.338	2715	185
10	0.505	2.195	3.181	62.168	0.642	0.051	0.013	14.659	11.219	0.255	0.490	0.962	0.011	0.199	96.552	2902	187
11	0.545	2.370	3.101	61.018	0.734	0.126	0.000	14.332	12.625	0.251	0.527	0.962	0.000	0.231	96.823	3094	192
12	0.426	1.982	4.140	65.218	0.752	0.216	0.024	14.587	7.955	0.285	0.398	1.402	0.005	0.127	97.515	3288	194
13	0.321	1.929	4.031	65.621	0.535	0.082	0.006	14.488	7.586	0.312	0.391	1.386	0.035	0.154	96.877	3684	396
14	0.585	2.384	3.051	62.151	0.766	0.108	0.000	14.368	12.209	0.240	0.515	0.956	0.040	0.228	97.600	3885	201
15	0.500	2.231	3.399	61.977	0.552	0.044	0.015	14.976	11.128	0.252	0.414	1.211	0.060	0.190	96.950	4089	204
16	0.476	2.271	3.072	61.922	0.705	0.044	0.006	14.467	11.780	0.210	0.457	0.920	0.018	0.197	96.546	4295	206
17	0.380	2.214	3.041	62.987	0.693	0.170	0.000	14.402	11.394	0.264	0.455	1.051	0.041	0.157	97.249	4504	209
18	0.416	2.037	3.465	62.852	0.617	0.229	0.026	14.230	10.480	0.249	0.447	1.189	0.000	0.207	96.443	4714	210
19	0.413	2.133	3.128	64.087	0.684	0.113	0.006	13.803	11.158	0.292	0.448	1.119	0.050	0.165	97.599	4926	212
20	0.364	1.888	4.271	65.079	0.501	0.069	0.019	14.193	8.521	0.319	0.387	1.434	0.003	0.211	97.260	5141	215
21	0.534	2.223	3.494	61.558	0.721	0.005	0.013	14.216	11.301	0.306	0.453	1.140	0.051	0.190	96.206	5357	216
22	0.454	2.398	3.181	60.391	0.760	0.183	0.000	14.119	12.732	0.257	0.476	0.962	0.014	0.161	96.086	5575	218
23	0.424	2.017	3.589	63.726	0.603	0.044	0.034	14.054	10.357	0.322	0.415	1.195	0.020	0.169	96.968	5795	220
24	0.492	2.218	3.258	63.170	0.725	0.077	0.000	14.290	11.421	0.244	0.420	0.990	0.007	0.114	97.425	6016	221
Average	0.513	2.199	3.232	64.046	0.671	0.109	0.010	14.270	10.289	0.263	0.505	1.065	0.023	0.176	97.371		
Maximum	0.720	2.485	4.271	69.939	0.793	0.229	0.036	15.218	12.732	0.322	0.773	1.434	0.060	0.288	99.492		
Minimum	0.321	1.888	2.038	60.391	0.501	0.005	0.000	13.484	6.741	0.210	0.387	0.804	0.000	0.051	96.086		
Range	0.399	0.598	2.233	9.548	0.292	0.224	0.036	1.734	5.991	0.111	0.386	0.630	0.060	0.237	3.406		

Table VIII:13EPMA line scan data for inhomogeneous Hils glass sample G8, glass drop $12^{th}/13^{th}$ centuries (Table VII:14, EPMA run 5)

Analysis Number	Na_2O	MgO	Al_2O_3	SiO_2	P_2O_5	SO_2	Cl	K_2O	CaO	TiO_2	MnO	FeO	CoO	CuO	Total	Distance from first analysis/ µm	Distance between analysis points/µm
1	0.644	2.049	2.740	64.907	0.709	0.082	0.028	16.619	10.229	0.252	0.507	0.982	0.009	0.049	99.808	0	0
2	0.630	2.044	3.034	64.621	0.672	0.051	0.000	16.527	9.727	0.206	0.480	0.796	0.015	0.023	98.825	162	162
3	0.567	1.721	2.278	68.163	0.354	0.121	0.024	15.919	7.952	0.175	0.388	0.529	0.008	0.072	98.271	322	161
4	0.596	1.993	2.927	65.517	0.562	0.039	0.021	16.352	9.656	0.232	0.425	0.813	0.019	0.005	99.156	484	162
5	0.637	2.053	2.587	63.221	0.750	0.152	0.034	16.142	10.822	0.224	0.465	0.657	0.000	0.089	97.833	644	160
6	0.572	1.979	2.357	65.874	0.613	0.190	0.000	16.127	10.147	0.167	0.488	0.503	0.000	0.119	99.137	806	162
7	0.582	1.671	3.047	67.492	0.425	0.126	0.026	15.940	8.242	0.234	0.460	0.702	0.017	0.095	99.058	966	161
8	0.576	2.035	1.790	65.843	0.539	0.147	0.000	15.849	10.466	0.156	0.480	0.343	0.000	0.044	98.267	1128	162
9	0.526	1.929	2.914	66.660	0.570	0.178	0.056	16.120	9.007	0.226	0.441	0.848	0.000	0.037	99.511	1289	162
10	0.492	1.855	3.005	67.372	0.515	0.090	0.002	16.144	8.488	0.224	0.408	0.653	0.014	0.056	99.319	1450	161
11	0.554	1.709	2.664	68.309	0.472	0.057	0.000	15.739	8.150	0.230	0.394	0.631	0.031	0.088	99.027	1612	162
12	0.548	1.843	2.744	67.534	0.543	0.039	0.047	15.899	8.887	0.209	0.396	0.567	0.030	0.084	99.370	1772	160
13	0.589	1.931	2.533	64.724	0.731	0.108	0.002	15.971	9.629	0.213	0.440	0.630	0.019	0.057	97.578	1933	162
14	0.576	2.001	2.558	65.486	0.570	0.147	0.000	15.951	9.549	0.209	0.460	0.539	0.003	0.003	98.053	2094	161
15	0.584	1.790	2.550	68.117	0.580	0.152	0.024	15.848	8.596	0.200	0.436	0.452	0.000	0.046	99.374	2256	162
Average	0.578	1.907	2.649	66.256	0.574	0.112	0.018	16.077	9.303	0.210	0.445	0.643	0.011	0.058	98.839		
Maximum	0.644	2.053	3.047	68.309	0.750	0.190	0.056	16.619	10.822	0.252	0.507	0.982	0.031	0.119	99.808		
Minimum	0.492	1.671	1.790	63.221	0.354	0.039	0.000	15.739	7.952	0.156	0.388	0.343	0.000	0.003	97.578		
Range	0.152	0.381	1.257	5.089	0.396	0.152	0.056	0.880	2.870	0.096	0.119	0.639	0.031	0.116	2.230		

Table VIII:14EPMA line scan data for inhomogeneous Hils glass sample G9, glass drop 12th/13th centuries (Table VII:14, EPMA run 5)

Analysis Number	Na_2O	MgO	Al_2O_3	SiO_2	P_2O_5	SO_2	Cl	K_2O	CaO	TiO_2	MnO	FeO	CoO	CuO	Total	Distance from first analysis/ µm	Distance between analysis points/µm
1	0.438	2.793	3.401	63.386	1.222	0.031	0.024	14.919	10.318	0.274	0.569	1.257	0.006	0.051	98.689	0	0
2	0.606	2.503	3.513	64.155	1.203	0.090	0.030	14.342	9.883	0.280	0.522	1.047	0.011	0.143	98.327	160	160
3	0.562	2.637	3.538	62.251	1.512	0.013	0.054	14.483	10.895	0.235	0.581	1.195	0.000	0.100	98.054	320	160
4	0.585	2.303	3.453	63.650	1.277	0.178	0.036	13.906	9.613	0.251	0.525	1.147	0.041	0.091	97.054	480	160
5	0.662	2.415	3.320	64.745	0.977	0.152	0.013	14.047	9.025	0.221	0.518	1.052	0.018	0.132	97.298	639	160
6	0.870	2.566	3.505	61.731	1.437	0.126	0.264	13.803	10.470	0.271	0.552	1.191	0.020	0.176	96.980	800	161
7	0.593	2.405	4.192	64.268	0.899	0.090	0.064	14.558	9.091	0.305	0.568	1.331	0.035	0.102	98.501	960	160
8	0.696	2.200	4.062	63.297	0.877	0.077	0.000	14.504	8.819	0.314	0.525	1.260	0.002	0.124	96.758	1120	160
9	0.571	2.903	2.840	62.441	1.528	0.039	0.062	13.719	12.227	0.229	0.620	0.954	0.024	0.112	98.267	1280	160
10	0.364	2.602	3.469	62.656	1.240	0.121	0.000	14.394	10.300	0.309	0.600	1.276	0.030	0.029	97.390	1440	160
Average	0.595	2.533	3.529	63.258	1.217	0.092	0.055	14.268	10.064	0.269	0.558	1.171	0.019	0.106	97.732		
Maximum	0.870	2.903	4.192	64.745	1.528	0.178	0.264	14.919	12.227	0.314	0.620	1.331	0.041	0.176	98.689		
Minimum	0.364	2.200	2.840	61.731	0.877	0.013	0.000	13.719	8.819	0.221	0.518	0.954	0.000	0.029	96.758		
Range	0.506	0.702	1.353	3.015	0.650	0.165	0.264	1.200	3.407	0.093	0.102	0.376	0.041	0.147	1.931		

Table VIII:15EPMA line scan data for inhomogeneous Hils glass sample G10, glass drop $12^{th}/13^{th}$ centuries (Table VII:14, EPMA run 5)

Analysis Number	Na_2O	MgO	Al_2O_3	SiO_2	P_2O_5	SO_2	Cl	K_2O	CaO	TiO_2	MnO	FeO	CoO	CuO	Total	Distance from first analysis/ µm	Distance between analysis points/µm
1	0.485	1.250	4.907	69.621	0.313	0.013	0.041	13.515	6.727	0.325	0.185	1.367	0.000	0.025	98.774	0	0
2	0.481	1.249	6.131	69.721	0.178	0.000	0.000	13.592	5.430	0.376	0.118	1.835	0.020	0.000	99.130	424	424
3	0.503	1.788	4.035	67.240	0.415	0.000	0.024	13.279	8.578	0.305	0.293	1.426	0.002	0.036	97.924	944	520
4	0.517	1.656	4.861	66.913	0.476	0.064	0.000	13.874	7.295	0.303	0.192	1.874	0.000	0.000	98.025	1526	582
5	0.431	1.211	4.969	69.259	0.206	0.000	0.000	13.313	7.118	0.311	0.133	1.657	0.000	0.022	98.630	2571	1045
Average	0.483	1.431	4.980	68.551	0.318	0.015	0.013	13.515	7.030	0.324	0.184	1.632	0.005	0.017	98.496		
Maximum	0.517	1.788	6.131	69.721	0.476	0.064	0.041	13.874	8.578	0.376	0.293	1.874	0.020	0.036	99.130		
Minimum	0.431	1.211	4.035	66.913	0.178	0.000	0.000	13.279	5.430	0.303	0.118	1.367	0.000	0.000	97.924		
Range	0.086	0.577	2.096	2.808	0.298	0.064	0.041	0.594	3.148	0.073	0.176	0.507	0.020	0.036	1.206		

Table VIII:16EPMA line scan data for inhomogeneous Hils glass sample G11, glass drop 12th/13th centuries (Table VII:14, EPMA run 5)

Analysis Number	Na_2O	MgO	Al_2O_3	SiO_2	P_2O_5	SO_2	Cl	K_2O	CaO	TiO_2	MnO	FeO	CoO	CuO	Total	Distance from first analysis/ µm	Distance between analysis points/µm
1	0.617	1.620	5.373	67.693	0.582	0.013	0.000	12.971	7.455	0.286	0.277	2.233	0.000	0.024	99.144	0	0
2	0.612	1.649	5.340	68.113	0.556	0.005	0.000	13.106	7.436	0.320	0.263	1.956	0.000	0.037	99.392	184	184
3	0.641	1.584	5.431	67.664	0.558	0.000	0.011	13.071	7.192	0.345	0.295	2.137	0.009	0.047	98.985	367	183
4	0.767	2.207	4.405	64.120	1.371	0.026	0.013	12.352	11.032	0.283	0.355	1.649	0.043	0.000	98.623	551	184
5	0.705	2.123	4.381	64.800	1.042	0.095	0.000	12.637	9.874	0.243	0.355	1.703	0.000	0.027	97.985	735	183
6	0.730	1.922	4.254	63.584	1.210	0.031	0.024	12.364	9.831	0.266	0.329	1.730	0.000	0.041	96.317	919	184
7	0.733	1.958	5.149	65.523	0.488	0.000	0.000	13.162	8.281	0.280	0.336	1.530	0.003	0.000	97.442	1102	183
8	0.686	2.255	4.476	65.203	1.071	0.069	0.000	12.613	10.494	0.292	0.373	1.729	0.000	0.000	99.261	1286	184
9	0.767	2.558	3.890	62.443	1.839	0.000	0.000	12.086	12.607	0.229	0.435	1.580	0.017	0.000	98.449	1470	184
10	0.712	2.406	3.913	62.404	2.066	0.026	0.000	12.133	12.537	0.278	0.386	1.695	0.001	0.016	98.573	1654	183
11	0.685	2.156	4.664	66.240	1.040	0.051	0.060	12.567	9.196	0.300	0.384	1.819	0.000	0.013	99.176	1838	184
12	0.699	2.190	4.445	64.926	1.150	0.013	0.004	12.618	9.596	0.272	0.336	1.842	0.000	0.000	98.090	2021	183
13	0.708	2.293	4.124	61.722	1.631	0.044	0.026	12.274	11.829	0.314	0.329	1.809	0.011	0.003	97.116	2205	184
14	0.730	2.303	4.202	62.081	1.680	0.000	0.002	12.357	11.486	0.266	0.374	1.607	0.022	0.000	97.111	2389	184
15	0.722	2.420	4.186	63.436	1.345	0.039	0.006	12.520	11.290	0.258	0.377	1.634	0.000	0.000	98.233	2573	183
16	0.956	2.525	3.722	60.271	1.882	0.018	0.000	12.371	13.461	0.218	0.470	1.351	0.000	0.010	97.255	2757	184
17	0.839	2.587	4.078	62.144	0.801	0.139	0.000	13.017	11.528	0.283	0.470	1.247	0.000	0.014	97.147	2940	183
18	0.726	2.300	4.321	60.951	1.784	0.160	0.000	12.811	12.288	0.263	0.416	1.371	0.011	0.000	97.401	3124	184
19	0.668	1.956	5.025	64.721	0.554	0.005	0.000	13.883	8.553	0.268	0.346	1.717	0.007	0.002	97.705	3308	183
20	0.667	2.077	4.803	65.412	0.441	0.000	0.021	14.271	8.513	0.302	0.347	1.877	0.025	0.000	98.755	3492	184
Average	0.718	2.154	4.509	64.173	1.155	0.037	0.008	12.759	10.224	0.278	0.363	1.711	0.007	0.012	98.108		
Maximum	0.956	2.587	5.431	68.113	2.066	0.160	0.060	14.271	13.461	0.345	0.470	2.233	0.043	0.047	99.392		
Minimum	0.612	1.584	3.722	60.271	0.441	0.000	0.000	12.086	7.192	0.218	0.263	1.247	0.000	0.000	96.317		
Range	0.344	1.003	1.709	7.842	1.626	0.160	0.060	2.185	6.269	0.127	0.207	0.986	0.043	0.047	3.074		

Table VIII:17EPMA line scan data for inhomogeneous Hils glass sample G12, glass drop $12^{th}/13^{th}$ centuries (Table VII:14, EPMA run 5)

Analysis Number	Na_2O	MgO	Al_2O_3	SiO_2	P_2O_5	SO_2	Cl	K_2O	CaO	TiO_2	MnO	FeO	CoO	CuO	Total	Distance from first analysis/ µm	Distance between analysis points/µm
1	0.414	1.993	2.765	67.841	0.529	0.121	0.015	14.498	9.465	0.244	0.390	0.777	0.060	0.086	99.198	0	0
2	0.414	1.996	3.602	66.762	0.519	0.090	0.011	14.097	9.230	0.288	0.404	1.085	0.020	0.094	98.613	250	250
3	0.510	1.986	3.573	66.033	0.537	0.152	0.006	14.863	9.377	0.305	0.384	1.135	0.000	0.102	98.962	599	349
4	0.416	2.082	1.601	67.272	0.486	0.031	0.024	14.095	10.158	0.139	0.362	0.634	0.033	0.140	97.472	607	7
5	0.311	2.037	3.438	67.076	0.566	0.082	0.000	14.786	9.334	0.263	0.391	1.143	0.010	0.181	99.620	650	44
6	0.520	2.180	2.786	63.338	0.684	0.170	0.000	15.762	10.959	0.230	0.377	1.011	0.023	0.189	98.227	1212	562
7	0.448	2.054	3.171	67.462	0.678	0.160	0.011	14.444	9.807	0.241	0.412	1.276	0.000	0.135	100.300	1460	248
8	0.310	2.003	3.161	69.202	0.568	0.108	0.034	14.953	8.155	0.244	0.357	1.048	0.006	0.120	100.269	1571	111
9	0.428	1.974	3.438	65.205	0.568	0.077	0.019	15.765	9.068	0.292	0.350	1.217	0.026	0.186	98.615	1777	206
10	0.390	2.111	3.123	66.015	0.497	0.026	0.013	15.703	10.286	0.216	0.347	0.842	0.032	0.161	99.764	2013	236
Average	0.416	2.041	3.066	66.621	0.563	0.102	0.013	14.897	9.584	0.246	0.377	1.017	0.021	0.140	99.104		
Maximum	0.520	2.180	3.602	69.202	0.684	0.170	0.034	15.765	10.959	0.305	0.412	1.276	0.060	0.189	100.300		
Minimum	0.310	1.974	1.601	63.338	0.486	0.026	0.000	14.095	8.155	0.139	0.347	0.634	0.000	0.086	97.472		
Range	0.210	0.206	2.001	5.864	0.198	0.144	0.034	1.671	2.803	0.165	0.065	0.642	0.060	0.103	2.828		

Table VIII:18EPMA line scan data for inhomogeneous Hils glass sample G14, glass drop $12^{th}/13^{th}$ centuries (Table VII:14, EPMA run 5)

Analysis Number	Na_2O	MgO	Al_2O_3	SiO_2	P_2O_5	SO_2	Cl	K_2O	CaO	TiO_2	MnO	FeO	CoO	CuO	Total	Distance from first analysis/ µm	Distance between analysis points/µm
1	0.403	2.268	5.062	65.992	0.902	0.026	0.037	13.198	9.122	0.398	0.519	1.044	0.004	0.017	98.991	0	0
2	0.376	2.318	4.520	67.677	0.987	0.038	0.033	13.305	8.678	0.357	0.506	0.875	0.034	0.029	99.733	218	218
3	0.425	2.483	2.166	67.035	1.377	0.021	0.002	12.318	11.805	0.148	0.622	0.825	0.019	0.021	99.266	435	218
4	0.448	2.318	2.068	69.219	0.968	0.051	0.000	12.330	11.054	0.197	0.654	0.635	0.011	0.024	99.978	654	219
5	0.434	2.289	1.804	69.731	1.080	0.021	0.000	11.984	10.788	0.138	0.637	0.473	0.000	0.000	99.380	871	218
6	0.454	2.409	1.880	68.389	1.084	0.021	0.061	12.115	12.015	0.159	0.658	0.531	0.013	0.000	99.789	1089	218
7	0.434	2.471	2.086	66.112	1.263	0.064	0.009	12.258	12.339	0.137	0.701	0.837	0.049	0.000	98.761	1307	218
8	0.414	2.479	2.097	65.002	1.748	0.000	0.009	12.308	12.603	0.190	0.701	0.813	0.002	0.000	98.367	1524	218
9	0.459	2.531	2.419	68.247	0.717	0.038	0.000	12.675	10.946	0.201	0.650	0.832	0.000	0.062	99.778	1743	219
10	0.444	2.551	2.225	65.691	1.200	0.000	0.049	12.594	11.416	0.142	0.649	0.908	0.032	0.000	97.902	1961	218
11	0.433	2.625	2.307	66.026	0.976	0.013	0.016	12.763	11.848	0.186	0.676	0.805	0.030	0.024	98.729	2178	218
12	0.505	2.648	2.121	64.316	1.307	0.141	0.030	12.519	12.646	0.165	0.716	0.655	0.000	0.002	97.772	2396	218
13	0.493	2.718	2.174	62.750	1.851	0.077	0.000	12.509	13.854	0.160	0.752	0.885	0.024	0.039	98.286	2614	219
14	0.425	2.639	2.164	64.947	1.402	0.000	0.000	12.743	12.653	0.179	0.745	0.779	0.004	0.039	98.720	2832	218
15	0.436	2.744	2.082	63.224	1.609	0.064	0.058	12.672	13.088	0.159	0.715	0.733	0.000	0.001	97.586	3050	218
16	0.470	2.878	1.923	65.344	1.527	0.000	0.019	12.710	12.851	0.181	0.736	0.700	0.009	0.045	99.393	3267	218
17	0.526	2.780	1.966	62.754	1.603	0.031	0.070	12.603	13.460	0.150	0.741	0.762	0.002	0.002	97.450	3485	218
18	0.534	2.812	1.941	63.215	1.676	0.064	0.019	12.465	13.614	0.154	0.736	0.638	0.000	0.021	97.890	3703	219
19	0.470	2.569	2.203	64.751	1.154	0.026	0.000	12.663	12.287	0.148	0.713	0.823	0.013	0.010	97.829	3921	218
20	0.462	2.533	2.060	64.832	1.326	0.013	0.026	12.414	12.457	0.187	0.655	0.749	0.000	0.000	97.712	4139	218
Average	0.452	2.553	2.363	65.763	1.288	0.035	0.022	12.557	11.976	0.187	0.674	0.765	0.012	0.017	98.666		
Maximum	0.534	2.878	5.062	69.731	1.851	0.141	0.070	13.305	13.854	0.398	0.752	1.044	0.049	0.062	99.978		
Minimum	0.376	2.268	1.804	62.750	0.717	0.000	0.000	11.984	8.678	0.137	0.506	0.473	0.000	0.000	97.450		
Range	0.158	0.610	3.257	6.981	1.134	0.141	0.070	1.321	5.176	0.261	0.246	0.571	0.049	0.062	2.528		

