APPENDIX 58: SCANNING ELECTRON MICROSCOPY OF LEAD SMELTING SLAG SAMPLES

This appendix summarises the results of the scanning electron microscopic (SEM) examination of selected mounted sub-samples, subsequent to their optical microscopy and following the laboratory measurement of mass specific magnetic susceptibility of a series of samples obtained from the following locations:

Botchergate, Carlisle

Grinton Smeltings, N. Yorkshire

Pentre Farm, Flint

The sub-samples were selected on the basis of the minimum, mean and maximum values in the measured range of magnetic susceptibility for each sample group; thus each site is represented by a set of three data sheets. These sheets are arranged in site order as listed above, and minimum, mean and maximum susceptibility within each site data.

Each data set consists of the sites of interest chosen for SEM analysis and the spectra analyses for those sites; the images are annotated with the analysis locations.

SCANNING ELECTRON MICROSCOPY

Sample: Lead smelting slag – Botchergate 337B
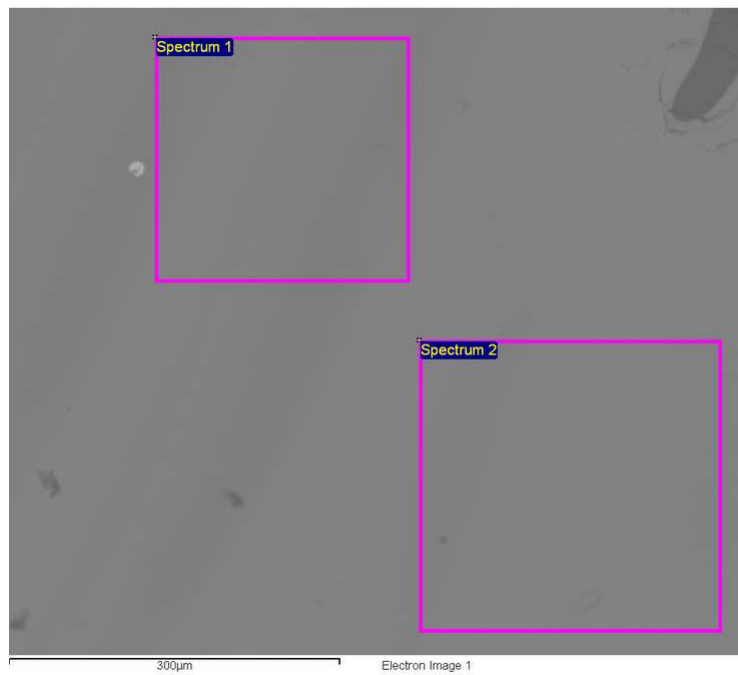
Site of interest 1

Site of interest 2

SCANNING ELECTRON MICROSCOPY

		Lead smelting slag	Sample	Botchergate 337B		Site of Interest 1
		Spectrum 1: Area			Spectrum 2: Area	
Element	Formula	Weight%	Weight% sigma	Compound%	Weight%	Weight% sigma	Compound%
F		n.d.			n.d.		
Na	Na2O	0.7	0.1	0.9	0.6	0.1	0.9
Mg	MgO	1.6	0.1	2.7	1.6	0.1	2.6
Al	Al2O3	2.1	0.1	4.1	2.1	0.1	4.0
Si	SiO2	22.5	0.2	48.0	22.2	0.2	47.6
P	P2O5	0.2	0.0	0.6	0.2	0.0	0.4
S	SO3	n.d.			n.d.		
K	K2O	1.2	0.0	1.5	1.2	0.0	1.4
Ca	CaO	6.4	0.1	8.9	6.6	0.1	9.2
Ti	TiO2	0.2	0.1	0.3	0.2	0.1	0.3
V	V2O5	0.1	0.1	0.1	n.d.		
Cr	Cr2O3	n.d.			n.d.		
Mn	MnO	0.4	0.1	0.5	0.3	0.1	0.4
Fe	Fe2O3	4.9	0.1	7.0	4.7	0.1	6.7
Co	CoO	n.d.			0.1	0.1	0.1
Ni	NiO	0.1	0.1	0.1	n.d.		
Cu	CuO	0.1	0.1	0.1	n.d.		
Zn	ZnO	2.8	0.1	3.5	2.3	0.1	2.8
As	As2O3	n.d.			n.d.		
Ag	Ag2O	n.d.			n.d.		
Sb	Sb2O3	0.4	0.2	0.5	0.4	0.2	0.5
Ba	BaO	0.1	0.1	0.1	n.d.		
Pb	PbO	20.3	0.3	21.9	22.3	0.3	24.0
O		36.5	0.3		36.0	0.3	
Totals		100.0			100.0		