Table VIII:19EPMA line scan data for inhomogeneous Hils glass sample G16, glass drop $12^{th}/13^{th}$ centuries (Table VII:14, EPMA run 4)

Analysis Number	Na_2O	MgO	Al_2O_3	SiO_2	P_2O_5	SO_2	Cl	K_2O	CaO	TiO_2	MnO	FeO	CoO	CuO	Total	Distance from first analysis/ µm	Distance between analysis points/µm
1	0.771	0.944	1.338	74.312	0.106	0.000	0.037	15.518	5.749	0.083	0.243	0.145	0.000	0.000	99.248	0	0
2	0.762	0.989	1.195	74.805	0.099	0.000	0.040	14.514	5.336	0.086	0.219	0.121	0.000	0.007	98.175	131	131
3	0.595	1.037	1.181	76.507	0.259	0.021	0.000	13.830	5.124	0.060	0.213	0.142	0.041	0.017	99.027	260	130
4	0.587	1.097	1.338	76.185	0.173	0.026	0.037	13.385	5.056	0.086	0.226	0.157	0.024	0.012	98.389	391	131
5	0.623	1.025	1.351	76.070	0.126	0.000	0.000	13.016	5.338	0.091	0.218	0.191	0.000	0.000	98.048	521	130
6	0.600	1.037	1.353	77.957	0.283	0.046	0.016	12.721	4.748	0.071	0.230	0.156	0.000	0.000	99.219	652	131
7	0.516	0.984	1.537	76.767	0.310	0.000	0.035	12.743	4.655	0.082	0.223	0.116	0.028	0.021	98.017	782	130
8	0.535	0.944	1.435	77.957	0.418	0.000	0.000	12.504	4.443	0.099	0.207	0.181	0.000	0.000	98.724	912	131
9	0.481	0.891	1.563	78.813	0.186	0.013	0.044	12.179	3.941	0.121	0.210	0.256	0.009	0.043	98.751	1042	130
10	0.504	1.193	1.625	75.906	0.462	0.051	0.033	13.053	5.075	0.118	0.201	0.388	0.000	0.000	98.609	1173	131
11	0.578	1.198	1.571	75.686	0.455	0.021	0.040	13.002	5.021	0.123	0.189	0.295	0.030	0.000	98.209	1303	130
12	0.544	1.135	1.592	76.458	0.407	0.000	0.058	12.950	4.936	0.123	0.202	0.319	0.000	0.025	98.749	1433	131
13	0.437	1.010	2.362	77.787	0.192	0.000	0.023	12.582	4.225	0.131	0.148	0.422	0.034	0.056	99.408	1563	130
14	0.520	1.108	2.751	75.261	0.204	0.118	0.000	12.745	4.222	0.175	0.122	0.386	0.034	0.000	97.644	1694	131
15	0.468	1.061	2.693	75.581	0.183	0.000	0.000	12.585	4.335	0.162	0.193	0.385	0.000	0.042	97.688	1824	130
16	0.506	1.049	2.654	76.853	0.169	0.033	0.014	12.702	4.450	0.184	0.192	0.430	0.000	0.029	99.265	1955	131
17	0.444	1.034	2.720	75.724	0.205	0.013	0.077	12.696	4.105	0.192	0.229	0.398	0.022	0.000	97.859	2084	130
18	0.481	1.015	2.499	76.978	0.185	0.000	0.037	12.694	4.121	0.137	0.202	0.351	0.007	0.042	98.750	2215	131
19	0.433	1.083	2.538	76.900	0.158	0.000	0.000	12.628	4.222	0.145	0.168	0.421	0.000	0.012	98.707	2345	130
20	0.483	1.032	3.012	76.202	0.173	0.079	0.000	12.956	4.236	0.183	0.157	0.386	0.002	0.010	98.912	2476	131
21	0.529	1.200	2.213	75.426	0.160	0.038	0.014	13.112	4.770	0.148	0.194	0.486	0.004	0.000	98.293	2605	130
22	0.551	1.061	2.826	74.969	0.226	0.000	0.000	12.879	4.333	0.171	0.173	0.453	0.034	0.027	97.705	2736	131
23	0.490	1.114	2.520	76.275	0.171	0.000	0.000	12.903	4.468	0.167	0.184	0.368	0.000	0.005	98.663	2866	130
24	0.494	1.120	2.370	76.413	0.143	0.000	0.000	12.757	4.391	0.165	0.190	0.428	0.000	0.000	98.471	2997	131
25	0.574	1.142	1.896	77.019	0.162	0.000	0.070	12.977	4.631	0.129	0.196	0.373	0.000	0.019	99.188	3126	130
26	0.484	1.039	2.213	75.317	0.158	0.000	0.000	12.837	4.643	0.104	0.226	0.347	0.011	0.042	97.420	3257	131
27	0.595	1.068	1.915	76.697	0.171	0.033	0.000	12.955	4.659	0.162	0.213	0.324	0.034	0.021	98.847	3387	130
28	0.499	1.001	2.125	75.959	0.192	0.067	0.033	12.880	4.464	0.156	0.198	0.308	0.015	0.041	97.938	3518	131
29	0.613	1.090	1.776	76.650	0.171	0.038	0.009	13.241	4.669	0.140	0.207	0.413	0.000	0.010	99.028	3648	130
30	0.571	1.020	1.602	77.059	0.135	0.000	0.058	13.202	4.638	0.116	0.219	0.369	0.013	0.000	99.003	3778	131
Average	0.542	1.057	1.992	76.350	0.215	0.020	0.023	13.025	4.633	0.130	0.200	0.317	0.011	0.016	98.532		
Maximum	0.771	1.200	3.012	78.813	0.462	0.118	0.077	15.518	5.749	0.192	0.243	0.486	0.041	0.056	99.408		
Minimum	0.433	0.891	1.181	74.312	0.099	0.000	0.000	12.179	3.941	0.060	0.122	0.116	0.000	0.000	97.420		
Range	0.338	0.309	1.831	4.500	0.363	0.118	0.077	3.339	1.808	0.132	0.122	0.370	0.041	0.056	1.988		

Table VIII:20 EPMA line scan data for inhomogeneous Hils glass sample G17, glass drop $12^{th}/13^{th}$ centuries (Table VII:14, EPMA run 4)

Analysis Number	Na_2O	MgO	Al_2O_3	SiO_2	P_2O_5	SO_2	Cl	K_2O	CaO	TiO_2	MnO	FeO	CoO	CuO	Total	Distance from first analysis/ µm	Distance between analysis points/µm
1	1.422	1.837	2.977	70.597	0.768	0.026	0.007	9.874	10.471	0.236	0.472	0.355	0.045	0.029	99.115	0	0
2	1.555	2.067	2.873	67.696	1.185	0.026	0.000	9.022	12.516	0.227	0.563	0.660	0.036	0.026	98.452	219	219
3	1.543	2.102	2.857	68.880	0.776	0.000	0.000	8.779	11.716	0.238	0.531	0.550	0.062	0.038	98.071	438	220
4	1.609	2.133	2.746	68.496	0.806	0.110	0.037	8.677	11.963	0.250	0.540	0.486	0.000	0.038	97.894	657	219
5	1.547	2.234	2.738	67.600	1.189	0.000	0.026	8.316	12.969	0.227	0.598	0.693	0.000	0.016	98.153	876	220
6	1.563	2.263	2.446	67.135	0.987	0.051	0.019	8.283	13.245	0.187	0.663	0.717	0.000	0.026	97.587	1095	219
7	1.673	2.258	2.424	68.750	0.960	0.169	0.030	8.158	13.254	0.200	0.588	0.634	0.030	0.017	99.145	1314	219
8	1.609	2.194	2.430	67.344	0.981	0.141	0.023	8.113	13.212	0.181	0.601	0.563	0.026	0.026	97.446	1533	219
9	1.522	2.076	2.757	68.547	0.706	0.000	0.037	8.341	11.699	0.261	0.546	0.534	0.000	0.000	97.026	1752	219
10	1.669	2.072	3.057	69.863	0.806	0.059	0.016	8.369	12.155	0.234	0.534	0.506	0.058	0.035	99.434	1971	219
11	1.498	2.071	3.063	67.611	0.959	0.000	0.030	8.220	12.449	0.231	0.460	0.465	0.000	0.000	97.057	2190	219
12	1.516	2.052	3.022	67.323	0.900	0.033	0.068	8.239	12.617	0.222	0.507	0.486	0.011	0.000	96.997	2409	219
13	1.641	2.158	2.657	68.166	1.134	0.000	0.023	8.076	13.313	0.258	0.547	0.485	0.017	0.000	98.474	2628	219
14	1.536	2.017	3.288	68.652	1.061	0.000	0.054	8.270	12.651	0.250	0.457	0.461	0.036	0.000	98.733	2847	219
15	1.594	1.930	3.668	68.891	0.932	0.072	0.028	8.323	11.920	0.245	0.478	0.468	0.006	0.000	98.554	3066	220
16	1.599	1.908	3.664	68.253	1.099	0.008	0.021	8.361	12.237	0.282	0.513	0.609	0.017	0.013	98.583	3285	219
17	1.494	1.901	3.543	68.294	1.149	0.000	0.098	8.338	11.967	0.244	0.502	0.556	0.065	0.020	98.172	3504	220
18	1.590	1.945	3.161	67.619	0.924	0.000	0.000	8.228	12.150	0.260	0.498	0.562	0.009	0.019	96.966	3723	219
19	1.547	1.966	3.018	68.782	0.879	0.000	0.065	8.183	12.039	0.217	0.514	0.500	0.000	0.025	97.735	3942	219
20	1.529	1.940	3.039	70.392	0.848	0.000	0.042	8.182	11.657	0.242	0.425	0.469	0.045	0.000	98.811	4161	219
21	1.486	1.848	2.562	71.388	0.723	0.008	0.000	7.982	10.511	0.165	0.452	0.649	0.026	0.054	97.853	4380	219
22	1.379	1.746	2.724	71.307	0.898	0.051	0.033	8.074	10.264	0.214	0.403	0.509	0.006	0.042	97.650	4599	219
23	1.486	1.854	3.016	70.727	0.949	0.021	0.054	8.140	10.734	0.222	0.416	0.551	0.000	0.042	98.211	4818	219
24	1.498	1.775	3.411	71.279	0.860	0.000	0.033	8.334	10.525	0.258	0.428	0.595	0.013	0.000	99.009	5038	219
25	1.429	1.787	3.135	70.027	0.928	0.000	0.016	8.127	10.559	0.227	0.427	0.518	0.026	0.000	97.207	5256	219
26	1.469	1.798	3.288	71.209	0.835	0.051	0.128	8.351	10.842	0.275	0.437	0.531	0.000	0.024	99.240	5475	219
27	1.431	1.961	3.129	67.914	1.143	0.000	0.040	8.438	12.495	0.264	0.472	0.489	0.007	0.001	97.784	5694	220
28	1.249	1.815	3.153	70.053	0.940	0.000	0.070	8.736	10.868	0.263	0.472	0.599	0.036	0.035	98.287	5913	219
29	1.193	1.808	3.253	69.857	1.063	0.000	0.049	8.951	10.884	0.252	0.452	0.514	0.030	0.026	98.332	6133	220
30	1.064	1.796	3.174	69.842	1.042	0.000	0.002	9.991	10.320	0.249	0.380	0.519	0.000	0.011	98.391	6351	219
Average	1.498	1.977	3.009	69.083	0.948	0.028	0.035	8.449	11.807	0.236	0.496	0.541	0.020	0.019	98.146		
Maximum	1.673	2.263	3.668	71.388	1.189	0.169	0.128	9.991	13.313	0.282	0.663	0.717	0.065	0.054	99.434		
Minimum	1.064	1.746	2.424	67.135	0.706	0.000	0.000	7.982	10.264	0.165	0.380	0.355	0.000	0.000	96.966		
Range	0.609	0.517	1.244	4.253	0.483	0.169	0.128	2.009	3.048	0.116	0.283	0.362	0.065	0.054	2.468		

Table VIII:21EPMA line scan data for inhomogeneous Hils glass sample G18 1400AD (Table VII:14, EPMA run 4)

Analysis Number	Na_2O	MgO	Al_2O_3	SiO_2	P_2O_5	SO_2	Cl	K_2O	CaO	TiO_2	MnO	FeO	CoO	CuO	Total	Distance from first analysis/ µm	Distance between analysis points/µm
1	3.036	4.274	2.777	49.299	4.375	0.087	0.622	6.692	23.855	0.237	1.440	1.017	0.176	0.075	97.961	0	0
2	3.020	4.244	2.707	49.730	4.479	0.062	0.766	6.611	23.963	0.268	1.313	0.976	0.141	0.156	98.436	218	218
3	3.082	4.344	2.726	49.170	4.342	0.044	0.680	6.677	23.916	0.200	1.435	0.992	0.143	0.087	97.837	437	219
4	3.077	4.327	2.763	49.991	4.473	0.087	0.699	6.605	24.089	0.237	1.504	1.002	0.159	0.102	99.114	655	218
5	3.029	4.359	2.755	49.961	4.289	0.039	0.673	6.622	24.012	0.230	1.356	1.093	0.186	0.109	98.713	873	218
6	3.007	4.303	2.730	49.558	4.199	0.087	0.654	6.644	23.969	0.227	1.419	1.021	0.150	0.141	98.109	1092	219
7	2.996	4.262	2.724	50.142	4.350	0.049	0.703	6.698	24.126	0.232	1.455	0.978	0.148	0.106	98.968	1310	218
8	3.024	4.320	2.802	49.005	4.381	0.018	0.680	6.723	23.734	0.232	1.382	0.948	0.133	0.124	97.506	1529	219
9	3.144	4.363	2.790	48.532	4.193	0.000	0.656	6.658	23.941	0.213	1.399	1.044	0.148	0.084	97.165	1747	218
10	3.129	4.237	2.742	49.318	4.422	0.124	0.753	6.678	23.866	0.229	1.414	0.910	0.176	0.111	98.110	1965	218
11	3.077	4.387	2.829	48.800	4.389	0.100	0.699	6.561	23.827	0.238	1.441	0.974	0.166	0.092	97.580	2184	219
12	3.043	4.346	2.728	50.248	4.397	0.093	0.716	6.698	23.912	0.227	1.416	0.888	0.167	0.135	99.014	2402	218
13	3.068	4.318	2.796	48.887	4.234	0.000	0.740	6.732	23.991	0.209	1.464	0.966	0.135	0.117	97.658	2620	218
14	3.140	4.272	2.773	49.464	4.191	0.080	0.755	6.720	23.901	0.229	1.313	1.073	0.192	0.143	98.246	2839	219
15	3.065	4.332	2.790	49.255	4.248	0.100	0.748	6.713	23.884	0.232	1.427	1.055	0.202	0.095	98.147	3057	218
16	3.071	4.330	2.717	49.028	4.275	0.000	0.708	6.600	24.112	0.241	1.400	0.980	0.158	0.094	97.715	3276	219
17	2.903	4.366	2.809	48.946	4.283	0.000	0.691	6.650	23.809	0.268	1.381	1.072	0.165	0.111	97.452	3494	218
18	3.261	4.248	2.792	49.654	4.242	0.118	0.686	6.663	23.908	0.234	1.423	1.061	0.140	0.117	98.547	3712	218
19	3.086	4.310	2.786	50.222	4.126	0.049	0.796	6.742	23.955	0.212	1.427	1.068	0.150	0.091	99.019	3931	219
20	3.092	4.231	2.753	49.702	4.203	0.044	0.706	6.338	23.974	0.201	1.404	1.012	0.190	0.092	97.940	4149	218
Average	3.068	4.309	2.764	49.446	4.305	0.059	0.707	6.651	23.937	0.230	1.411	1.007	0.161	0.109	98.162		
Maximum	3.261	4.387	2.829	50.248	4.479	0.124	0.796	6.742	24.126	0.268	1.504	1.093	0.202	0.156	99.114		
Minimum	2.903	4.231	2.707	48.532	4.126	0.000	0.622	6.338	23.734	0.200	1.313	0.888	0.133	0.075	97.165		
Range	0.358	0.156	0.122	1.716	0.353	0.124	0.174	0.405	0.392	0.068	0.190	0.206	0.069	0.081	1.949		

Table VIII:22EPMA line scan data for homogeneous Hils glass sample G19 window glass 1400AD (Table VII:14, EPMA run 5)

Analysis Number	Na_2O	MgO	Al_2O_3	SiO_2	P_2O_5	SO_2	Cl	K_2O	CaO	TiO_2	MnO	FeO	CoO	CuO	Total	Distance from first analysis/ µm	Distance between analysis points/µm
1	3.096	4.603	2.682	51.614	4.240	0.345	0.740	6.626	23.071	0.237	1.222	0.930	0.028	0.000	99.435	0	0
2	2.976	4.622	2.682	50.501	4.307	0.399	0.740	6.534	23.061	0.175	1.348	0.989	0.000	0.010	98.344	195	195
3	2.910	4.663	2.699	51.059	4.162	0.232	0.761	6.432	23.184	0.206	1.259	0.932	0.024	0.000	98.522	388	194
4	2.972	4.669	2.777	51.163	4.493	0.425	0.695	6.532	23.283	0.165	1.204	0.936	0.000	0.009	99.323	583	195
5	3.000	4.653	2.703	49.987	4.475	0.250	0.703	6.470	23.464	0.182	1.234	0.909	0.000	0.055	98.086	776	194
6	3.248	4.644	2.653	50.396	4.407	0.311	0.738	6.611	23.036	0.181	1.284	0.894	0.003	0.061	98.469	971	195
7	3.102	4.691	2.637	50.880	4.146	0.224	0.727	6.589	23.003	0.181	1.276	0.922	0.014	0.084	98.475	1164	194
8	2.948	4.871	2.804	48.752	4.473	0.499	0.706	6.195	24.140	0.192	1.337	0.986	0.000	0.018	97.922	1359	195
9	2.972	4.912	2.765	48.388	4.649	0.443	0.703	5.916	24.876	0.181	1.311	0.989	0.043	0.010	98.159	1552	194
10	3.184	4.796	2.817	48.878	4.407	0.535	0.654	6.092	24.471	0.209	1.324	0.930	0.000	0.036	98.332	1747	195
11	3.113	4.634	2.593	51.440	4.097	0.301	0.712	6.660	22.734	0.196	1.307	0.970	0.000	0.044	98.802	1940	193
12	3.046	4.646	2.657	50.858	4.003	0.244	0.778	6.530	23.114	0.193	1.229	0.926	0.000	0.058	98.284	2135	195
13	3.023	4.682	2.666	50.159	4.389	0.301	0.671	6.465	23.523	0.182	1.267	1.012	0.006	0.031	98.378	2328	194
14	3.154	4.572	2.738	50.658	4.174	0.275	0.643	6.645	22.656	0.221	1.202	0.942	0.000	0.000	97.881	2523	195
15	3.113	4.553	2.691	51.660	4.138	0.280	0.661	6.869	22.424	0.212	1.270	0.882	0.032	0.039	98.824	2716	194
16	3.165	4.626	2.630	50.227	4.011	0.489	0.500	6.657	22.566	0.212	1.243	0.889	0.026	0.052	97.292	2911	195
17	3.160	4.839	2.751	49.013	4.471	0.399	0.553	6.308	24.083	0.198	1.313	0.772	0.000	0.018	97.877	3105	194
18	3.030	4.950	2.800	48.525	4.477	0.298	0.781	6.090	24.855	0.216	1.305	0.870	0.000	0.053	98.253	3299	195
19	3.155	4.779	2.769	49.059	4.326	0.337	0.731	6.326	24.229	0.182	1.282	0.922	0.008	0.044	98.150	3493	194
20	3.126	4.830	2.848	48.904	4.693	0.448	0.714	6.153	24.759	0.176	1.332	0.933	0.026	0.027	98.970	3687	195
Average	3.075	4.712	2.718	50.106	4.327	0.352	0.696	6.435	23.527	0.195	1.277	0.927	0.011	0.032	98.389		
Maximum	3.248	4.950	2.848	51.660	4.693	0.535	0.781	6.869	24.876	0.237	1.348	1.012	0.043	0.084	99.435		
Minimum	2.910	4.553	2.593	48.388	4.003	0.224	0.500	5.916	22.424	0.165	1.202	0.772	0.000	0.000	97.292		
Range	0.338	0.397	0.255	3.272	0.689	0.311	0.281	0.954	2.453	0.071	0.145	0.240	0.043	0.084	2.143		

Table VIII:23EPMA line scan data for inhomogeneous Hils glass sample G20 window glass 1400AD (Table VII:14, EPMA run 5)

Analysis Number	Na_2O	MgO	Al_2O_3	SiO_2	P_2O_5	SO_2	Cl	K_2O	CaO	TiO_2	MnO	FeO	CoO	CuO	Total	Distance from first analysis/ µm	Distance between analysis points/µm
1	2.207	1.561	8.246	71.646	0.245	0.013	0.024	7.434	5.373	0.666	0.336	2.417	0.009	0.000	100.177	0	0
2	2.096	1.539	8.036	70.546	0.307	0.000	0.009	7.335	5.469	0.666	0.340	2.416	0.015	0.000	98.774	104	104
3	2.134	1.556	8.051	70.464	0.327	0.000	0.000	7.361	5.511	0.685	0.342	2.283	0.001	0.006	98.720	397	293
4	2.052	1.573	8.018	70.387	0.341	0.093	0.013	7.400	5.629	0.656	0.351	2.413	0.000	0.000	98.926	571	174
5	2.192	1.436	8.146	71.912	0.210	0.033	0.009	7.376	5.257	0.608	0.347	2.500	0.000	0.000	100.026	675	104
6	2.083	1.384	7.941	72.690	0.208	0.051	0.000	7.326	4.824	0.612	0.357	2.387	0.000	0.038	99.902	757	82
7	1.752	1.520	5.576	72.494	0.245	0.000	0.015	6.310	4.933	0.540	0.303	2.252	0.000	0.054	95.992	898	141
8	2.059	1.451	8.049	71.768	0.368	0.051	0.009	7.063	5.789	0.571	0.371	2.211	0.000	0.000	99.760	1934	1036
9	1.848	1.594	6.518	72.810	0.335	0.000	0.024	6.635	5.696	0.537	0.336	2.411	0.008	0.017	98.766	2007	74
10	2.048	1.403	8.105	72.387	0.304	0.000	0.000	7.591	5.321	0.594	0.312	2.491	0.000	0.000	100.555	2181	174
11	2.168	1.625	7.982	71.045	0.325	0.051	0.049	7.320	6.273	0.653	0.395	2.271	0.006	0.000	100.164	2328	147
12	2.096	1.494	8.001	71.304	0.237	0.046	0.000	7.434	6.136	0.646	0.370	2.307	0.000	0.000	100.071	2550	222
13	2.313	1.685	7.827	67.503	0.380	0.039	0.000	7.148	6.968	0.665	0.425	2.678	0.000	0.000	97.630	2830	280
14	2.159	1.603	7.840	71.015	0.272	0.000	0.000	7.139	6.237	0.603	0.336	2.608	0.000	0.044	99.855	3093	263
15	2.007	1.366	8.103	72.117	0.215	0.000	0.009	7.403	4.952	0.628	0.281	2.355	0.000	0.000	99.435	3465	372
Average	2.081	1.519	7.763	71.339	0.288	0.025	0.011	7.218	5.625	0.622	0.347	2.400	0.003	0.011	99.250		
Maximum	2.313	1.685	8.246	72.810	0.380	0.093	0.049	7.591	6.968	0.685	0.425	2.678	0.015	0.054	100.555		
Minimum	1.752	1.366	5.576	67.503	0.208	0.000	0.000	6.310	4.824	0.537	0.281	2.211	0.000	0.000	95.992		
Range	0.561	0.319	2.670	5.306	0.172	0.093	0.049	1.281	2.144	0.148	0.144	0.467	0.015	0.054	4.563		

Table VIII:24EPMA line scan data for inhomogeneous Hils glass sample G21, glass waste $12^{th}/13^{th}$ centuries (Table VII:14, EPMA run 5)

Analysis Number	Na_2O	MgO	Al_2O_3	SiO_2	P_2O_5	SO_2	Cl	K_2O	CaO	TiO_2	MnO	FeO	CoO	CuO	Total	Distance from first analysis/ µm	Distance between analysis points/µm
1	1.356	1.590	4.073	71.796	0.316	0.000	0.000	10.911	5.533	0.407	0.411	1.002	0.002	0.049	97.445	0	0
2	1.489	1.611	3.535	71.550	0.278	0.000	0.021	10.826	6.498	0.409	0.396	0.866	0.002	0.024	97.505	444	444
3	1.436	1.472	4.242	71.966	0.223	0.000	0.016	11.144	5.881	0.469	0.366	1.031	0.000	0.035	98.280	1154	710
4	1.348	1.207	3.881	74.931	0.226	0.000	0.000	10.663	5.078	0.406	0.329	1.114	0.000	0.092	99.274	1684	530
5	1.592	1.605	3.386	70.168	0.335	0.000	0.007	10.723	6.475	0.385	0.379	0.808	0.021	0.115	96.000	3404	1720
6	1.778	1.326	2.953	73.368	0.318	0.000	0.023	11.133	6.140	0.283	0.402	0.766	0.000	0.116	98.604	5664	2260
7	1.634	1.257	3.043	71.855	0.251	0.013	0.054	11.134	5.993	0.308	0.403	0.799	0.022	0.012	96.778	6107	443
8	1.543	1.288	3.825	72.079	0.280	0.013	0.000	11.149	5.404	0.381	0.433	1.102	0.000	0.058	97.554	6126	19
9	1.777	1.056	2.074	73.649	0.103	0.038	0.042	11.125	5.739	0.288	0.291	0.870	0.022	0.020	97.094	6450	324
10	1.613	1.296	3.086	71.644	0.321	0.038	0.000	11.151	6.139	0.304	0.396	0.745	0.073	0.032	96.839	7418	968
Average	1.557	1.371	3.410	72.301	0.265	0.010	0.016	10.996	5.888	0.364	0.381	0.910	0.014	0.055	97.537		
Maximum	1.778	1.611	4.242	74.931	0.335	0.038	0.054	11.151	6.498	0.469	0.433	1.114	0.073	0.116	99.274		
Minimum	1.348	1.056	2.074	70.168	0.103	0.000	0.000	10.663	5.078	0.283	0.291	0.745	0.000	0.012	96.000		
Range	0.430	0.555	2.168	4.763	0.232	0.038	0.054	0.488	1.420	0.186	0.143	0.369	0.073	0.104	3.274		

Table VIII:25 EPMA line scan data for inhomogeneous Hils glass sample G22, glass waste $12^{th}/13^{th}$ centuries (Table VII:14, EPMA run 4)

Analysis Number	Na_2O	MgO	Al_2O_3	SiO_2	P_2O_5	SO_2	Cl	K_2O	CaO	TiO_2	MnO	FeO	CoO	CuO	Total	Distance from first analysis/ µm	Distance between analysis points/µm
1	0.562	2.826	3.000	59.751	0.725	0.151	0.000	17.552	11.173	0.212	1.005	0.943	0.000	0.090	97.990	0	0
2	0.549	2.612	2.857	58.924	0.854	0.126	0.000	17.035	11.569	0.192	0.983	0.890	0.028	0.068	96.686	248	248
3	0.617	2.603	2.812	59.346	0.774	0.087	0.000	16.908	12.115	0.189	0.964	0.962	0.021	0.096	97.494	744	496
4	0.565	2.685	2.945	59.261	0.858	0.190	0.037	17.285	12.099	0.228	0.954	0.896	0.073	0.084	98.160	991	248
5	0.580	2.649	2.930	59.297	0.789	0.000	0.007	17.082	11.966	0.234	0.960	1.015	0.079	0.081	97.671	1239	248
6	0.661	2.589	2.943	59.156	0.829	0.000	0.047	16.929	12.043	0.238	1.011	0.927	0.032	0.068	97.473	1487	249
7	0.531	2.488	3.272	59.212	0.727	0.108	0.005	17.238	11.053	0.245	0.919	0.991	0.039	0.087	96.915	1735	247
8	0.548	2.598	2.955	58.962	0.812	0.182	0.026	16.618	11.809	0.198	0.869	0.986	0.000	0.068	96.631	1982	248
9	0.582	2.605	3.284	59.615	0.687	0.108	0.000	16.503	11.225	0.242	0.865	1.135	0.028	0.098	96.977	2230	248
10	0.517	2.570	3.267	58.741	0.761	0.108	0.065	16.308	11.525	0.266	0.944	1.003	0.028	0.061	96.165	2479	249
11	0.540	2.591	3.047	58.476	0.799	0.126	0.077	16.575	12.301	0.194	0.959	1.027	0.073	0.060	96.844	2726	247
12	0.549	2.392	3.437	60.609	0.761	0.159	0.082	16.865	10.680	0.271	0.844	1.019	0.017	0.086	97.770	2974	248
13	0.545	2.357	3.319	61.183	0.728	0.228	0.075	16.552	10.793	0.204	0.845	1.057	0.030	0.072	97.989	3222	249
14	0.623	2.486	3.153	59.180	0.744	0.151	0.028	16.507	11.172	0.260	0.919	1.176	0.021	0.082	96.502	3470	248
15	0.511	2.402	4.077	60.893	0.719	0.126	0.000	16.988	10.241	0.297	0.845	1.122	0.045	0.030	98.294	3717	247
16	0.499	2.311	3.682	60.605	0.635	0.031	0.049	16.648	10.260	0.278	0.836	1.018	0.022	0.110	96.985	3965	248
17	0.516	2.376	4.226	61.390	0.637	0.095	0.000	16.386	9.705	0.304	0.820	1.122	0.013	0.068	97.658	4213	249
18	0.497	2.354	3.668	60.811	0.706	0.051	0.054	16.208	10.452	0.305	0.840	1.109	0.058	0.133	97.246	4461	248
19	0.468	2.282	4.355	61.603	0.639	0.064	0.000	16.387	9.736	0.269	0.822	1.059	0.045	0.058	97.786	4708	247
20	0.506	2.373	3.641	61.016	0.687	0.121	0.000	16.190	10.729	0.233	0.834	1.115	0.026	0.129	97.600	4957	249
21	0.464	2.411	3.498	60.453	0.715	0.133	0.000	16.187	10.842	0.305	0.871	1.012	0.050	0.067	97.009	5204	248
22	0.499	2.450	3.932	61.136	0.715	0.038	0.000	16.482	10.507	0.253	0.882	1.121	0.019	0.055	98.090	5452	248
23	0.439	2.376	3.686	60.726	0.683	0.064	0.000	16.564	10.566	0.269	0.834	1.010	0.000	0.042	97.259	5699	247
24	0.517	2.469	3.392	59.805	0.679	0.159	0.000	16.533	10.785	0.282	0.890	1.051	0.000	0.112	96.674	5948	249
25	0.469	2.460	3.409	60.592	0.704	0.203	0.042	16.585	10.875	0.238	0.914	1.015	0.022	0.096	97.623	6196	248
26	0.490	3.073	3.496	63.303	1.059	0.267	0.000	17.736	5.872	0.271	1.005	1.169	0.065	0.104	97.911	6443	248
27	0.526	2.589	3.104	58.837	0.883	0.272	0.012	16.546	12.033	0.242	0.926	1.031	0.058	0.091	97.148	6691	247
28	0.516	2.618	2.869	60.886	0.782	0.087	0.063	16.312	12.089	0.217	0.976	1.022	0.021	0.048	98.506	6939	249
29	0.571	2.630	2.977	59.557	0.801	0.013	0.012	16.085	12.283	0.216	0.960	0.853	0.037	0.000	96.996	7187	248
Average	0.533	2.525	3.353	60.115	0.755	0.119	0.023	16.683	10.983	0.247	0.907	1.030	0.033	0.077	97.381		
Maximum	0.661	3.073	4.355	63.303	1.059	0.272	0.082	17.736	12.301	0.305	1.011	1.176	0.079	0.133	98.506		
Minimum	0.439	2.282	2.812	58.476	0.635	0.000	0.000	16.085	5.872	0.189	0.820	0.853	0.000	0.000	96.165		
Range	0.223	0.791	1.543	4.827	0.424	0.272	0.082	1.651	6.429	0.116	0.190	0.323	0.079	0.133	2.341		

Table VIII:26 EPMA line scan data for inhomogeneous Hils glass sample G23, glass waste $12^{th}/13^{th}$ centuries (Table VII:14, EPMA run 4)

Analysis Number	Na_2O	MgO	Al_2O_3	SiO_2	P_2O_5	SO_2	Cl	K_2O	CaO	TiO_2	MnO	FeO	CoO	CuO	Total
1	0.933	0.733	4.298	77.848	0.031	0.000	0.009	12.194	2.454	0.345	0.235	1.105	0.000	0.000	100.186
2	0.991	0.761	4.499	78.036	0.078	0.013	0.000	12.645	2.617	0.408	0.301	1.188	0.011	0.037	101.585
3	1.065	0.636	2.684	81.737	0.029	0.033	0.000	11.500	2.773	0.230	0.268	0.798	0.023	0.016	101.793
4	0.875	0.751	4.149	77.142	0.035	0.046	0.026	12.549	2.569	0.371	0.303	1.256	0.000	0.000	100.072
5	0.941	0.634	3.792	79.737	0.018	0.021	0.000	11.794	2.272	0.306	0.295	1.099	0.009	0.037	100.953
Average	0.961	0.703	3.884	78.900	0.038	0.023	0.007	12.137	2.537	0.332	0.280	1.089	0.009	0.018	100.918
Maximum	1.065	0.761	4.499	81.737	0.078	0.046	0.026	12.645	2.773	0.408	0.303	1.256	0.023	0.037	101.793
Minimum	0.875	0.634	2.684	77.142	0.018	0.000	0.000	11.500	2.272	0.230	0.235	0.798	0.000	0.000	100.072
Range	0.190	0.127	1.814	4.594	0.061	0.046	0.026	1.145	0.501	0.178	0.067	0.458	0.023	0.037	1.721

Table VIII:27EPMA data for inhomogeneous Hils glass sample G24, glass waste $12^{th}/13^{th}$ centuries (Table VII:14, EPMA run 5)

Analysis Number	Na_2O	MgO	Al_2O_3	SiO_2	P_2O_5	SO_2	Cl	K_2O	CaO	TiO_2	MnO	FeO	CoO	CuO	Total	Distance from first analysis/ µm	Distance between analysis points/µm
1	0.885	2.503	2.998	66.882	0.881	0.051	0.037	11.379	11.987	0.278	0.753	1.165	0.034	0.030	99.864	0	0
2	0.682	2.395	3.615	66.700	0.643	0.021	0.014	11.206	11.006	0.283	0.698	1.150	0.000	0.032	98.445	307	307
3	0.650	1.815	4.524	68.095	0.371	0.072	0.000	11.095	9.721	0.340	0.468	1.235	0.000	0.019	98.406	1058	751
4	0.631	1.741	4.504	69.098	0.373	0.021	0.023	10.729	9.578	0.374	0.495	1.297	0.030	0.000	98.895	1095	37
5	0.708	2.014	4.498	67.261	0.542	0.038	0.035	11.013	10.712	0.365	0.523	1.225	0.000	0.026	98.961	1238	142
6	0.573	1.516	4.555	70.548	0.306	0.046	0.042	10.737	8.675	0.384	0.420	1.349	0.013	0.045	99.209	1253	15
7	0.609	1.561	4.498	69.919	0.371	0.033	0.065	10.663	9.320	0.398	0.407	1.440	0.002	0.000	99.285	1423	170
8	0.598	1.552	4.637	70.827	0.352	0.059	0.000	10.720	8.556	0.422	0.416	1.413	0.000	0.000	99.552	1627	204
9	0.612	1.576	4.283	70.667	0.342	0.008	0.035	10.826	9.455	0.382	0.431	1.515	0.000	0.008	100.140	2343	716
10	0.692	1.978	4.179	68.198	0.470	0.000	0.026	10.836	10.269	0.340	0.559	1.307	0.006	0.027	98.885	2574	231
11	0.670	2.150	3.827	68.102	0.591	0.000	0.000	10.742	10.639	0.294	0.600	1.241	0.002	0.042	98.898	2814	240
12	0.621	1.535	4.778	71.279	0.306	0.051	0.000	10.636	8.755	0.349	0.414	1.442	0.000	0.026	100.193	2857	43
13	0.607	1.643	4.622	69.821	0.500	0.085	0.000	10.494	9.790	0.370	0.420	1.419	0.024	0.041	99.836	2893	36
14	0.605	1.451	4.651	70.294	0.251	0.000	0.000	10.648	8.575	0.407	0.391	1.488	0.000	0.011	98.773	3272	380
Average	0.653	1.816	4.298	69.121	0.450	0.035	0.020	10.837	9.789	0.356	0.500	1.335	0.008	0.022	99.239		
Maximum	0.885	2.503	4.778	71.279	0.881	0.085	0.065	11.379	11.987	0.422	0.753	1.515	0.034	0.045	100.193		
Minimum	0.573	1.451	2.998	66.700	0.251	0.000	0.000	10.494	8.556	0.278	0.391	1.150	0.000	0.000	98.406		
Range	0.313	1.053	1.780	4.579	0.630	0.085	0.065	0.885	3.431	0.143	0.362	0.365	0.034	0.045	1.787		

Table VIII:28EPMA line scan data for inhomogeneous Hils glass sample G27, glass waste $12^{th}/13^{th}$ centuries (Table VII:14, EPMA run 4)

Analysis Number	Na_2O	MgO	Al_2O_3	SiO_2	P_2O_5	SO_2	Cl	K_2O	CaO	TiO_2	MnO	FeO	Total	Distance from first analysis/μm	Distance between analysis points/μm
1	3.514	8.032	1.681	51.559	3.706	0.267	0.751	13.807	15.219	0.077	1.816	0.515	100.945	0	0
2	3.217	8.129	1.547	51.021	3.575	0.334	0.817	13.600	15.399	0.056	1.810	0.486	99.992	50	50
3	3.288	8.202	1.584	51.258	3.691	0.253	0.790	13.707	15.427	0.082	1.908	0.525	100.716	75	25
4	3.360	8.087	1.607	50.616	3.769	0.191	0.880	13.634	15.388	0.068	1.798	0.471	99.869	152	77
5	3.480	8.138	1.617	51.049	3.554	0.191	0.751	13.617	15.396	0.098	1.818	0.486	100.194	200	48
6	3.499	8.157	1.560	51.009	3.750	0.183	0.674	13.814	15.389	0.082	1.888	0.491	100.496	249	49
7	3.265	8.163	1.597	50.667	3.650	0.164	0.797	13.779	15.345	0.077	1.863	0.534	99.901	442	193
8	3.557	8.149	1.525	50.343	3.704	0.170	0.744	13.852	15.379	0.103	1.778	0.456	99.760	776	335
9	3.500	8.131	1.634	51.280	3.620	0.213	0.819	13.804	15.352	0.050	1.880	0.510	100.793	851	74
10	3.417	7.937	1.568	50.981	3.816	0.178	0.808	13.853	15.378	0.101	1.819	0.507	100.363	859	8
11	3.407	8.052	1.593	50.812	3.732	0.196	0.843	13.888	15.431	0.098	1.833	0.486	100.372	1570	711
Average	3.410	8.107	1.592	50.963	3.688	0.213	0.789	13.760	15.373	0.081	1.837	0.497	100.309		
Maximum	3.557	8.202	1.681	51.559	3.816	0.334	0.880	13.888	15.431	0.103	1.908	0.534	100.945		
Minimum	3.217	7.937	1.525	50.343	3.554	0.164	0.674	13.600	15.219	0.050	1.778	0.456	99.760		
Range	0.340	0.264	0.157	1.216	0.263	0.170	0.206	0.288	0.213	0.053	0.130	0.079	1.185		