Processing option : Oxygen by stoichiometry (Normalised)　　　n.d. = not detected
Number of iterations : 3
Sample is polished.
Sample is coated with Carbon - thickness (nm): 15.0, density (g/cm3): 2.25
Detector efficiency : Calculation

337B: Site of interest 1 spectra analysis

SCANNING ELECTRON MICROSCOPY

Lead smelting slag

Element	Formula	Sample Spectrum 1: Area Weight%	Weight% sigma	Compound%	Botchergate 337B Spectrum 2: Area Weight%	Weight% sigma	Compound%	Site of Interest 2 Spectrum 3: Phase Weight%	Weight% sigma	Compound%	Spectrum 4: Phase Weight%	Weight% sigma	Compound%
F		n.d.			n.d.			n.d.			n.d.		
Na	Na2O	0.7	0.1	0.9	0.6	0.1	0.8	0.7	0.1	0.9	0.6	0.1	0.7
Mg	MgO	1.6	0.1	2.7	1.7	0.1	2.8	1.5	0.1	2.4	1.6	0.1	2.6
Al	Al2O3	2.1	0.1	3.9	2.1	0.1	3.9	1.9	0.1	3.6	2.0	0.1	3.9
Si	SiO2	22.2	0.2	47.6	22.1	0.2	47.2	21.6	0.2	46.1	22.0	0.2	47.1
P	P2O5	0.2	0.0	0.5	0.2	0.0	0.4	0.2	0.0	0.4	0.2	0.0	0.4
S	SO3	n.d.			n.d.			n.d.			n.d.		
K	K2O	1.3	0.1	1.6	1.3	0.0	1.5	1.2	0.0	1.4	1.3	0.0	1.5
Ca	CaO	6.6	0.1	9.3	6.5	0.1	9.1	6.3	0.1	8.8	6.4	0.1	9.0
Ti	TiO2	0.1	0.1	0.2	0.2	0.1	0.3	0.1	0.1	0.2	0.2	0.1	0.3
V	V2O5	0.1	0.1	0.1	n.d.			0.1	0.1	0.1	n.d.		
Cr	Cr2O3	n.d.			n.d.			n.d.			n.d.		
Mn	MnO	0.5	0.1	0.6	0.4	0.1	0.5	0.4	0.1	0.5	0.4	0.1	0.5
Fe	Fe2O3	4.7	0.1	6.7	4.6	0.1	6.6	4.4	0.1	6.3	4.5	0.1	6.5
Co	CoO	n.d.			0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Ni	NiO	n.d.			n.d.			0.1	0.1	0.1	n.d.		
Cu	CuO	n.d.			n.d.			0.1	0.1	0.1	n.d.		
Zn	ZnO	2.5	0.1	3.1	2.5	0.1	3.1	2.4	0.1	3.0	2.7	0.1	3.3
As	As2O3	n.d.			n.d.			0.1	0.1	0.1	0.1	0.1	0.1
Ag	Ag2O	n.d.			n.d.			n.d.			n.d.		
Sb	Sb2O3	0.1	0.2	0.1	0.2	0.2	0.2	0.3	0.2	0.4	0.3	0.2	0.3
Ba	BaO	0.2	0.1	0.2	n.d.			0.2	0.1	0.2	n.d.		
Pb	PbO	22.7	0.3	24.4	23.0	0.3	24.8	24.0	0.3	25.9	22.6	0.3	24.3
O		36.1	0.3		35.8	0.3		35.0	0.3		35.6	0.3	
Totals		100.0			100.0			100.0			100.0		