Table VIII:29 EPMA line scan data for inhomogeneous Little Birches North Site glass sample LBN1 glass waste (Table VII:9, EPMA run 2)

Analysis Number	Na_2O	MgO	Al_2O_3	SiO_2	P_2O_5	SO_2	Cl	K_2O	CaO	TiO_2	MnO	FeO	Total	Distance from first analysis/μm	Distance between analysis points/μm
1	3.163	7.865	1.628	51.539	3.634	0.246	0.750	13.768	15.626	0.111	1.829	0.517	100.677	0	0
2	3.372	7.911	1.601	51.299	3.579	0.217	0.750	13.705	15.651	0.090	1.779	0.476	100.431	525	525
3	3.304	7.827	1.748	51.620	3.644	0.184	0.699	13.897	15.481	0.112	1.796	0.478	100.790	1050	525
4	3.260	7.991	1.616	51.571	3.658	0.201	0.702	13.660	15.728	0.120	1.770	0.487	100.765	1575	525
5	3.318	7.848	1.682	51.753	3.503	0.184	0.699	13.496	15.598	0.072	1.771	0.521	100.444	2101	526
6	3.303	7.932	1.669	51.753	3.767	0.217	0.618	13.788	15.523	0.119	1.857	0.515	101.061	2626	525
7	3.166	7.914	1.661	51.526	3.554	0.346	0.660	13.637	15.555	0.104	1.697	0.507	100.328	3151	525
8	3.210	7.825	1.700	51.742	3.662	0.162	0.681	13.615	15.578	0.101	1.753	0.519	100.550	3676	525
9	3.316	7.792	1.657	51.451	3.515	0.212	0.639	13.831	15.556	0.138	1.762	0.553	100.422	4201	525
10	3.386	7.958	1.717	51.440	3.709	0.150	0.660	13.644	15.620	0.106	1.777	0.502	100.670	4726	525
11	3.394	7.912	1.576	51.757	3.603	0.251	0.729	13.698	15.497	0.140	1.795	0.546	100.899	5252	526
12	3.169	7.902	1.647	51.314	3.480	0.179	0.714	13.581	15.461	0.151	1.824	0.498	99.919	5777	525
13	3.374	7.853	1.690	51.389	3.517	0.079	0.718	13.738	15.530	0.119	1.725	0.498	100.228	6302	525
14	3.374	7.930	1.709	51.661	3.540	0.146	0.791	13.629	15.566	0.128	1.703	0.464	100.639	6827	525
15	3.259	7.919	1.640	51.284	3.752	0.117	0.727	13.738	15.545	0.099	1.788	0.456	100.325	7353	525
16	3.236	7.953	1.690	51.342	3.570	0.167	0.712	13.533	15.541	0.096	1.823	0.514	100.176	7878	525
17	3.218	7.944	1.634	51.443	3.624	0.241	0.702	13.581	15.674	0.114	1.791	0.464	100.430	8404	526
18	3.111	7.699	1.760	51.344	3.550	0.146	0.637	13.839	15.121	0.133	1.769	0.503	99.614	8929	525
19	3.215	7.631	1.734	51.412	3.597	0.258	0.662	13.758	15.125	0.123	1.736	0.554	99.805	9454	525
20	3.267	7.776	1.742	51.571	3.736	0.067	0.639	13.853	15.015	0.123	1.736	0.529	100.054	9979	525
Average	3.271	7.869	1.675	51.511	3.610	0.188	0.695	13.699	15.500	0.115	1.774	0.505	100.411		
Maximum	3.394	7.991	1.760	51.757	3.767	0.346	0.791	13.897	15.728	0.151	1.857	0.554	101.061		
Minimum	3.111	7.631	1.576	51.284	3.480	0.067	0.618	13.496	15.015	0.072	1.697	0.456	99.614		
Range	0.283	0.361	0.184	0.473	0.288	0.279	0.172	0.401	0.713	0.079	0.160	0.098	1.448		

Table VIII:30 EPMA line scan data for inhomogeneous Little Birches North Site glass sample LBN3 glass waste (Table VII:9, EPMA run 3)

Analysis Number	Na_2O	MgO	Al_2O_3	SiO_2	P_2O_5	SO_2	Cl	K_2O	CaO	TiO_2	MnO	FeO	Total	Distance from first analysis/μm	Distance between analysis points/μm
1	3.117	7.662	1.669	51.021	3.544	0.196	0.681	12.833	16.819	0.148	1.709	0.614	100.012	0	0
2	3.349	7.638	1.678	50.875	3.527	0.301	0.676	12.715	16.876	0.088	1.777	0.620	100.119	774	774
3	3.068	7.615	1.734	50.920	3.605	0.146	0.689	12.904	16.756	0.079	1.697	0.535	99.747	1989	1215
4	2.717	7.210	1.690	52.087	3.771	0.084	0.628	11.843	15.790	0.101	1.682	0.648	98.251	2992	1003
5	3.241	7.247	1.841	50.571	3.548	0.275	0.637	12.700	17.123	0.075	1.651	0.736	99.647	4165	1172
6	3.281	7.037	1.893	50.820	3.352	0.167	0.603	12.596	17.480	0.112	1.691	1.113	100.145	5464	1300
7	3.196	7.132	1.911	50.794	3.480	0.179	0.628	12.794	17.260	0.085	1.583	1.036	100.078	6775	1311
Average	3.138	7.363	1.774	51.013	3.547	0.192	0.649	12.626	16.872	0.098	1.684	0.758	99.714		
Maximum	3.349	7.662	1.911	52.087	3.771	0.301	0.689	12.904	17.480	0.148	1.777	1.113	100.145		
Minimum	2.717	7.037	1.669	50.571	3.352	0.084	0.603	11.843	15.790	0.075	1.583	0.535	98.251		
Range	0.632	0.625	0.242	1.516	0.419	0.217	0.086	1.061	1.690	0.072	0.194	0.578	1.894		

Table VIII:31EPMA line scan data for inhomogeneous Little Birches North Site glass sample LBN4 glass waste (Table VII:9, EPMA run 3)

Analysis Number	Na_2O	MgO	Al_2O_3	SiO_2	P_2O_5	SO_2	Cl	K_2O	CaO	TiO_2	MnO	FeO	Total	Distance from first analysis/μm	Distance between analysis points/μm
1	1.758	6.155	3.527	51.361	3.466	0.038	0.096	12.610	18.085	0.151	1.485	0.867	99.599	0	0
2	1.695	6.265	2.729	50.546	3.685	0.079	0.130	12.003	19.309	0.164	1.407	0.874	98.885	4535	4535
3	1.726	6.297	2.878	50.338	3.703	0.079	0.121	12.175	19.374	0.138	1.518	0.871	99.218	6745	2209
4	1.714	6.232	3.002	50.276	3.762	0.127	0.040	12.285	19.429	0.130	1.518	0.948	99.463	7835	1090
5	1.866	6.503	3.004	50.049	3.838	0.088	0.144	12.324	19.549	0.152	1.581	0.818	99.917	10165	2330
6	1.754	6.445	2.894	49.801	3.691	0.122	0.115	12.691	19.569	0.152	1.529	0.893	99.655	13079	2913
Average	1.752	6.316	3.005	50.395	3.691	0.089	0.108	12.348	19.219	0.148	1.506	0.879	99.456		
Maximum	1.866	6.503	3.527	51.361	3.838	0.127	0.144	12.691	19.569	0.164	1.581	0.948	99.917		
Minimum	1.695	6.155	2.729	49.801	3.466	0.038	0.040	12.003	18.085	0.130	1.407	0.818	98.885		
Range	0.171	0.348	0.798	1.561	0.372	0.088	0.103	0.689	1.483	0.034	0.174	0.130	1.032		

Table VIII:32EPMA line scan data for homogeneous Little Birches North Site glass sample LBN7 glass waste (Table VII:9, EPMA run 3)

Analysis Number	Na_2O	MgO	Al_2O_3	SiO_2	P_2O_5	SO_2	Cl	K_2O	CaO	TiO_2	MnO	FeO	Total	Distance from first analysis/μm	Distance between analysis points/μm
1	3.679	7.904	1.217	51.521	3.763	0.054	0.970	16.448	12.290	0.079	1.879	0.430	100.235	0	0
2	3.685	8.068	1.207	51.536	3.750	0.253	0.964	16.599	12.431	0.061	1.862	0.456	100.870	102	102
3	3.572	7.680	1.537	52.157	3.681	0.213	0.817	16.813	11.818	0.064	1.772	0.468	100.591	210	109
4	3.672	7.900	1.182	51.926	3.646	0.156	0.861	16.817	12.200	0.082	1.723	0.429	100.594	352	142
5	3.427	8.029	1.168	51.467	3.836	0.183	0.900	16.666	12.548	0.055	1.783	0.457	100.519	488	135
6	3.665	7.219	1.799	52.212	3.353	0.347	0.782	17.245	11.711	0.098	1.700	0.621	100.752	867	379
Average	3.617	7.800	1.352	51.803	3.671	0.201	0.882	16.765	12.166	0.073	1.787	0.477	100.594		
Maximum	3.685	8.068	1.799	52.212	3.836	0.347	0.970	17.245	12.548	0.098	1.879	0.621	100.870		
Minimum	3.427	7.219	1.168	51.467	3.353	0.054	0.782	16.448	11.711	0.055	1.700	0.429	100.235		
Range	0.258	0.849	0.631	0.745	0.482	0.293	0.189	0.797	0.837	0.043	0.179	0.192	0.635		

Table VIII:33EPMA line scan data for homogeneous Little Birches South Site glass sample LBS2 glass waste (Table VII:11, EPMA run 2)

Analysis Number	Na_2O	MgO	Al_2O_3	SiO_2	P_2O_5	SO_2	Cl	K_2O	CaO	TiO_2	MnO	FeO	Total	Distance from first analysis/μm	Distance between analysis points/μm
1	2.778	6.578	2.451	54.499	3.271	0.280	0.880	13.364	14.450	0.133	1.543	0.626	100.855	0	0
2	2.882	6.784	2.265	54.275	3.089	0.213	0.803	13.096	14.741	0.125	1.603	0.566	100.442	328	328
3	2.926	6.604	2.218	54.621	3.049	0.124	0.876	13.272	14.780	0.114	1.595	0.553	100.734	656	328
4	2.890	6.767	2.111	54.248	2.998	0.253	0.681	13.161	14.966	0.101	1.524	0.568	100.268	983	327
5	2.967	6.767	2.084	54.243	3.253	0.323	0.764	13.197	15.086	0.098	1.503	0.582	100.867	1219	236
6	3.055	6.610	2.346	54.071	3.065	0.261	0.799	13.257	14.786	0.119	1.528	0.564	100.461	1701	482
7	3.510	7.480	1.541	53.255	3.544	0.248	0.753	14.465	13.320	0.048	1.734	0.448	100.345	7885	6184
8	3.443	7.457	1.587	53.610	3.371	0.336	0.788	14.406	13.341	0.095	1.725	0.422	100.581	8197	312
9	3.509	7.464	1.560	53.507	3.530	0.232	0.810	14.474	13.376	0.095	1.785	0.460	100.801	8769	572
10	2.975	7.041	1.822	53.808	3.301	0.124	0.762	12.956	15.008	0.101	1.502	0.599	99.999	9556	787
11	2.846	6.819	2.269	54.278	2.928	0.280	0.777	13.691	14.421	0.111	1.550	0.566	100.536	9570	15
12	2.761	6.698	2.224	54.015	3.101	0.288	0.685	12.922	15.152	0.108	1.512	0.603	100.070	9710	140
13	3.111	6.796	1.950	54.039	3.126	0.323	0.889	13.555	14.294	0.124	1.637	0.544	100.387	9752	41
14	3.151	7.291	1.690	53.535	3.291	0.191	0.812	14.298	13.605	0.101	1.616	0.501	100.082	10694	942
Average	3.057	6.940	2.008	54.000	3.208	0.248	0.791	13.580	14.381	0.105	1.597	0.543	100.459		
Maximum	3.510	7.480	2.451	54.621	3.544	0.336	0.889	14.474	15.152	0.133	1.785	0.626	100.867		
Minimum	2.761	6.578	1.541	53.255	2.928	0.124	0.681	12.922	13.320	0.048	1.502	0.422	99.999		
Range	0.749	0.901	0.910	1.366	0.616	0.213	0.209	1.552	1.832	0.085	0.283	0.204	0.868		

Table VIII:34EPMA line scan data for homogeneous Little Birches South Site glass sample LBS3 glass waste (Table VII:11, EPMA run 2)

Analysis Number	Na_2O	MgO	Al_2O_3	SiO_2	P_2O_5	SO_2	Cl	K_2O	CaO	TiO_2	MnO	FeO	Total	Distance from first analysis/μm	Distance between analysis points/μm
1	2.538	7.611	1.580	57.254	2.923	0.210	0.484	13.386	12.164	0.087	1.399	0.557	100.194	0	0
2	2.454	7.615	1.607	57.449	2.710	0.227	0.511	13.429	12.115	0.111	1.418	0.510	100.156	665	665
3	2.504	7.610	1.651	57.426	2.935	0.165	0.419	13.450	12.164	0.098	1.420	0.586	100.427	1619	954
4	2.461	7.713	1.626	56.903	2.982	0.203	0.459	13.529	12.119	0.106	1.457	0.538	100.097	2843	1224
5	2.546	7.718	1.632	57.034	3.039	0.248	0.492	13.675	12.189	0.119	1.446	0.579	100.717	4046	1203
6	2.570	7.687	1.591	57.115	2.818	0.392	0.546	13.496	12.312	0.090	1.457	0.522	100.596	5092	1046
Average	2.512	7.659	1.615	57.197	2.901	0.241	0.485	13.494	12.177	0.102	1.433	0.549	100.365		
Maximum	2.570	7.718	1.651	57.449	3.039	0.392	0.546	13.675	12.312	0.119	1.457	0.586	100.717		
Minimum	2.454	7.610	1.580	56.903	2.710	0.165	0.419	13.386	12.115	0.087	1.399	0.510	100.097		
Range	0.116	0.109	0.070	0.546	0.329	0.227	0.126	0.289	0.197	0.032	0.058	0.076	0.620		

Table VIII:35EPMA line scan data for inhomogeneous Little Birches South Site glass sample LBS4 glass waste (Table VII:11, EPMA run 3)

Analysis Number	Na_2O	MgO	Al_2O_3	SiO_2	P_2O_5	SO_2	Cl	K_2O	CaO	TiO_2	MnO	FeO	Total	Distance from first analysis/μm	Distance between analysis points/μm
1	2.579	7.580	1.738	57.550	2.896	0.136	0.446	13.604	12.005	0.123	1.418	0.549	100.623	0	0
2	2.467	7.413	1.651	57.674	2.745	0.170	0.496	13.610	11.984	0.119	1.443	0.501	100.272	1331	1331
3	2.570	7.690	1.659	56.843	2.902	0.277	0.779	13.435	12.174	0.119	1.414	0.588	100.451	1997	666
4	2.487	7.657	1.638	57.130	2.712	0.198	0.509	13.395	12.068	0.087	1.390	0.491	99.763	2663	666
5	2.491	7.722	1.640	57.055	2.949	0.193	0.480	13.708	12.107	0.096	1.432	0.509	100.383	3329	666
6	2.516	7.793	1.651	56.927	2.947	0.277	0.450	13.640	12.147	0.099	1.362	0.505	100.315	3995	665
7	2.665	7.744	1.674	56.976	2.937	0.148	0.480	13.648	12.096	0.095	1.431	0.604	100.498	4660	666
8	2.598	7.666	1.603	57.171	2.831	0.193	0.540	13.625	12.100	0.083	1.442	0.527	100.379	5326	666
9	2.617	7.667	1.541	57.235	2.896	0.136	0.494	13.629	12.094	0.104	1.448	0.537	100.399	5992	666
10	2.479	7.611	1.556	56.935	2.941	0.177	0.438	13.609	11.979	0.114	1.344	0.543	99.727	6658	665
11	2.486	7.797	1.624	56.935	2.865	0.119	0.484	13.464	12.360	0.128	1.422	0.555	100.239	7324	666
12	2.378	7.646	1.657	57.541	2.906	0.255	0.521	13.626	12.107	0.075	1.360	0.542	100.615	7990	666
13	2.494	7.349	1.684	57.595	3.031	0.198	0.494	13.525	11.889	0.119	1.394	0.688	100.459	8655	666
14	2.484	7.678	1.698	57.158	2.814	0.193	0.389	13.518	12.094	0.138	1.389	0.563	100.116	9321	665
15	2.564	7.587	1.614	57.289	3.019	0.339	0.477	13.591	11.921	0.098	1.456	0.464	100.418	9987	666
16	2.555	7.615	1.549	57.122	2.920	0.248	0.456	13.575	12.185	0.096	1.468	0.598	100.387	11319	1332
17	2.318	6.822	1.744	60.874	2.491	0.246	0.268	13.546	10.551	0.123	1.281	0.607	100.871	11984	665
18	2.524	7.708	1.593	56.940	2.867	0.165	0.521	13.574	12.163	0.090	1.504	0.521	100.167	12650	666
Average	2.515	7.597	1.640	57.386	2.871	0.204	0.484	13.573	12.001	0.106	1.411	0.550	100.338		
Maximum	2.665	7.797	1.744	60.874	3.031	0.339	0.779	13.708	12.360	0.138	1.504	0.688	100.871		
Minimum	2.318	6.822	1.541	56.843	2.491	0.119	0.268	13.395	10.551	0.075	1.281	0.464	99.727		
Range	0.347	0.975	0.203	4.031	0.540	0.220	0.511	0.313	1.809	0.063	0.223	0.224	1.144		

Table VIII:36EPMA line scan data for inhomogeneous Little Birches South Site glass sample LBS5 glass waste (Table VII:11, EPMA run 3)

Analysis Number	Na_2O	MgO	Al_2O_3	SiO_2	P_2O_5	SO_2	Cl	K_2O	CaO	TiO_2	MnO	FeO	Total	Distance from first analysis/μm	Distance between analysis points/μm
1	2.389	7.799	1.603	56.918	3.109	0.136	0.450	13.533	12.146	0.091	1.432	0.576	100.183	0	0
2	2.460	7.846	1.601	56.873	2.875	0.148	0.452	13.574	12.038	0.091	1.362	0.569	99.889	674	674
3	2.539	7.872	1.630	57.180	3.123	0.193	0.444	13.506	12.146	0.114	1.410	0.575	100.732	1349	675
4	2.475	7.883	1.624	57.141	3.137	0.210	0.498	13.466	12.249	0.085	1.497	0.562	100.827	2023	674
5	2.501	7.907	1.657	56.835	2.912	0.165	0.446	13.543	12.255	0.091	1.490	0.549	100.350	2698	675
6	2.580	7.610	1.738	57.835	2.878	0.251	0.440	13.544	11.796	0.132	1.372	0.547	100.722	3372	674
7	2.412	7.807	1.620	56.843	3.041	0.260	0.362	13.405	12.301	0.117	1.424	0.505	100.098	6070	2698
8	2.916	7.851	1.595	56.426	3.045	0.220	0.898	13.311	12.275	0.123	1.410	0.521	100.590	6744	674
9	2.404	7.771	1.663	57.079	2.935	0.095	0.477	13.394	12.312	0.119	1.413	0.545	100.206	7419	675
10	2.467	7.760	1.587	57.152	3.025	0.248	0.442	13.315	12.256	0.138	1.394	0.515	100.299	8093	674
11	2.549	7.699	1.597	57.252	3.092	0.222	0.406	13.425	12.283	0.096	1.468	0.539	100.628	10116	2023
12	2.385	7.732	1.628	57.436	2.996	0.284	0.486	13.480	12.165	0.122	1.401	0.521	100.636	11465	1349
13	2.547	7.688	1.609	57.612	2.906	0.267	0.456	13.387	12.258	0.090	1.390	0.522	100.733	12140	675
14	2.484	7.776	1.595	57.132	2.935	0.227	0.440	13.449	12.104	0.120	1.423	0.537	100.222	12814	674
Average	2.508	7.786	1.625	57.122	3.001	0.209	0.478	13.452	12.185	0.109	1.420	0.542	100.437		
Maximum	2.916	7.907	1.738	57.835	3.137	0.284	0.898	13.574	12.312	0.138	1.497	0.576	100.827		
Minimum	2.385	7.610	1.587	56.426	2.875	0.095	0.362	13.311	11.796	0.085	1.362	0.505	99.889		
Range	0.531	0.298	0.151	1.409	0.262	0.189	0.536	0.263	0.516	0.053	0.135	0.072	0.937		

Table VIII:37EPMA line scan data for inhomogeneous Little Birches South Site glass sample LBS6 glass waste (Table VII:11, EPMA run 3)

Analysis Number	Na_2O	MgO	Al_2O_3	SiO_2	P_2O_5	SO_2	Cl	K_2O	CaO	TiO_2	MnO	FeO	Total	Distance from first analysis/µm	Distance between analysis points/µm
1	2.458	7.569	1.649	57.340	2.941	0.193	0.425	13.424	12.188	0.093	1.419	0.559	100.259	0	0
2	2.573	7.608	1.566	57.481	3.068	0.244	0.511	13.257	12.205	0.096	1.476	0.566	100.651	478	478
3	2.437	7.622	1.636	56.873	3.000	0.119	0.591	13.312	12.150	0.106	1.403	0.530	99.780	955	478
4	2.411	7.599	1.618	57.368	2.888	0.141	0.507	13.429	12.089	0.114	1.376	0.543	100.082	1434	478
5	2.473	7.503	1.651	57.524	2.996	0.074	0.471	13.616	12.219	0.069	1.407	0.522	100.525	1912	478
6	2.491	7.645	1.624	57.152	2.949	0.170	0.477	13.486	12.126	0.138	1.333	0.531	100.122	2867	955
7	2.504	7.669	1.630	56.895	3.088	0.136	0.496	13.593	12.224	0.099	1.424	0.538	100.296	3345	478
8	2.387	7.270	1.518	58.472	2.871	0.193	0.348	13.697	11.370	0.119	1.344	0.519	100.109	3822	478
9	2.447	7.627	1.585	56.897	2.839	0.232	0.509	13.316	12.161	0.109	1.378	0.594	99.694	4301	479
10	2.402	7.681	1.661	57.070	3.070	0.153	0.429	13.604	12.311	0.099	1.529	0.507	100.518	4779	478
11	2.600	7.685	1.740	57.002	2.941	0.153	0.515	13.893	12.000	0.138	1.465	0.543	100.676	5734	955
12	2.564	7.823	1.653	56.696	2.982	0.193	0.561	13.788	12.128	0.111	1.521	0.588	100.607	6212	478
13	2.622	7.771	1.630	56.638	3.012	0.193	0.492	13.784	12.068	0.095	1.449	0.582	100.336	7168	956
14	2.454	7.722	1.587	56.270	2.841	0.129	0.517	13.863	11.996	0.104	1.509	0.526	99.518	7646	478
15	2.614	7.582	1.645	56.719	3.004	0.220	0.559	13.755	12.093	0.069	1.420	0.480	100.159	10035	2389
16	2.527	7.694	1.591	56.676	3.047	0.186	0.530	13.883	12.098	0.103	1.449	0.575	100.360	10513	478
17	2.580	7.680	1.609	57.237	2.959	0.141	0.553	13.546	11.975	0.090	1.384	0.519	100.274	12424	1911
18	2.549	7.643	1.643	57.462	3.082	0.119	0.521	13.399	11.943	0.127	1.361	0.567	100.415	13858	1434
Average	2.505	7.633	1.624	57.099	2.977	0.166	0.501	13.591	12.075	0.104	1.425	0.544	100.243		
Maximum	2.622	7.823	1.740	58.472	3.088	0.244	0.591	13.893	12.311	0.138	1.529	0.594	100.676		
Minimum	2.387	7.270	1.518	56.270	2.839	0.074	0.348	13.257	11.370	0.069	1.333	0.480	99.518		
Range	0.235	0.553	0.221	2.203	0.249	0.170	0.243	0.636	0.941	0.069	0.195	0.114	1.158		

Table VIII:38EPMA line scan data for inhomogeneous Little Birches South Site glass sample LBS7 glass waste (Table VII:11, EPMA run 3)

Analysis Number	Na_2O	MgO	Al_2O_3	SiO_2	P_2O_5	SO_2	Cl	K_2O	CaO	TiO_2	MnO	FeO	Total	Distance from first analysis/μm	Distance between analysis points/μm
1	2.435	8.278	1.655	56.120	2.651	0.112	0.253	13.649	12.770	0.085	1.283	0.525	99.816	0	0
2	2.140	7.979	2.135	57.944	2.375	0.000	0.329	13.545	12.349	0.128	1.250	0.576	100.751	1126	1126
3	2.247	8.369	1.634	56.861	2.689	0.074	0.323	12.930	13.319	0.114	1.302	0.545	100.406	3378	2251
4	2.203	8.233	1.558	56.612	2.771	0.153	0.329	12.889	13.490	0.120	1.348	0.503	100.209	3940	563
5	2.221	8.333	1.754	57.366	2.749	0.141	0.310	13.187	12.470	0.122	1.319	0.518	100.490	5066	1125
6	2.195	8.397	1.626	56.154	2.569	0.232	0.325	12.747	13.407	0.114	1.281	0.530	99.578	5629	563
Average	2.240	8.265	1.727	56.843	2.634	0.119	0.312	13.158	12.967	0.114	1.297	0.533	100.208		
Maximum	2.435	8.397	2.135	57.944	2.771	0.232	0.329	13.649	13.490	0.128	1.348	0.576	100.751		
Minimum	2.140	7.979	1.558	56.120	2.375	0.000	0.253	12.747	12.349	0.085	1.250	0.503	99.578		
Range	0.295	0.418	0.577	1.824	0.396	0.232	0.077	0.902	1.141	0.043	0.098	0.073	1.173		

Table VIII:39 EPMA line scan data for homogeneous Little Birches South Site glass sample LBS8 glass waste (Table VII:11, EPMA run 3)

Analysis Number	Na_2O	MgO	Al_2O_3	SiO_2	P_2O_5	SO_2	Cl	K_2O	CaO	TiO_2	MnO	FeO	Total
1	2.184	7.877	2.176	58.064	2.465	0.000	0.195	13.148	12.110	0.135	1.294	0.602	100.250
2	2.050	8.028	1.986	57.869	2.626	0.086	0.310	12.942	12.455	0.098	1.271	0.541	100.261
3	2.219	8.149	1.738	57.045	2.759	0.131	0.245	12.642	13.332	0.095	1.356	0.518	100.228
Average	2.151	8.018	1.967	57.659	2.617	0.072	0.250	12.911	12.632	0.109	1.307	0.553	100.246
Maximum	2.219	8.149	2.176	58.064	2.759	0.131	0.310	13.148	13.332	0.135	1.356	0.602	100.261
Minimum	2.050	7.877	1.738	57.045	2.465	0.000	0.195	12.642	12.110	0.095	1.271	0.518	100.228
Range	0.169	0.271	0.439	1.019	0.294	0.131	0.115	0.506	1.222	0.040	0.084	0.084	0.033

Table VIII:40 EPMA data for homogeneous Little Birches South Site glass sample LBS9 glass waste (Table VII:11, EPMA run 3)

Analysis Number	Na_2O	MgO	Al_2O_3	SiO_2	P_2O_5	SO_2	K_2O	CaO	TiO_2	MnO	FeO	Total
1	2.740	7.351	0.926	59.073	2.890	0.203	10.899	14.102	0.129	1.237	0.416	99.985
2	2.656	7.457	0.804	58.942	2.691	0.071	11.031	13.925	0.017	1.039	0.841	99.477
3	2.585	7.202	0.828	59.073	2.924	0.122	11.173	14.155	0.017	1.108	0.940	100.149
Average	2.660	7.336	0.853	59.029	2.835	0.132	11.034	14.060	0.054	1.128	0.732	99.870
Maximum	2.740	7.457	0.926	59.073	2.924	0.203	11.173	14.155	0.129	1.237	0.940	100.149
Minimum	2.585	7.202	0.804	58.942	2.691	0.071	10.899	13.925	0.017	1.039	0.416	99.477
Range	0.156	0.255	0.122	0.131	0.233	0.132	0.273	0.230	0.112	0.198	0.524	0.672

Table VIII:41 EPMA data for homogeneous Blunden's Wood vessel glass sample BW1 (Table VII:3, EPMA run 1)

Analysis Number	Na_2O	MgO	Al_2O_3	SiO_2	P_2O_5	SO_2	K_2O	CaO	TiO_2	MnO	FeO	Total
1	2.273	6.436	1.011	60.280	2.786	0.203	10.818	13.371	0.129	1.108	0.673	99.127
2	2.704	7.553	0.755	58.831	2.588	0.223	11.649	13.956	0.146	1.197	0.584	100.218
3	3.147	7.255	0.694	59.566	2.769	0.254	11.385	14.500	0.240	1.128	0.752	101.740
4	2.357	6.723	0.877	61.035	2.648	0.000	11.173	13.308	0.198	1.049	1.326	100.705
5	2.405	6.531	0.755	60.753	3.321	0.071	11.173	13.120	0.060	1.059	0.574	99.820
6	2.309	6.680	1.084	60.492	2.588	0.000	11.385	13.621	0.026	1.049	0.831	100.055
Average	2.533	6.863	0.863	60.159	2.783	0.125	11.264	13.646	0.133	1.098	0.790	100.278
Maximum	3.147	7.553	1.084	61.035	3.321	0.254	11.649	14.500	0.240	1.197	1.326	101.740
Minimum	2.273	6.436	0.694	58.831	2.588	0.000	10.818	13.120	0.026	1.049	0.574	99.127
Range	0.873	1.117	0.390	2.204	0.733	0.254	0.831	1.380	0.215	0.148	0.752	2.613

Table VIII:42 EPMA data for homogeneous Blunden's Wood waste glass or cullet sample BW2 (Table VII:3, EPMA run 1)

Analysis Number	Na_2O	MgO	Al_2O_3	SiO_2	P_2O_5	SO_2	K_2O	CaO	TiO_2	MnO	FeO	Total
1	2.920	7.127	1.035	48.586	5.038	0.152	19.813	12.085	0.258	1.356	0.940	99.342
2	2.920	7.531	1.315	48.607	5.314	0.000	20.086	12.409	0.198	1.019	0.831	100.213
3	3.003	7.351	1.133	48.848	5.176	0.122	20.289	12.534	0.069	0.960	0.920	100.426
4	2.333	7.499	1.583	49.532	5.081	0.223	19.276	12.566	0.129	1.257	0.990	100.521
5	3.003	7.053	1.133	48.033	5.572	0.122	20.076	12.273	0.129	0.712	0.752	98.874
6	3.147	7.723	0.853	48.999	4.960	0.152	20.036	12.043	0.146	1.098	0.950	100.135
Average	2.888	7.381	1.175	48.768	5.190	0.129	19.929	12.318	0.155	1.067	0.897	99.918
Maximum	3.147	7.723	1.583	49.532	5.572	0.223	20.289	12.566	0.258	1.356	0.990	100.521
Minimum	2.333	7.053	0.853	48.033	4.960	0.000	19.276	12.043	0.069	0.712	0.752	98.874
Range	0.814	0.670	0.731	1.499	0.612	0.223	1.013	0.523	0.189	0.643	0.237	1.646

Table VIII:43EPMA data for homogeneous Blunden's Wood waste glass or cullet sample BW3 (Table VII:3, EPMA run 1)

Analysis Number	Na_2O	MgO	Al_2O_3	SiO_2	P_2O_5	SO_2	K_2O	CaO	TiO_2	MnO	FeO	Total
1	2.234	5.961	2.663	62.169	2.787	0.090	11.461	11.536	0.066	0.921	0.969	100.856
2	2.234	5.961	2.783	61.910	2.734	0.128	11.945	11.628	0.165	0.988	0.893	101.369
3	2.116	6.068	2.739	61.571	2.817	0.154	11.847	12.151	0.099	0.921	0.845	101.328
4	2.423	5.887	2.390	61.810	2.589	0.000	12.400	11.833	0.041	0.846	0.931	101.150
Average	2.252	5.969	2.644	61.865	2.732	0.093	11.913	11.787	0.093	0.919	0.909	101.176
Maximum	2.423	6.068	2.783	62.169	2.817	0.154	12.400	12.151	0.165	0.988	0.969	101.369
Minimum	2.116	5.887	2.390	61.571	2.589	0.000	11.461	11.536	0.041	0.846	0.845	100.856
Range	0.307	0.181	0.393	0.598	0.228	0.154	0.939	0.616	0.124	0.142	0.123	0.513

Table VIII:44EPMA data for inhomogeneous Blunden's Wood waste glass or cullet sample BW4 (Table VII:3, EPMA run 1)

Analysis Number	Na_2O	MgO	Al_2O_3	SiO_2	P_2O_5	SO_2	K_2O	CaO	TiO_2	MnO	FeO	Total
1	2.501	6.840	1.815	58.861	2.726	0.152	9.137	13.590	0.275	0.950	2.355	99.302
2	2.860	7.638	1.133	59.566	2.752	0.203	8.802	14.646	0.103	0.831	1.643	100.251
3	2.692	7.265	1.315	57.996	2.510	0.355	9.147	14.405	0.172	0.960	2.434	99.409
Average	2.684	7.248	1.421	58.808	2.663	0.237	9.029	14.214	0.183	0.914	2.144	99.654
Maximum	2.860	7.638	1.815	59.566	2.752	0.355	9.147	14.646	0.275	0.960	2.434	100.251
Minimum	2.501	6.840	1.133	57.996	2.510	0.152	8.802	13.590	0.103	0.831	1.643	99.302
Range	0.359	0.798	0.682	1.570	0.242	0.203	0.344	1.056	0.172	0.129	0.792	0.949

Table VIII:45EPMA data for inhomogeneous Blunden's Wood crucible glass sample BW5 (Table VII:3, EPMA run 1)

Analysis Number	Na_2O	MgO	Al_2O_3	SiO_2	P_2O_5	SO_2	K_2O	CaO	TiO_2	MnO	FeO	Total
1	2.577	7.038	0.906	62.079	2.559	0.385	10.127	13.198	0.190	0.846	0.712	100.617
2	2.884	6.526	1.015	62.059	2.643	0.321	9.969	12.839	0.000	0.921	0.570	99.747
3	2.612	6.846	0.808	62.258	2.589	0.347	9.327	12.736	0.264	1.030	0.731	99.549
Average	2.691	6.804	0.910	62.132	2.597	0.351	9.808	12.924	0.151	0.932	0.671	99.971
Maximum	2.884	7.038	1.015	62.258	2.643	0.385	10.127	13.198	0.264	1.030	0.731	100.617
Minimum	2.577	6.526	0.808	62.059	2.559	0.321	9.327	12.736	0.000	0.846	0.570	99.549
Range	0.307	0.512	0.207	0.199	0.084	0.064	0.800	0.462	0.264	0.184	0.161	1.068

Table VIII:46EPMA data for inhomogeneous Blunden's Wood crucible glass sample BW6 (Table VII:3, EPMA run 1)

Analysis Number	Na_2O	MgO	Al_2O_3	SiO_2	P_2O_5	SO_2	K_2O	CaO	TiO_2	MnO	FeO	Total
1	2.045	3.807	7.345	67.818	0.873	0.090	12.370	5.224	0.148	0.435	0.883	101.039
2	2.293	3.285	7.214	67.608	1.010	0.000	12.410	5.316	0.107	0.419	1.064	100.726
3	1.986	3.338	7.422	68.545	1.200	0.000	12.528	4.988	0.231	0.285	0.969	101.490
Average	2.108	3.477	7.327	67.990	1.028	0.030	12.436	5.176	0.162	0.380	0.972	101.085
Maximum	2.293	3.807	7.422	68.545	1.200	0.090	12.528	5.316	0.231	0.435	1.064	101.490
Minimum	1.986	3.285	7.214	67.608	0.873	0.000	12.370	4.988	0.107	0.285	0.883	100.726
Range	0.307	0.523	0.207	0.937	0.327	0.090	0.158	0.328	0.124	0.151	0.180	0.765

Table VIII:47 EPMA data for inhomogeneous Blunden's Wood crucible glass sample BW7 (Table VII:3, EPMA run 1)

Analysis Number	Na_2O	MgO	Al_2O_3	SiO_2	P_2O_5	SO_2	K_2O	CaO	TiO_2	MnO	FeO	Total
1	2.068	0.565	2.248	77.113	0.623	0.128	14.682	1.365	0.148	0.000	1.842	100.784
2	2.092	0.672	2.041	76.426	0.456	0.000	14.751	1.427	0.000	0.117	1.719	99.700
3	1.938	0.512	2.150	77.233	0.608	0.000	14.475	1.180	0.066	0.109	1.444	99.714
Average	2.033	0.583	2.146	76.924	0.562	0.043	14.636	1.324	0.071	0.075	1.668	100.066
Maximum	2.092	0.672	2.248	77.233	0.623	0.128	14.751	1.427	0.148	0.117	1.842	100.784
Minimum	1.938	0.512	2.041	76.426	0.456	0.000	14.475	1.180	0.000	0.000	1.444	99.700
Range	0.154	0.160	0.207	0.807	0.167	0.128	0.277	0.246	0.148	0.117	0.399	1.084

Table VIII:48 EPMA data for homogeneous Blunden's Wood crucible glass sample BW8 (Table VII:3, EPMA run 1)

Analysis Number	Na_2O	MgO	Al_2O_3	SiO_2	P_2O_5	SO_2	K_2O	CaO	TiO_2	MnO	FeO	Total
1	2.506	6.740	0.928	60.575	2.612	0.090	9.999	13.424	0.190	0.712	1.149	98.923
2	2.482	5.801	2.368	62.209	2.400	0.090	10.691	11.402	0.272	0.929	0.978	99.622
3	2.305	6.345	1.342	61.830	2.612	0.128	9.959	12.942	0.107	0.645	0.997	99.213
Average	2.431	6.295	1.546	61.538	2.541	0.103	10.216	12.589	0.190	0.762	1.042	99.253
Maximum	2.506	6.740	2.368	62.209	2.612	0.128	10.691	13.424	0.272	0.929	1.149	99.622
Minimum	2.305	5.801	0.928	60.575	2.400	0.090	9.959	11.402	0.107	0.645	0.978	98.923
Range	0.201	0.938	1.441	1.634	0.213	0.039	0.731	2.022	0.165	0.285	0.171	0.699

Table VIII:49 EPMA data for homogeneous Blunden's Wood crucible glass sample BW9 (Table VII:3, EPMA run 1)

Analysis Number	Na_2O	MgO	Al_2O_3	SiO_2	P_2O_5	SO_2	K_2O	CaO	TiO_2	MnO	FeO	Total
1	2.671	6.452	2.019	60.425	2.506	0.450	11.767	11.536	0.082	0.787	0.551	99.246
2	2.825	6.964	1.135	58.712	2.908	0.321	11.175	13.106	0.264	0.812	0.541	98.762
3	2.990	6.846	0.950	58.632	3.030	0.347	10.770	14.378	0.000	0.887	0.503	99.334
Average	2.829	6.754	1.368	59.256	2.815	0.372	11.237	13.007	0.115	0.829	0.532	99.114
Maximum	2.990	6.964	2.019	60.425	3.030	0.450	11.767	14.378	0.264	0.887	0.551	99.334
Minimum	2.671	6.452	0.950	58.632	2.506	0.321	10.770	11.536	0.000	0.787	0.503	98.762
Range	0.319	0.512	1.070	1.793	0.524	0.128	0.998	2.843	0.264	0.100	0.047	0.571

Table VIII:50 EPMA data for inhomogeneous Blunden's Wood crucible glass sample BW10 (Table VII:3, EPMA run 1)

Analysis Number	Na_2O	MgO	Al_2O_3	SiO_2	P_2O_5	SO_2	K_2O	CaO	TiO_2	MnO	FeO	Total
1	3.026	7.572	1.113	59.040	2.643	0.154	9.959	14.861	0.000	0.971	0.940	100.279
2	3.156	7.764	1.211	58.273	2.422	0.218	9.999	14.686	0.124	0.787	0.589	99.229
3	3.109	7.220	1.113	58.951	2.521	0.193	9.702	14.358	0.124	1.046	0.646	98.982
Average	3.097	7.518	1.146	58.755	2.529	0.188	9.887	14.635	0.082	0.935	0.725	99.497
Maximum	3.156	7.764	1.211	59.040	2.643	0.218	9.999	14.861	0.124	1.046	0.940	100.279
Minimum	3.026	7.220	1.113	58.273	2.422	0.154	9.702	14.358	0.000	0.787	0.589	98.982
Range	0.130	0.544	0.098	0.767	0.220	0.064	0.296	0.503	0.124	0.260	0.351	1.297