Processing option : Oxygen by stoichiometry (Normalised)
Number of iterations : 3
Sample is polished.
Sample is coated with Carbon - thickness (nm): 15.0, density (g/cm3): 2.25
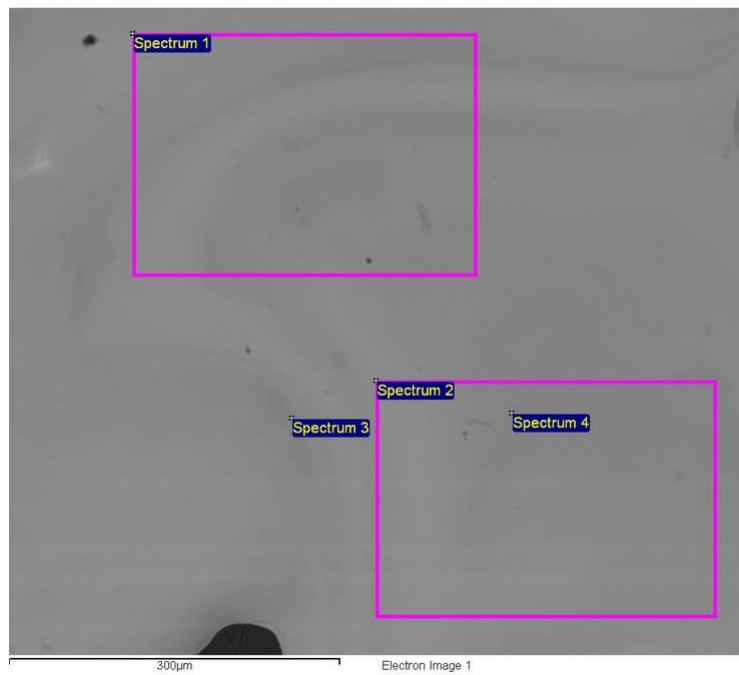Detector efficiency : Calculation

n.d. = not detected

337B: Site of interest 2 spectra analysis

4

SCANNING ELECTRON MICROSCOPY

Sample: Lead smelting slag – Botchergate 155A

Site of interest 1

Site of interest 2

SCANNING ELECTRON MICROSCOPY

Lead smelting slag   Sample   Botchergate 155A   Site of Interest 1

Element	Formula	Spectrum 1: Area Weight%	Weight% sigma	Compound%	Spectrum 2: Area Weight%	Weight% sigma	Compound%	Spectrum 3: Phase Weight%	Weight% sigma	Compound%	Spectrum 4: Phase Weight%	Weight% sigma	Compound%
F		n.d.			n.d.			n.d.			n.d.		
Na	Na2O	1.1	0.1	1.4	1.0	0.1	1.4	1.0	0.1	1.3	1.0	0.1	1.3
Mg	MgO	0.6	0.1	0.9	0.5	0.1	0.9	0.6	0.1	1.1	0.5	0.1	0.9
Al	Al2O3	1.7	0.1	3.2	1.8	0.1	3.3	1.9	0.1	3.5	1.8	0.1	3.4
Si	SiO2	18.7	0.2	40.0	18.7	0.2	40.0	19.8	0.2	42.2	18.0	0.2	38.4
P	P2O5	0.1	0.0	0.2	0.2	0.0	0.4	0.2	0.0	0.4	0.1	0.0	0.3
S	SO3	n.d.			n.d.			n.d.			n.d.		
K	K2O	1.1	0.0	1.3	1.1	0.0	1.3	1.3	0.1	1.5	1.0	0.1	1.2
Ca	CaO	2.5	0.1	3.5	2.5	0.1	3.5	2.5	0.1	3.5	2.4	0.1	3.3
Ti	TiO2	0.2	0.1	0.3	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.1	0.3
V	V2O5	n.d.			0.1	0.1	0.1	n.d.			n.d.		
Cr	Cr2O3	n.d.			n.d.			n.d.			n.d.		
Mn	MnO	0.4	0.1	0.6	0.4	0.1	0.6	0.5	0.1	0.6	0.4	0.1	0.5
Fe	Fe2O3	5.7	0.1	8.1	5.7	0.1	8.2	5.4	0.1	7.7	5.6	0.1	8.0
Co	CoO	n.d.			n.d.			n.d.			n.d.		
Ni	NiO	n.d.			n.d.			n.d.			n.d.		
Cu	CuO	0.1	0.1	0.1	n.d.			n.d.			n.d.		
Zn	ZnO	7.6	0.2	9.5	7.7	0.2	9.5	7.2	0.2	8.9	7.7	0.2	9.6
As	As2O3	n.d.			n.d.			n.d.			n.d.		
Ag	Ag2O	n.d.			n.d.			0.1	0.1	0.1	n.d.		
Sb	Sb2O3	0.3	0.1	0.3	0.3	0.2	0.4	0.3	0.2	0.3	0.3	0.2	0.4
Ba	BaO	n.d.			0.2	0.1	0.2	n.d.			0.1	0.1	0.1
Pb	PbO	29.5	0.3	31.8	30.2	0.3	32.5	28.2	0.3	30.3	31.0	0.3	33.4
O		31.5	0.3		31.5	0.3		32.7	0.3		30.8	0.3	
Totals		100.0			100.0			100.0			100.0		