Table VIII:51EPMA data for homogeneous Blunden's Wood glass waste sample BW11 (Table VII:3, EPMA run 1)

Analysis Number	Na_2O	MgO	Al_2O_3	SiO_2	P_2O_5	SO_2	K_2O	CaO	TiO_2	MnO	FeO	Total
1	2.789	1.077	1.528	74.294	0.175	0.000	16.046	1.262	0.082	0.804	0.693	98.750
2	2.470	0.906	2.368	74.722	0.334	0.000	16.619	2.309	0.099	0.075	1.073	100.977
3	2.281	0.619	3.034	75.678	0.471	0.000	15.957	1.427	0.247	0.042	1.653	101.408
4	2.671	0.970	2.183	71.673	0.456	0.000	17.024	3.305	0.041	0.218	1.358	99.899
5	2.021	1.472	2.434	70.458	0.782	0.000	16.569	4.413	0.148	0.410	1.482	100.189
6	2.009	0.810	2.532	74.891	0.577	0.000	15.403	2.689	0.099	0.226	1.482	100.719
Average	2.374	0.976	2.347	73.619	0.466	0.000	16.270	2.567	0.120	0.296	1.290	100.324
Maximum	2.789	1.472	3.034	75.678	0.782	0.000	17.024	4.413	0.247	0.804	1.653	101.408
Minimum	2.009	0.619	1.528	70.458	0.175	0.000	15.403	1.262	0.041	0.042	0.693	98.750
Range	0.780	0.853	1.506	5.221	0.608	0.000	1.620	3.151	0.206	0.762	0.959	2.658

Table VIII:52EPMA data for inhomogeneous Blunden's Wood glass waste sample BW12 (Table VII:3, EPMA run 1)

Analysis Number	Na_2O	MgO	Al_2O_3	SiO_2	P_2O_5	SO_2	K_2O	CaO	TiO_2	MnO	FeO	Total
1	0.946	0.970	4.409	76.446	0.592	0.026	12.835	2.186	0.396	0.310	2.916	102.031
2	0.520	0.800	4.824	78.070	0.402	0.000	11.165	1.519	0.247	0.209	3.239	100.995
3	1.229	0.832	3.613	74.443	0.577	0.000	13.773	2.545	0.231	0.109	2.859	100.211
4	1.135	1.152	2.870	77.980	0.486	0.000	13.259	2.402	0.000	0.260	1.634	101.177
5	1.064	0.992	3.220	76.914	0.402	0.000	13.210	2.083	0.289	0.301	1.947	100.422
Average	0.979	0.949	3.787	76.770	0.492	0.005	12.848	2.147	0.233	0.238	2.519	100.967
Maximum	1.229	1.152	4.824	78.070	0.592	0.026	13.773	2.545	0.396	0.310	3.239	102.031
Minimum	0.520	0.800	2.870	74.443	0.402	0.000	11.165	1.519	0.000	0.109	1.634	100.211
Range	0.709	0.352	1.954	3.627	0.190	0.026	2.608	1.026	0.396	0.201	1.605	1.820

Table VIII:53EPMA data for inhomogeneous Blunden's Wood glass waste sample BW13 (Table VII:3, EPMA run 1)

Analysis Number	Na_2O	MgO	Al_2O_3	SiO_2	P_2O_5	SO_2	K_2O	CaO	TiO_2	MnO	FeO	Total
1	2.979	6.968	1.522	59.304	2.433	0.071	10.494	14.918	0.283	1.356	1.118	101.466
2	2.764	6.893	1.376	59.133	2.588	0.122	10.068	15.284	0.103	1.138	0.930	100.425
3	2.967	7.148	1.315	58.600	2.924	0.355	10.058	15.231	0.198	1.019	0.445	100.327
Average	2.904	7.003	1.405	59.012	2.648	0.183	10.207	15.144	0.195	1.171	0.831	100.739
Maximum	2.979	7.148	1.522	59.304	2.924	0.355	10.494	15.284	0.283	1.356	1.118	101.466
Minimum	2.764	6.893	1.315	58.600	2.433	0.071	10.058	14.918	0.103	1.019	0.445	100.327
Range	0.215	0.255	0.207	0.704	0.492	0.284	0.436	0.366	0.180	0.336	0.673	1.139

Table VIII:54EPMA data for homogeneous Blunden's Wood glass waste sample BW14 (Table VII:3, EPMA run 1)

Analysis Number	Na_2O	MgO	Al_2O_3	SiO_2	P_2O_5	SO_2	K_2O	CaO	TiO_2	MnO	FeO	Total
1	2.776	6.319	1.912	58.187	2.769	0.000	8.063	17.291	0.198	0.604	0.811	98.920
2	2.680	6.648	1.888	58.509	2.803	0.122	8.012	17.855	0.172	1.069	0.703	100.478
3	2.788	6.648	2.022	58.449	2.890	0.051	8.164	18.064	0.198	0.910	0.683	100.863
Average	2.748	6.539	1.941	58.382	2.821	0.058	8.080	17.737	0.189	0.861	0.732	100.087
Maximum	2.788	6.648	2.022	58.509	2.890	0.122	8.164	18.064	0.198	1.069	0.811	100.863
Minimum	2.680	6.319	1.888	58.187	2.769	0.000	8.012	17.291	0.172	0.604	0.683	98.920
Range	0.108	0.330	0.134	0.322	0.121	0.122	0.152	0.774	0.026	0.465	0.129	1.943

Table VIII:55EPMA data for homogeneous Knightons crown glass sample K1 (Table VII:5, EPMA run 1)

Analysis Number	Na_2O	MgO	Al_2O_3	SiO_2	P_2O_5	SO_2	K_2O	CaO	TiO_2	MnO	FeO	Total
1	2.273	6.383	1.864	56.979	3.338	0.376	10.372	15.890	0.060	0.891	0.900	99.423
2	2.309	6.734	1.961	57.976	3.166	0.426	10.534	16.559	0.258	0.861	0.762	101.647
3	2.070	6.723	1.985	58.620	3.338	0.305	10.362	16.454	0.240	0.643	0.772	101.582
4	2.178	6.734	2.022	58.358	3.140	0.477	10.545	15.974	0.198	1.049	0.940	101.737
5	2.333	6.574	1.790	57.221	3.338	0.274	10.453	15.900	0.343	0.960	0.891	100.146
Average	2.233	6.629	1.924	57.831	3.264	0.372	10.453	16.155	0.220	0.881	0.853	100.907
Maximum	2.333	6.734	2.022	58.620	3.338	0.477	10.545	16.559	0.343	1.049	0.940	101.737
Minimum	2.070	6.383	1.790	56.979	3.140	0.274	10.362	15.890	0.060	0.643	0.762	99.423
Range	0.263	0.351	0.231	1.640	0.198	0.203	0.182	0.669	0.283	0.406	0.178	2.314

Table VIII:56EPMA data for homogeneous Knightons crown glass sample K2 (Table VII:5, EPMA run 1)

Analysis Number	Na_2O	MgO	Al_2O_3	SiO_2	P_2O_5	SO_2	K_2O	CaO	TiO_2	MnO	FeO	Total
1	1.914	6.031	2.229	58.922	3.597	0.325	10.382	16.643	0.343	0.792	0.990	102.258
2	1.903	5.840	2.253	58.559	3.226	0.305	10.251	16.224	0.240	0.703	0.881	100.466
3	2.070	5.946	2.412	59.093	3.261	0.325	10.241	16.329	0.172	0.742	0.861	101.535
4	2.070	5.904	2.436	58.469	3.183	0.325	10.433	16.183	0.189	1.059	0.920	101.258
5	1.819	5.840	2.351	57.996	3.226	0.355	10.393	16.496	0.129	1.088	0.613	100.389
Average	1.955	5.912	2.336	58.608	3.299	0.327	10.340	16.375	0.215	0.877	0.853	101.181
Maximum	2.070	6.031	2.436	59.093	3.597	0.355	10.433	16.643	0.343	1.088	0.990	102.258
Minimum	1.819	5.840	2.229	57.996	3.183	0.305	10.241	16.183	0.129	0.703	0.613	100.389
Range	0.251	0.191	0.207	1.097	0.414	0.051	0.192	0.460	0.215	0.386	0.376	1.870

Table VIII:57EPMA data for homogeneous Knightons crown glass sample K3 (Table VII:5, EPMA run 1)

Analysis Number	Na_2O	MgO	Al_2O_3	SiO_2	P_2O_5	SO_2	Cl	K_2O	CaO	TiO_2	MnO	FeO	Total
1	1.768	5.776	2.245	58.785	3.263	0.280	1.003	10.170	16.236	0.196	0.933	0.686	101.341
2	1.893	5.840	2.440	58.560	2.899	0.307	1.063	10.026	16.119	0.188	0.868	0.726	100.930
3	1.876	5.880	2.232	58.487	3.021	0.234	1.005	10.126	16.189	0.191	0.870	0.670	100.782
Average	1.846	5.832	2.306	58.611	3.061	0.274	1.023	10.108	16.181	0.191	0.890	0.694	101.018
Maximum	1.893	5.880	2.440	58.785	3.263	0.307	1.063	10.170	16.236	0.196	0.933	0.726	101.341
Minimum	1.768	5.776	2.232	58.487	2.899	0.234	1.003	10.026	16.119	0.188	0.868	0.670	100.782
Range	0.125	0.105	0.208	0.298	0.363	0.072	0.060	0.144	0.118	0.008	0.065	0.055	0.559

Table VIII:58EPMA data for homogeneous Knightons crown glass sample K4 (Table VII:5, EPMA run 2)

Analysis Number	Na_2O	MgO	Al_2O_3	SiO_2	P_2O_5	SO_2	Cl	K_2O	CaO	TiO_2	MnO	FeO	Total
1	1.880	5.929	2.361	57.814	3.084	0.351	1.003	10.099	16.350	0.175	0.870	0.784	100.699
2	1.858	5.847	2.306	57.270	3.120	0.302	0.943	10.135	16.100	0.208	0.910	0.695	99.694
3	1.862	5.830	2.335	58.336	3.307	0.331	1.133	10.118	16.294	0.225	0.918	0.653	101.341
Average	1.867	5.869	2.334	57.807	3.170	0.328	1.026	10.117	16.248	0.203	0.899	0.710	100.578
Maximum	1.880	5.929	2.361	58.336	3.307	0.351	1.133	10.135	16.350	0.225	0.918	0.784	101.341
Minimum	1.858	5.830	2.306	57.270	3.084	0.302	0.943	10.099	16.100	0.175	0.870	0.653	99.694
Range	0.023	0.100	0.055	1.066	0.222	0.048	0.190	0.036	0.249	0.050	0.048	0.131	1.647

Table VIII:59 EPMA data for homogeneous Knightons crown glass sample K5 (Table VII:5, EPMA run 2)

Analysis Number	Na_2O	MgO	Al_2O_3	SiO_2	P_2O_5	SO_2	Cl	K_2O	CaO	TiO_2	MnO	FeO	Total
1	2.054	5.879	2.237	57.590	3.175	0.326	1.038	10.214	16.263	0.192	0.820	0.649	100.436
2	1.834	5.750	2.356	58.007	2.977	0.321	0.973	10.085	16.019	0.175	0.847	0.727	100.071
3	1.907	5.816	2.308	57.203	2.897	0.213	1.085	10.150	16.002	0.205	0.929	0.760	99.476
Average	1.932	5.815	2.300	57.600	3.016	0.287	1.032	10.150	16.095	0.191	0.865	0.712	99.994
Maximum	2.054	5.879	2.356	58.007	3.175	0.326	1.085	10.214	16.263	0.205	0.929	0.760	100.436
Minimum	1.834	5.750	2.237	57.203	2.897	0.213	0.973	10.085	16.002	0.175	0.820	0.649	99.476
Range	0.220	0.129	0.120	0.804	0.277	0.114	0.113	0.129	0.261	0.030	0.109	0.111	0.960

Table VIII:60 EPMA data for homogeneous Knightons crown glass sample K6 (Table VII:5, EPMA run 2)

Analysis Number	Na_2O	MgO	Al_2O_3	SiO_2	P_2O_5	SO_2	K_2O	CaO	TiO_2	MnO	FeO	Total
1	2.046	5.861	2.606	58.710	3.123	0.477	10.362	16.224	0.318	0.841	0.851	101.547
2	2.142	6.085	2.326	58.811	3.321	0.173	10.119	16.381	0.232	0.801	0.792	101.222
3	1.867	5.861	2.436	58.449	3.338	0.173	10.271	16.454	0.155	0.910	0.564	100.508
4	1.914	6.117	2.399	58.429	3.304	0.274	10.190	15.974	0.258	0.980	0.900	100.810
5	1.950	6.138	2.302	58.791	3.321	0.305	10.372	16.298	0.198	1.039	0.980	101.776
6	2.046	5.659	2.558	58.680	3.243	0.152	10.190	15.890	0.060	1.039	0.940	100.501
Average	1.994	5.953	2.438	58.645	3.275	0.259	10.251	16.204	0.203	0.935	0.838	101.061
Maximum	2.142	6.138	2.606	58.811	3.338	0.477	10.372	16.454	0.318	1.039	0.980	101.776
Minimum	1.867	5.659	2.302	58.429	3.123	0.152	10.119	15.890	0.060	0.801	0.564	100.501
Range	0.275	0.479	0.304	0.382	0.216	0.325	0.253	0.565	0.258	0.237	0.416	1.275

Table VIII:61EPMA data for homogeneous Knightons crown glass sample K7 (Table VII:5, EPMA run 1)

Analysis Number	Na_2O	MgO	Al_2O_3	SiO_2	P_2O_5	SO_2	K_2O	CaO	TiO_2	MnO	FeO	Total
1	1.912	5.998	2.421	57.455	3.069	0.214	10.258	16.230	0.189	0.920	0.769	99.435
2	1.940	6.102	2.492	56.318	3.043	0.386	10.246	16.407	0.216	0.905	0.782	98.836
3	1.782	5.984	2.462	56.937	3.063	0.273	10.227	16.363	0.199	0.984	0.770	99.045
Average	1.878	6.028	2.458	56.903	3.058	0.291	10.244	16.333	0.201	0.936	0.774	99.106
Maximum	1.940	6.102	2.492	57.455	3.069	0.386	10.258	16.407	0.216	0.984	0.782	99.435
Minimum	1.782	5.984	2.421	56.318	3.043	0.214	10.227	16.230	0.189	0.905	0.769	98.836
Range	0.158	0.118	0.071	1.138	0.026	0.172	0.031	0.177	0.027	0.079	0.012	0.599

Table VIII:62EPMA data for homogeneous Knightons crown glass sample K8 (Table VII:5, EPMA run 1)

Analysis Number	Na_2O	MgO	Al_2O_3	SiO_2	P_2O_5	SO_2	K_2O	CaO	TiO_2	MnO	FeO	Total
1	1.873	5.943	2.468	56.444	3.135	0.143	10.259	16.532	0.237	0.913	0.756	98.703
2	1.937	6.128	2.456	55.964	3.072	0.214	10.192	16.640	0.212	0.934	0.741	98.492
3	1.958	6.083	2.534	57.001	3.063	0.303	9.984	16.733	0.246	0.896	0.721	99.522
Average	1.923	6.051	2.486	56.470	3.090	0.220	10.145	16.635	0.232	0.914	0.740	98.906
Maximum	1.958	6.128	2.534	57.001	3.135	0.303	10.259	16.733	0.246	0.934	0.756	99.522
Minimum	1.873	5.943	2.456	55.964	3.063	0.143	9.984	16.532	0.212	0.896	0.721	98.492
Range	0.085	0.185	0.078	1.036	0.072	0.160	0.276	0.201	0.034	0.037	0.035	1.031

Table VIII:63EPMA data for homogeneous Knightons crown glass sample K9 (Table VII:5, EPMA run 1)

Analysis Number	Na_2O	MgO	Al_2O_3	SiO_2	P_2O_5	SO_2	K_2O	CaO	TiO_2	MnO	FeO	Total
1	1.997	6.079	2.462	55.390	2.977	0.137	10.144	16.403	0.213	0.932	0.647	97.381
2	1.929	6.044	2.374	56.231	3.224	0.237	10.246	16.398	0.224	0.966	0.834	98.707
3	2.093	6.057	2.455	55.825	3.112	0.190	10.322	16.530	0.222	0.930	0.705	98.441
Average	2.006	6.060	2.431	55.816	3.104	0.188	10.237	16.444	0.220	0.943	0.729	98.176
Maximum	2.093	6.079	2.462	56.231	3.224	0.237	10.322	16.530	0.224	0.966	0.834	98.707
Minimum	1.929	6.044	2.374	55.390	2.977	0.137	10.144	16.398	0.213	0.930	0.647	97.381
Range	0.164	0.035	0.088	0.841	0.247	0.100	0.178	0.132	0.011	0.036	0.186	1.326

Table VIII:64EPMA data for homogeneous Knightons crown glass sample K10 (Table VII:5, EPMA run 1)

Analysis Number	Na_2O	MgO	Al_2O_3	SiO_2	P_2O_5	SO_2	K_2O	CaO	TiO_2	MnO	FeO	Total
1	2.017	6.022	2.380	56.680	3.210	0.231	10.509	16.215	0.239	0.935	0.773	99.211
2	1.918	6.195	2.422	54.857	3.140	0.184	10.212	16.381	0.211	0.914	0.694	97.129
3	1.808	6.205	2.482	56.405	3.111	0.267	10.193	16.584	0.221	0.923	0.679	98.878
4	1.798	6.124	2.472	56.351	2.973	0.249	10.414	16.066	0.206	0.968	0.753	98.375
5	1.909	6.032	2.414	55.256	3.124	0.296	10.444	16.303	0.219	0.894	0.698	97.591
6	1.679	6.021	2.458	56.194	3.096	0.208	10.431	16.364	0.217	0.942	0.687	98.296
Average	1.855	6.100	2.438	55.957	3.109	0.239	10.367	16.319	0.219	0.929	0.714	98.246
Maximum	2.017	6.205	2.482	56.680	3.210	0.296	10.509	16.584	0.239	0.968	0.773	99.211
Minimum	1.679	6.021	2.380	54.857	2.973	0.184	10.193	16.066	0.206	0.894	0.679	97.129
Range	0.338	0.184	0.102	1.823	0.237	0.113	0.316	0.518	0.034	0.074	0.094	2.082

Table VIII:65EPMA data for homogeneous Knightons crown glass sample K11 (Table VII:5, EPMA run 1)

Analysis Number	Na_2O	MgO	Al_2O_3	SiO_2	P_2O_5	SO_2	K_2O	CaO	TiO_2	MnO	FeO	Total
1	2.865	6.221	2.524	54.696	2.831	0.237	10.102	17.418	0.217	0.870	0.765	98.746
2	2.796	6.231	2.540	54.793	2.876	0.231	10.200	17.312	0.200	0.896	0.721	98.797
3	2.787	6.264	2.555	55.190	2.855	0.260	10.173	17.387	0.221	0.927	0.735	99.353
4	2.747	6.182	2.542	55.316	2.740	0.041	10.105	17.341	0.204	0.909	0.763	98.891
5	2.770	6.234	2.510	54.310	2.735	0.266	10.236	17.233	0.173	0.888	0.785	98.140
6	2.761	6.182	2.588	55.298	2.588	0.172	10.248	17.312	0.188	0.902	0.767	99.006
Average	2.788	6.219	2.543	54.934	2.771	0.201	10.177	17.334	0.200	0.899	0.756	98.822
Maximum	2.865	6.264	2.588	55.316	2.876	0.266	10.248	17.418	0.221	0.927	0.785	99.353
Minimum	2.747	6.182	2.510	54.310	2.588	0.041	10.102	17.233	0.173	0.870	0.721	98.140
Range	0.118	0.082	0.078	1.005	0.287	0.225	0.146	0.185	0.047	0.057	0.063	1.213

Table VIII:66EPMA data for homogeneous Knightons cullet sample K12 (Table VII:5, EPMA run 1)

Analysis Number	Na_2O	MgO	Al_2O_3	SiO_2	P_2O_5	SO_2	K_2O	CaO	TiO_2	MnO	FeO	Total
1	2.224	5.211	3.086	56.486	2.692	0.178	8.776	18.496	0.216	0.907	0.874	99.145
2	2.258	5.116	3.172	56.288	2.627	0.131	8.746	18.583	0.201	0.871	0.759	98.751
3	2.353	5.110	3.032	55.863	2.570	0.196	8.745	18.568	0.173	0.931	0.744	98.284
4	2.154	5.049	3.039	56.465	2.454	0.237	8.720	18.509	0.226	0.884	0.747	98.484
5	2.325	5.219	3.028	56.351	2.622	0.167	8.654	18.307	0.231	0.891	0.784	98.579
6	2.235	5.058	3.038	56.134	2.646	0.160	8.759	18.613	0.206	0.915	0.714	98.478
Average	2.258	5.127	3.066	56.264	2.602	0.178	8.733	18.513	0.209	0.900	0.770	98.620
Maximum	2.353	5.219	3.172	56.486	2.692	0.237	8.776	18.613	0.231	0.931	0.874	99.145
Minimum	2.154	5.049	3.028	55.863	2.454	0.131	8.654	18.307	0.173	0.871	0.714	98.284
Range	0.199	0.171	0.143	0.623	0.238	0.106	0.122	0.306	0.058	0.060	0.160	0.861

Table VIII:67EPMA data for homogeneous Knightons cullet sample K13 (Table VII:5, EPMA run 1)

Analysis Number	Na_2O	MgO	Al_2O_3	SiO_2	P_2O_5	SO_2	K_2O	CaO	TiO_2	MnO	FeO	Total
1	2.293	5.250	3.051	55.110	2.578	0.053	8.695	18.667	0.271	0.886	0.778	97.631
2	2.097	5.143	2.974	56.245	2.555	0.226	8.858	18.572	0.215	0.854	0.751	98.491
3	2.302	5.166	3.098	56.510	2.572	0.143	8.838	18.563	0.203	0.916	0.724	99.034
4	2.212	5.068	3.094	56.195	2.575	0.155	8.922	18.465	0.210	0.915	0.854	98.665
5	2.105	5.119	3.142	55.989	2.613	0.237	8.848	18.658	0.224	0.864	0.802	98.601
Average	2.202	5.149	3.072	56.010	2.579	0.163	8.832	18.585	0.225	0.887	0.782	98.484
Maximum	2.302	5.250	3.142	56.510	2.613	0.237	8.922	18.667	0.271	0.916	0.854	99.034
Minimum	2.097	5.068	2.974	55.110	2.555	0.053	8.695	18.465	0.203	0.854	0.724	97.631
Range	0.204	0.182	0.168	1.400	0.059	0.184	0.228	0.202	0.068	0.062	0.129	1.404

Table VIII:68 EPMA data for homogeneous Knightons cullet sample K14 (Table VII:5, EPMA run 1)

Analysis Number	Na_2O	MgO	Al_2O_3	SiO_2	P_2O_5	SO_2	K_2O	CaO	TiO_2	MnO	FeO	Total
1	2.990	7.444	2.041	57.626	3.151	0.642	11.264	13.280	0.313	1.306	1.016	101.073
2	3.026	7.572	1.921	57.655	3.045	0.283	11.175	13.198	0.181	1.046	0.313	99.416
3	2.376	4.788	4.147	66.094	0.957	0.000	12.370	6.537	0.305	0.619	1.064	99.258
Average	2.797	6.601	2.703	60.458	2.384	0.308	11.603	11.005	0.267	0.991	0.798	99.916
Maximum	3.026	7.572	4.147	66.094	3.151	0.642	12.370	13.280	0.313	1.306	1.064	101.073
Minimum	2.376	4.788	1.921	57.626	0.957	0.000	11.175	6.537	0.181	0.619	0.313	99.258
Range	0.650	2.783	2.227	8.468	2.195	0.642	1.196	6.743	0.132	0.686	0.750	1.815

Table VIII:69 EPMA data for inhomogeneous Knightons cullet or waste glass sample K15 (Table VII:5, EPMA run 1)

Analysis Number	Na_2O	MgO	Al_2O_3	SiO_2	P_2O_5	SO_2	K_2O	CaO	TiO_2	MnO	FeO	Total
1	2.659	6.281	2.150	57.028	2.696	0.154	10.226	16.595	0.099	0.846	0.864	99.598
2	2.411	5.183	3.449	60.355	2.005	0.347	11.234	13.321	0.181	0.712	0.855	100.053
3	2.624	6.388	2.161	58.373	2.643	0.000	10.108	15.815	0.082	0.661	0.997	99.852
Average	2.565	5.951	2.587	58.585	2.448	0.167	10.523	15.244	0.121	0.739	0.905	99.834
Maximum	2.659	6.388	3.449	60.355	2.696	0.347	11.234	16.595	0.181	0.846	0.997	100.053
Minimum	2.411	5.183	2.150	57.028	2.005	0.000	10.108	13.321	0.082	0.661	0.855	99.598
Range	0.248	1.205	1.299	3.328	0.691	0.347	1.126	3.274	0.099	0.184	0.142	0.454

Table VIII:70EPMA data for inhomogeneous Knightons cullet or waste glass sample K16 (Table VII:5, EPMA run 1)

Analysis Number	Na_2O	MgO	Al_2O_3	SiO_2	P_2O_5	SO_2	K_2O	CaO	TiO_2	MnO	FeO	Total
1	2.872	7.404	1.754	55.279	3.123	0.305	13.077	13.736	0.275	1.009	0.406	99.286
2	3.231	7.255	1.754	55.279	3.123	0.305	13.279	13.193	0.258	0.999	1.029	99.781
3	3.075	7.616	1.681	56.013	3.123	0.203	12.874	13.914	0.343	1.316	0.653	100.842
Average	3.059	7.425	1.730	55.524	3.123	0.271	13.077	13.614	0.292	1.108	0.696	99.969
Maximum	3.231	7.616	1.754	56.013	3.123	0.305	13.279	13.914	0.343	1.316	1.029	100.842
Minimum	2.872	7.255	1.681	55.279	3.123	0.203	12.874	13.193	0.258	0.999	0.406	99.286
Range	0.359	0.362	0.073	0.735	0.000	0.102	0.405	0.721	0.086	0.317	0.623	1.556

Table VIII:71EPMA data for inhomogeneous Knightons crucible glass sample K17 (Table VII:5, EPMA run 1)

Analysis Number	Na_2O	MgO	Al_2O_3	SiO_2	P_2O_5	SO_2	K_2O	CaO	TiO_2	MnO	FeO	Total
1	4.930	10.914	2.533	53.910	3.079	0.122	6.361	16.517	0.215	0.970	0.673	100.208
2	5.014	11.169	2.351	54.383	3.399	0.254	6.402	16.496	0.043	1.049	0.900	101.488
3	4.738	11.042	2.326	53.497	3.226	0.254	6.604	16.601	0.240	0.950	0.742	100.244
4	5.038	11.180	2.606	53.608	3.166	0.457	6.432	16.643	0.258	0.930	0.831	101.229
5	5.097	11.286	2.619	54.252	3.364	0.223	6.554	16.643	0.215	1.098	0.683	102.043
6	5.277	11.233	2.229	53.578	3.554	0.426	6.361	16.057	0.343	1.039	0.594	100.753
7	5.097	11.010	2.509	53.930	3.321	0.305	6.564	16.758	0.155	1.168	0.703	101.552
Average	5.027	11.119	2.453	53.880	3.301	0.292	6.468	16.531	0.210	1.029	0.732	101.074
Maximum	5.277	11.286	2.619	54.383	3.554	0.457	6.604	16.758	0.343	1.168	0.900	102.043
Minimum	4.738	10.914	2.229	53.497	3.079	0.122	6.361	16.057	0.043	0.930	0.594	100.208
Range	0.538	0.372	0.390	0.886	0.474	0.335	0.243	0.700	0.301	0.237	0.307	1.835

Table VIII:72EPMA data for homogeneous Knightons crucible glass sample K18 (Table VII:5, EPMA run 1)

Analysis Number	Na_2O	MgO	Al_2O_3	SiO_2	P_2O_5	SO_2	K_2O	CaO	TiO_2	MnO	FeO	Total
1	2.388	5.972	3.318	55.175	2.977	0.000	10.740	16.523	0.289	0.854	1.054	99.289
2	2.459	5.801	4.016	55.772	2.544	0.347	10.720	16.144	0.223	0.753	0.893	99.672
3	2.423	6.100	3.383	55.922	2.787	0.000	10.532	16.687	0.206	0.929	0.655	99.626
Average	2.423	5.958	3.573	55.623	2.769	0.116	10.664	16.451	0.239	0.846	0.867	99.529
Maximum	2.459	6.100	4.016	55.922	2.977	0.347	10.740	16.687	0.289	0.929	1.054	99.672
Minimum	2.388	5.801	3.318	55.175	2.544	0.000	10.532	16.144	0.206	0.753	0.655	99.289
Range	0.071	0.299	0.699	0.747	0.433	0.347	0.207	0.544	0.082	0.176	0.399	0.383

Table VIII:73EPMA data for inhomogeneous Knightons crucible glass sample K19 (Table VII:5, EPMA run 1)

Analysis Number	Na_2O	MgO	Al_2O_3	SiO_2	P_2O_5	SO_2	K_2O	CaO	TiO_2	MnO	FeO	Total
1	1.915	4.116	6.232	63.872	1.617	0.321	11.441	8.015	0.618	0.209	2.289	100.647
2	1.915	4.511	6.101	64.042	1.390	0.193	11.106	8.344	0.594	0.368	2.165	100.727
3	1.986	3.807	6.188	64.958	1.306	0.128	11.155	7.051	0.552	0.285	2.517	99.933
Average	1.938	4.145	6.174	64.291	1.438	0.214	11.234	7.803	0.588	0.287	2.324	100.436
Maximum	1.986	4.511	6.232	64.958	1.617	0.321	11.441	8.344	0.618	0.368	2.517	100.727
Minimum	1.915	3.807	6.101	63.872	1.306	0.128	11.106	7.051	0.552	0.209	2.165	99.933
Range	0.071	0.704	0.131	1.086	0.311	0.193	0.336	1.293	0.066	0.159	0.351	0.794

Table VIII:74EPMA data for homogeneous Knightons glass waste sample K20 (Table VII:5, EPMA run 1)

Analysis Number	Na_2O	MgO	Al_2O_3	SiO_2	P_2O_5	SO_2	K_2O	CaO	TiO_2	MnO	FeO	Total
1	5.097	10.031	1.864	51.777	3.718	0.223	9.359	15.827	0.172	0.792	0.623	99.499
2	4.990	9.967	2.144	51.948	3.718	0.152	9.380	16.183	0.112	0.693	0.752	100.040
3	4.858	10.233	2.071	51.877	3.476	0.305	9.167	15.681	0.301	0.980	0.762	99.753
4	4.810	10.457	1.961	52.380	3.261	0.254	9.137	15.869	0.112	0.495	0.762	99.524
Average	4.939	10.172	2.010	51.995	3.543	0.234	9.261	15.890	0.174	0.740	0.725	99.704
Maximum	5.097	10.457	2.144	52.380	3.718	0.305	9.380	16.183	0.301	0.980	0.762	100.040
Minimum	4.810	9.967	1.864	51.777	3.261	0.152	9.137	15.681	0.112	0.495	0.623	99.499
Range	0.287	0.489	0.280	0.604	0.457	0.152	0.243	0.502	0.189	0.485	0.139	0.541

Table VIII:75EPMA data for inhomogeneous Knightons glass waste sample K21 (Table VII:5, EPMA run 1)

Analysis Number	Na_2O	MgO	Al_2O_3	SiO_2	P_2O_5	SO_2	K_2O	CaO	TiO_2	MnO	FeO	Total
1	2.801	2.794	3.962	59.847	1.792	0.128	4.150	23.235	0.355	0.569	1.197	100.830
2	2.612	3.125	4.006	60.525	1.754	0.154	4.249	22.558	0.181	0.678	1.225	101.066
3	2.754	2.869	3.689	60.375	1.709	0.257	4.179	22.866	0.066	0.753	1.311	100.828
Average	2.722	2.929	3.885	60.249	1.752	0.180	4.193	22.886	0.201	0.667	1.244	100.908
Maximum	2.801	3.125	4.006	60.525	1.792	0.257	4.249	23.235	0.355	0.753	1.311	101.066
Minimum	2.612	2.794	3.689	59.847	1.709	0.128	4.150	22.558	0.066	0.569	1.197	100.828
Range	0.189	0.331	0.317	0.677	0.084	0.128	0.099	0.677	0.289	0.184	0.114	0.239

Table VIII:76EPMA data for homogeneous Sidney Wood vessel glass sample SW1 (Table VII:7, EPMA run 1)

Analysis Number	Na_2O	MgO	Al_2O_3	SiO_2	P_2O_5	SO_2	K_2O	CaO	TiO_2	MnO	FeO	Total
1	2.754	2.933	3.831	59.588	1.633	0.154	4.090	22.702	0.396	0.594	1.111	99.786
2	2.600	2.922	3.853	59.698	1.724	0.064	4.071	23.174	0.313	0.887	1.434	100.740
3	2.624	2.954	3.918	59.439	1.686	0.218	4.199	22.835	0.247	0.661	1.263	100.045
Average	2.659	2.936	3.867	59.575	1.681	0.146	4.120	22.903	0.319	0.714	1.269	100.190
Maximum	2.754	2.954	3.918	59.698	1.724	0.218	4.199	23.174	0.396	0.887	1.434	100.740
Minimum	2.600	2.922	3.831	59.439	1.633	0.064	4.071	22.702	0.247	0.594	1.111	99.786
Range	0.154	0.032	0.087	0.259	0.091	0.154	0.128	0.472	0.148	0.293	0.323	0.954

Table VIII:77EPMA data for homogeneous Sidney Wood vessel glass sample SW2 (Table VII:7, EPMA run 1)

Analysis Number	Na_2O	MgO	Al_2O_3	SiO_2	P_2O_5	SO_2	K_2O	CaO	TiO_2	MnO	FeO	Total
1	2.742	2.986	4.060	59.927	1.564	0.064	4.140	23.174	0.305	0.586	1.083	100.631
2	2.742	2.901	3.798	60.276	1.633	0.000	4.081	22.938	0.330	0.745	1.263	100.706
3	2.742	2.869	3.798	60.296	1.724	0.000	4.120	22.722	0.453	0.586	1.567	100.877
Average	2.742	2.918	3.885	60.166	1.640	0.021	4.114	22.944	0.363	0.639	1.304	100.738
Maximum	2.742	2.986	4.060	60.296	1.724	0.064	4.140	23.174	0.453	0.745	1.567	100.877
Minimum	2.742	2.869	3.798	59.927	1.564	0.000	4.081	22.722	0.305	0.586	1.083	100.631
Range	0.000	0.117	0.262	0.369	0.159	0.064	0.059	0.452	0.148	0.159	0.484	0.246

Table VIII:78EPMA data for homogeneous Sidney Wood vessel glass sample SW3 (Table VII:7, EPMA run 1)

Analysis Number	Na_2O	MgO	Al_2O_3	SiO_2	P_2O_5	SO_2	K_2O	CaO	TiO_2	MnO	FeO	Total
1	14.420	2.559	1.550	60.764	0.334	0.128	7.865	6.661	0.107	2.821	0.969	98.178
2	13.699	2.261	5.010	61.700	0.402	0.257	8.122	5.255	0.305	2.486	0.893	100.390
3	12.470	1.290	13.348	57.655	0.122	0.000	8.942	2.566	0.552	1.884	0.807	99.636
Average	13.530	2.037	6.636	60.040	0.286	0.128	8.309	4.827	0.322	2.397	0.890	99.401
Maximum	14.420	2.559	13.348	61.700	0.402	0.257	8.942	6.661	0.552	2.821	0.969	100.390
Minimum	12.470	1.290	1.550	57.655	0.122	0.000	7.865	2.566	0.107	1.884	0.807	98.178
Range	1.950	1.269	11.798	4.045	0.281	0.257	1.077	4.095	0.445	0.938	0.161	2.211

Table VIII:79EPMA data for inhomogeneous Sidney Wood crucible glass sample SW4 (Table VII:7, EPMA run 1)

Analysis Number	Na_2O	MgO	Al_2O_3	SiO_2	P_2O_5	SO_2	K_2O	CaO	TiO_2	MnO	FeO	Total
1	2.423	2.410	10.128	60.057	1.169	0.218	3.893	16.739	0.313	0.594	0.864	98.809
2	2.116	2.922	7.815	59.359	1.602	0.000	3.181	19.017	0.478	0.787	1.225	98.503
3	2.470	2.389	9.997	61.441	1.238	0.128	3.735	17.272	0.495	0.285	1.368	100.818
Average	2.336	2.574	9.313	60.286	1.337	0.116	3.603	17.676	0.429	0.555	1.152	99.377
Maximum	2.470	2.922	10.128	61.441	1.602	0.218	3.893	19.017	0.495	0.787	1.368	100.818
Minimum	2.116	2.389	7.815	59.359	1.169	0.000	3.181	16.739	0.313	0.285	0.864	98.503
Range	0.355	0.533	2.314	2.082	0.433	0.218	0.711	2.278	0.181	0.502	0.503	2.316

Table VIII:80EPMA data for inhomogeneous Sidney Wood crucible glass sample SW6 (Table VII:7, EPMA run 1)

Analysis Number	Na_2O	MgO	Al_2O_3	SiO_2	P_2O_5	SO_2	K_2O	CaO	TiO_2	MnO	FeO	Total
1	1.418	2.069	4.016	61.382	0.904	0.193	20.531	6.722	0.066	0.829	1.273	99.403
2	1.253	2.655	4.006	62.786	1.200	0.090	20.126	5.357	0.437	0.745	1.358	100.014
3	1.253	2.687	4.038	62.039	1.094	0.000	20.087	6.322	0.355	1.113	1.225	100.213
Average	1.308	2.471	4.020	62.069	1.066	0.094	20.248	6.134	0.286	0.896	1.285	99.876
Maximum	1.418	2.687	4.038	62.786	1.200	0.193	20.531	6.722	0.437	1.113	1.358	100.213
Minimum	1.253	2.069	4.006	61.382	0.904	0.000	20.087	5.357	0.066	0.745	1.225	99.403
Range	0.165	0.619	0.033	1.405	0.296	0.193	0.445	1.365	0.371	0.368	0.133	0.810

Table VIII:81EPMA data for inhomogeneous Sidney Wood furnace fragment SW7 (Table VII:7, EPMA run 1)

Analysis Number	Hils Glass Sample Number								
	G1	G5	G6	G7	G8	G9	G10	G11	G12
1	0.392	0.380	0.505	0.189	0.353	0.381	0.409	0.332	0.365
2	0.400	0.370	0.500	0.195	0.333	0.370	0.408	0.285	0.362
3	0.390	0.369	0.501	0.169	0.376	0.333	0.429	0.392	0.355
4	0.386	0.401	0.498	0.171	0.375	0.371	0.409	0.345	0.472
5	0.397	0.403	0.501	0.189	0.375	0.401	0.391	0.348	0.439
6	0.391	0.376	0.502		0.358	0.386	0.431		0.443
7	0.434	0.393	0.505		0.463	0.341	0.384		0.386
8	0.440	0.382	0.508		0.461	0.398	0.378		0.454
9	0.441	0.383	0.513		0.465	0.358	0.471		0.511
10	0.462	0.380	0.508		0.434	0.345	0.417		0.508
11	0.471	0.377	0.505		0.468	0.341			0.423
12	0.441	0.376	0.506		0.353	0.359			0.432
13	0.430	0.375	0.504		0.344	0.376			0.491
14	0.428	0.376	0.503		0.459	0.374			0.482
15	0.434	0.377	0.503		0.426	0.352			0.474
16	0.429	0.382	0.497		0.449				0.521
17	0.435		0.497		0.442				0.470
18	0.435		0.496		0.424				0.490
19	0.426		0.495		0.447				0.381
20	0.461				0.375				0.374
21	0.469				0.443				
22	0.466				0.474				
23	0.454				0.424				
24	0.452				0.444				
25	0.450								
26	0.452								
27	0.447								
28	0.459								
29	0.454								
30	0.437								

Table IX:1Ratio of CaO/(CaO+K_2O) for Hils glass samples G1 and G5-G12 (Table VIII:8 and Table VIII:10-Table VIII:17)