Processing option : Oxygen by stoichiometry (Normalised)
Number of Iterations : 3
Sample is polished.
Sample is coated with Carbon - thickness (nm): 15.0, density (g/cm3): 2.25
Detector efficiency : Calculation

n.d. = not detected

155A: Site of interest 1 spectra analysis

6

Lead smelting slag **Sample** **Botchergate 155A** **Site of Interest 2**

Element	Formula	Spectrum 1: Area			Spectrum 2: Area			Spectrum 3: Phase			Spectrum 4: Phase		
		Weight%	Weight% sigma	Compound%	Weight%	Weight% sigma	Compound%	Weight%	Weight% sigma	Compound%	Weight%	Weight% sigma	Compound%
F		n.d.			n.d.			n.d.			n.d.		
Na	Na_2O	1.0	0.1	1.4	1.2	0.1	1.4	0.9	0.1	1.6	1.0	0.1	1.4
Mg	MgO	0.6	0.1	1.0	0.6	0.1	1.0	0.6	0.1	1.0	0.5	0.1	0.9
Al	Al_2O_3	1.6	0.1	3.0	1.6	0.1	3.0	2.3	0.1	3.0	1.7	0.1	3.1
Si	SiO_2	17.9	0.2	38.3	18.3	0.2	38.3	19.3	0.2	39.1	19.4	0.2	41.5
P	P_2O_5	0.1	0.0	0.3	0.1	0.0	0.3	0.2	0.0	0.2	0.1	0.0	0.2
S	SO_3	n.d.			n.d.			n.d.			n.d.		
K	K_2O	1.0	0.0	1.2	1.0	0.0	1.2	1.4	0.1	1.2	1.1	0.0	1.3
Ca	CaO	2.6	0.1	3.6	2.4	0.1	3.1	2.2	0.1	3.3	2.5	0.1	3.5
Ti	TiO_2	0.1	0.1	0.2	0.1	0.1	0.3	0.2	0.1	0.2	0.1	0.1	0.2
V	V_2O_5	n.d.			n.d.			n.d.			n.d.		
Cr	Cr_2O_3	n.d.			n.d.			n.d.			n.d.		
Mn	MnO	0.5	0.1	0.6	0.4	0.1	0.5	0.4	0.1	0.5	0.5	0.1	0.6
Fe	Fe_2O_3	5.8	0.1	8.3	5.7	0.1	7.3	5.1	0.1	8.2	5.5	0.1	7.9
Co	CoO	0.1	0.1	0.2	n.d.			n.d.			n.d.		
Ni	NiO	n.d.			n.d.			n.d.			n.d.		
Cu	CuO	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Zn	ZnO	8.2	0.2	10.2	8.2	0.2	8.0	6.5	0.2	10.2	7.5	0.2	9.3
As	As_2O_3	n.d.			n.d.			n.d.			n.d.		
Ag	Ag_2O	n.d.			n.d.			n.d.			n.d.		
Sb	Sb_2O_3	0.3	0.2	0.4	0.1	0.2	0.4	0.3	0.1	0.4	0.2	0.1	0.3
Ba	BaO	n.d.			n.d.			n.d.			n.d.		
Pb	PbO	30.3	0.3	32.7	30.4	0.3	31.5	29.2	0.3	32.7	28.6	0.3	30.9
O		31.1	0.3		30.9	0.3		32.1	0.3		32.1	0.3	
Totals		100.0			100.0			100.0			100.0		