Analysis Number	Hils Glass Sample Number											
	G13	G14	G16	G17	G18	G19	G20	G21	G22	G23	G24	G27
1	0.329	0.395	0.409	0.270	0.515	0.781	0.777	0.420	0.336	0.389	0.168	0.513
2	0.421	0.396	0.395	0.269	0.581	0.784	0.779	0.427	0.375	0.404	0.171	0.496
3	0.425	0.387	0.489	0.270	0.572	0.782	0.783	0.428	0.345	0.417	0.194	0.467
4	0.407	0.419	0.473	0.274	0.580	0.785	0.781	0.432	0.323	0.412	0.170	0.472
5	0.334	0.387	0.474	0.291	0.609	0.784	0.784	0.416	0.377	0.412	0.162	0.493
6	0.323	0.410	0.498	0.272	0.615	0.783	0.777	0.397	0.355	0.416		0.447
7	0.343	0.404	0.502	0.268	0.619	0.783	0.777	0.439	0.350	0.391		0.466
8	0.343	0.353	0.506	0.262	0.620	0.779	0.796	0.450	0.326	0.415		0.444
9	0.380	0.365	0.463	0.244	0.584	0.782	0.808	0.462	0.340	0.405		0.466
10	0.394	0.396	0.475	0.280	0.592	0.781	0.801	0.412	0.355	0.414		0.487
11	0.429		0.481	0.279	0.602	0.784	0.773	0.461		0.426		0.498
12	0.409		0.503	0.276	0.605	0.781	0.780	0.452		0.388		0.452
13	0.425		0.526	0.251	0.622	0.781	0.784	0.494		0.395		0.483
14	0.414		0.498	0.249	0.605	0.781	0.773	0.466		0.404		0.446
15	0.416		0.508	0.256	0.589	0.781	0.765	0.401		0.376		
16	0.442		0.503	0.259	0.594	0.785	0.772			0.381		
17	0.385		0.516	0.244	0.589	0.782	0.792			0.372		
18	0.425		0.522	0.245	0.596	0.782	0.803			0.392		
19	0.376		0.492	0.251	0.595	0.780	0.793			0.373		
20	0.309		0.501	0.246	0.588	0.791	0.801			0.399		
21				0.267	0.568					0.401		
22				0.252	0.560					0.389		
23				0.257	0.569					0.389		
24				0.256	0.558					0.395		
25				0.263	0.565					0.396		
26				0.266	0.565					0.249		
27				0.264	0.597					0.421		
28				0.257	0.554					0.426		
29				0.261	0.549					0.433		
30				0.260	0.508							

Table IX:2 Ratio of CaO/(CaO+K_2O) for Hils glass samples G13-14, G16-G24, and G27 (Table VIII:7, Table VIII:18, and Table VIII:28)

Analysis Number	Litle Birches Glass Samples (North and South Site)											
	LBN1	LBN3	LBN4	LBN7	LBS2	LBS3	LBS4	LBS5	LBS6	LBS7	LBS8	LBS9
1	0.524	0.532	0.567	0.589	0.428	0.520	0.476	0.469	0.473	0.476	0.483	0.479
2	0.531	0.533	0.570	0.617	0.428	0.530	0.474	0.468	0.470	0.479	0.477	0.490
3	0.530	0.527	0.565	0.614	0.413	0.527	0.475	0.475	0.473	0.477	0.507	0.513
4	0.530	0.535	0.571	0.613	0.420	0.532	0.473	0.474	0.476	0.474	0.511	
5	0.531	0.536	0.574	0.613	0.430	0.533	0.471	0.469	0.475	0.473	0.486	
6	0.527	0.530	0.581	0.607	0.404	0.527	0.477	0.471	0.466	0.473	0.513	
7	0.527	0.533	0.574			0.479		0.470	0.479	0.473		
8	0.526	0.534				0.481		0.470	0.480	0.454		
9	0.527	0.529				0.480		0.470	0.479	0.477		
10	0.526	0.534				0.537		0.468	0.479	0.475		
11	0.526	0.531				0.513		0.479	0.478	0.463		
12		0.532				0.540		0.470	0.474	0.468		
13		0.531				0.513		0.468	0.478	0.467		
14		0.533				0.488		0.472	0.474	0.464		
15		0.531						0.467		0.468		
16		0.535						0.473		0.466		
17		0.536						0.438		0.469		
18		0.522						0.473		0.471		
19		0.524										
20		0.520										

Table IX:3 Ratio of CaO/(CaO+K_2O) for Little Birches (North and South Sites) glass samples LBN1, 3, 4 and 7, and LBS2-9 (Table VIII:29-Table VIII:40)

Analysis Number	Blunden's Wood Glass Samples													
	BW1	BW2	BW3	BW4	BW5	BW6	BW7	BW8	BW9	BW10	BW11	BW12	BW13	BW14
1	0.564	0.553	0.379	0.502	0.598	0.566	0.297	0.085	0.573	0.495	0.599	0.073	0.146	0.495
2	0.558	0.545	0.382	0.493	0.625	0.563	0.300	0.088	0.516	0.540	0.595	0.122	0.120	0.587
3	0.559	0.560	0.382	0.506	0.612	0.577	0.285	0.075	0.565	0.572	0.597	0.082	0.156	0.603
4		0.544	0.395	0.488								0.163	0.153	0.602
5		0.540	0.379									0.210	0.136	
6		0.545	0.375									0.149		

Table IX:4 Ratio of $CaO/(CaO+K_2O)$ for Blunden's Wood glass samples BW1-14 (Table VIII:41-Table VIII:54)

Analysis Number	Knightons Glass Samples									
	K1	K2	K3	K4	K5	K6	K7	K8	K9	K10
1	0.682	0.605	0.616	0.615	0.618	0.614	0.610	0.613	0.617	0.618
2	0.690	0.611	0.613	0.617	0.614	0.614	0.618	0.616	0.620	0.615
3	0.689	0.614	0.615	0.615	0.617	0.612	0.616	0.615	0.626	0.616
4		0.602	0.608		0.616	0.613	0.611			
5		0.603	0.613				0.611			
6							0.609			

Table IX:5 Ratio of $CaO/(CaO+K_2O)$ for Knightons glass samples K1-10 (Table VIII:55-Table VIII:64)

Analysis Number	Knightons Glass Samples										
	K11	K12	K13	K14	K15	K16	K17	K18	K19	K20	K21
1	0.607	0.633	0.678	0.682	0.541	0.619	0.541	0.722	0.606	0.412	0.628
2	0.616	0.629	0.680	0.677	0.542	0.543	0.512	0.720	0.601	0.429	0.633
3	0.619	0.631	0.680	0.677	0.346	0.610	0.498	0.715	0.613	0.387	0.631
4	0.607	0.632	0.680	0.674			0.519	0.721			0.635
5	0.610	0.627	0.679	0.678				0.717			
6	0.611	0.628	0.680					0.716			
7								0.719			

Table IX:6 Ratio of $CaO/(CaO+K_2O)$ for Knightons glass samples K11-21 (Table VIII:65-Table VIII:75)

Analysis Number	Sidney Wood Glass Samples					
	SW1	SW2	SW3	SW4	SW5	SW6
1	0.848	0.847	0.848	0.459	0.811	0.247
2	0.842	0.851	0.849	0.393	0.857	0.210
3	0.845	0.845	0.847	0.223	0.822	0.239

Table IX:7 Ratio of $CaO/(CaO+K_2O)$ for Sidney Wood glass samples SW1-6 (Table VIII:76-Table VIII:81)

APPENDIX A

Crucibles and Furnaces used in this Research

Crucibles

Two high refractory crucible fabrics were used in the experimental section of this research (see Section 2.7). Slip cast crucibles were produced in two modern refractory fabrics (mullite and alumina). Table B:1 lists the main raw materials of each fabric. The compositions are the commercial property of the Department of Engineering Materials, University of Sheffield and therefore cannot be stated here.

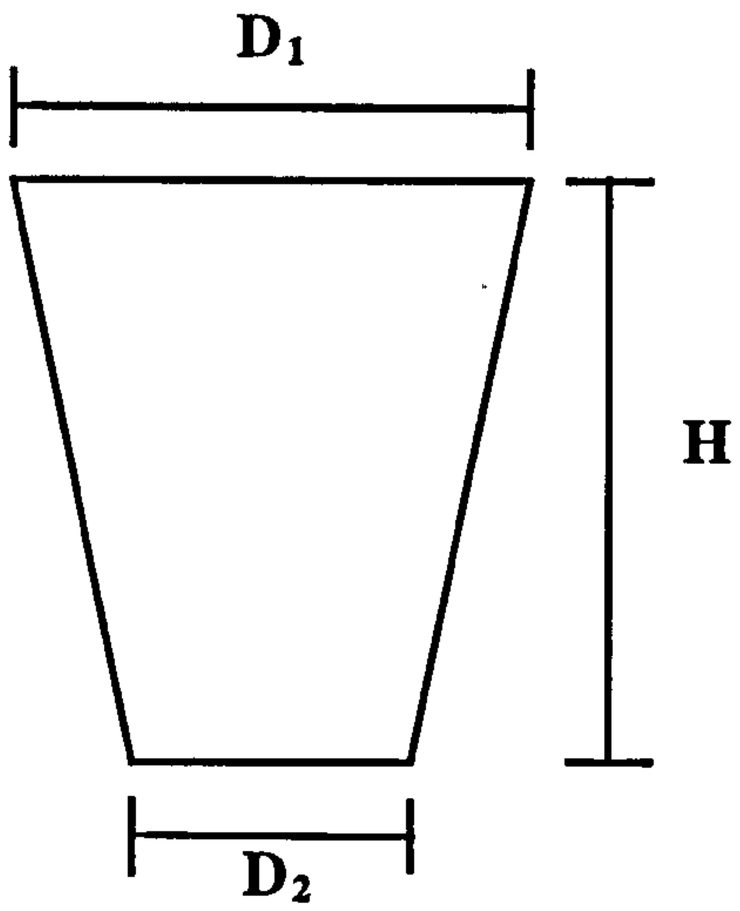
Crucible Fabric	Main Components						
Mullite	Kaolin	Ball Clay	Calcined Alumina	Molochite 120	Molochite 200	Sodium Silicate	Water
Alumina	Aluminum Oxide (RA10)			Flocculent		Distilled Water	

Table A:1 The Main Components of Mullite and Alumina Crucible Fabric

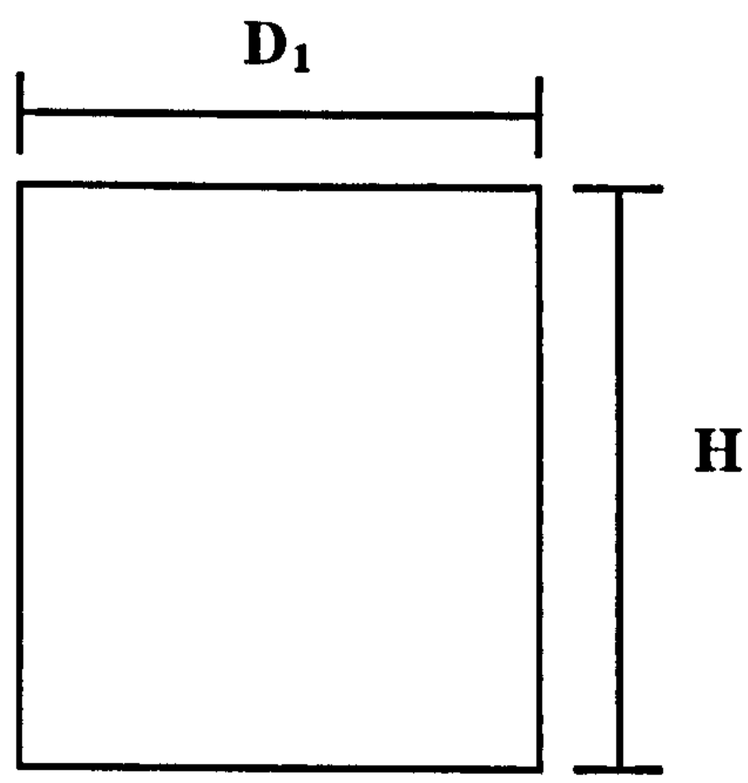
Conical (CON) and cylindrical (CYL) (Figure B:1) crucible forms were produced in mullite and alumina. Conical shields, tall form crucibles (CB) and trays were produced in mullite only. Figure B:1 shows the dimensions (H, D_1 and D_2) for each form, Table B:2 lists the mean dimensions and volume.

Crucible Type	Nominal External Dimensions/mm				Nominal Volume/ml
	H	D_1	D_2	L	
CYL 7	33.6	28.6	n/a	n/a	21
CON 7	60.3	49.5	42.8	n/a	73
CON 9	54.5	42.2	35.0	n/a	43
CB1	95.5	73.5	46.0	n/a	170
Small Tray	15	803	n/a	125	150
Shield	97.0	103.0	86.0	n/a	

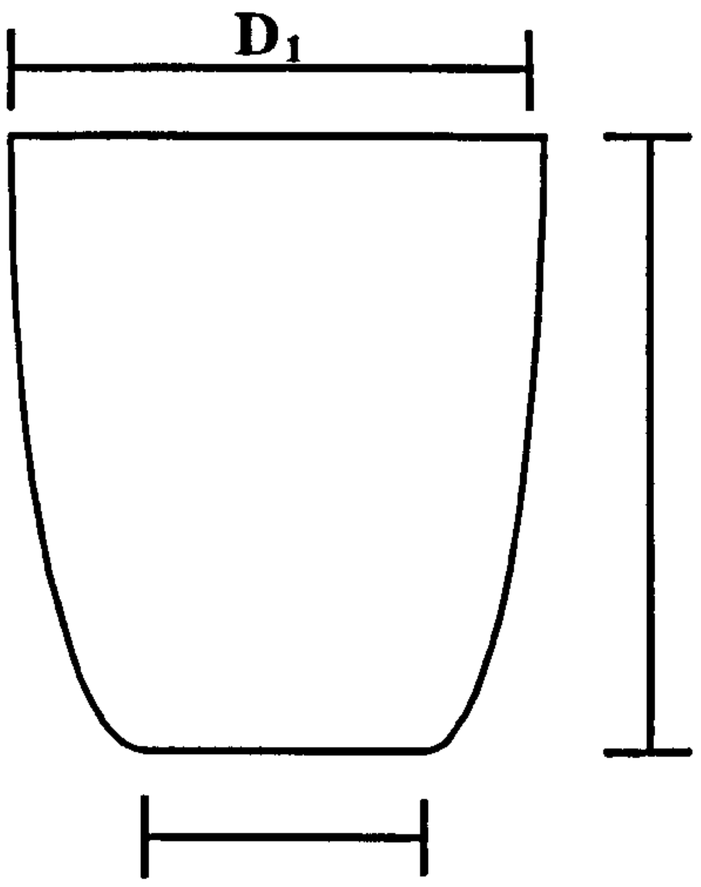
Table A:2 Crucible Dimensions and Volumes



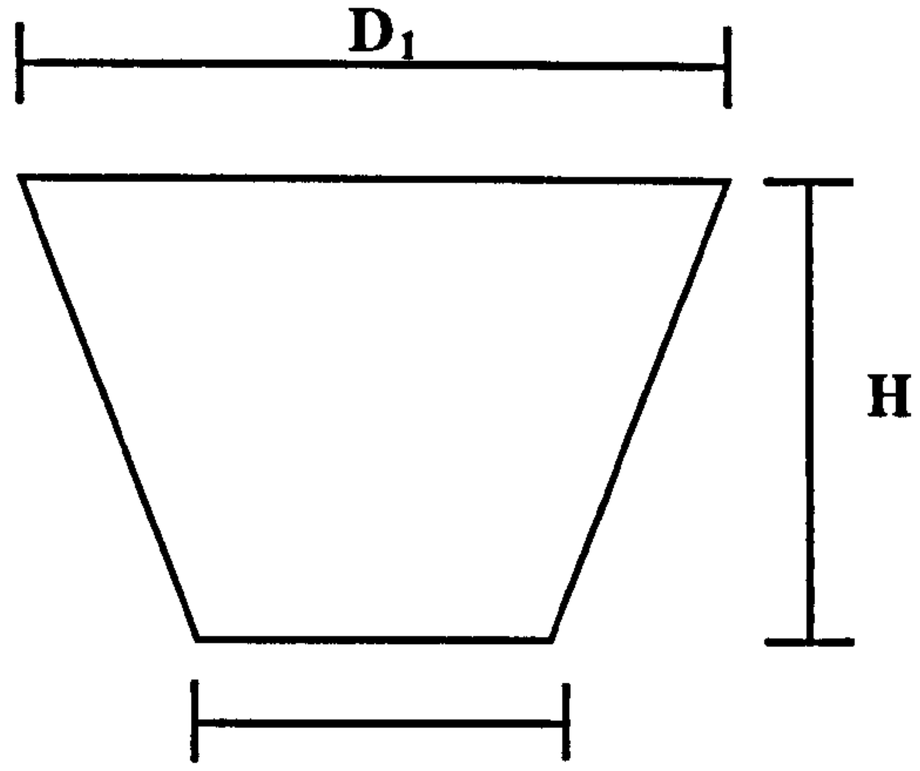
CONICAL FORM



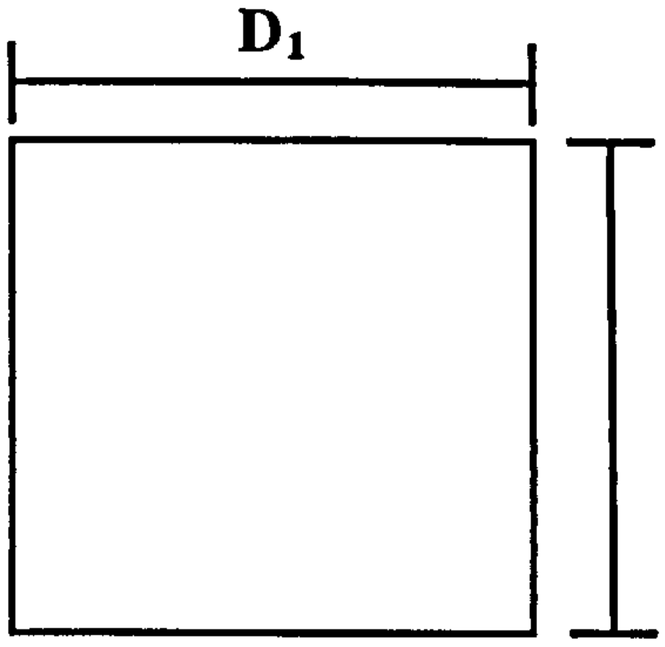
CYLINDRICAL FORM



TALL FORM



CONICAL SHIELD



TRAY FORM

Plan View

TRAY FORM

Side View

Figure A :1 Crucible Dimensions

Furnaces

Two types of electric and a pre-mix gas/air furnace were used in these experiments (Table B:3). Depending upon the experimental parameters to be tested, the electric furnaces were used predominantly as they are more isothermal than the gas furnace and reheat rapidly. In the gas furnace the temperature will also vary depending on the position of the crucible with respect to the burner. The crucibles were therefore always placed in the same position for each melt. The gas furnace was only used when a reducing atmosphere was required. Furnace temperatures were recorded from the furnace controller.

In the furnaces the glasses were all melted in crucibles placed inside shields. The shield serves two functions, a) to smooth temperature fluctuations inside the furnace and b) to capture spilt batch or glass.

FurnaceType	Use	Temperature Range	Furnace Atmosphere
Electric Muffle	Drying Raw Materials and Fritting	0-1150°C (±5°C)	Air
Electric	Glass Melting	1000-1450°C (±3-5°C)	Air
Gas	Glass Melting	1000-1650°C (±20°C)	Oxidising or Reducing

Table A:3 Furnace Types

APPENDIX B

EPMA Detection Limit Formula

The detection limit in Wt.% for the EPMA is calculated by the following formula:

$$C_{\min} = \left(\frac{FC_t}{I_t - B_t}\right) * \left(\frac{\lambda(\alpha,\beta)}{2t_e}\sqrt{\frac{1+4B_e t_e\left(1+\alpha_e^{-1}\right)}{\lambda(\alpha,\beta)}}\right)$$

F is the correction factor whose value is calculated.

C_t is the concentration in the standard specimen.

I_t is the peak intensity in the standard specimen.

B_t is the background intensity in the standard specimen.

B_e is the background intensity in the sample.

t_e is the counting time for the peak in the sample.

α_e is the constant which is introduced to take account of the differences in counting times for peak and background measurements.

$\lambda(\alpha,\beta)$ is a tabulated parameter which depends on the following statistical variables:

α is the probability for mistakenly considering the true concentration to be greater than 0 when it is in fact it is 0

β is the probability for mistakenly considering the true concentration to be 0 when it is in fact greater than 0.

In the Cameca software, λ is taken for $\alpha = \beta = 5\ \%$