Processing option : Oxygen by stoichiometry (Normalised)
Number of iterations : 3
Sample is polished.
Sample is coated with Carbon - thickness (nm): 15.0, density (g/cm3): 2.25
Detector efficiency : Calculation

n.d. = not detected

155A: Site of interest 2 spectra analysis

SCANNING ELECTRON MICROSCOPY

Sample: Lead smelting slag – Botchergate 160

Site of interest 1

Site of interest 2

Site of interest 3

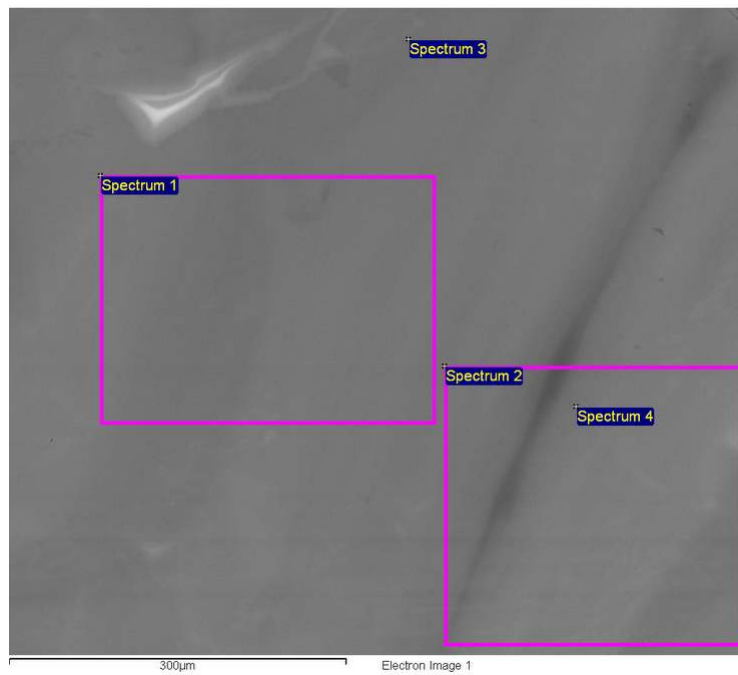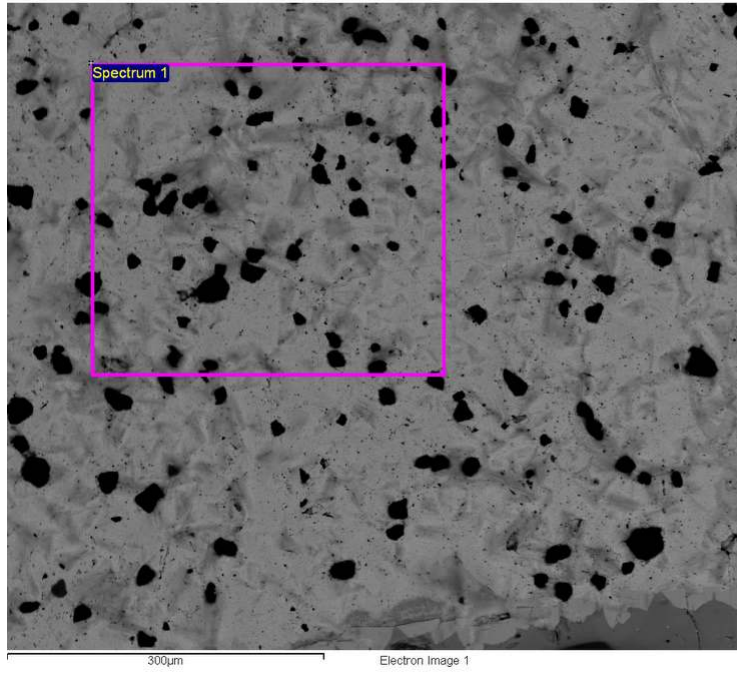**SCANNING ELECTRON MICROSCOPY**

Lead smelting slag   Sample   Botchergate 160   Site of Interest 1

Element	Formula	Spectrum 1: Area Weight%	Weight% sigma	Compound%	Spectrum 2: Area Weight%	Weight% sigma	Compound%	Spectrum 3: Phase Weight%	Weight% sigma	Compound%	Spectrum 4: Phase Weight%	Weight% sigma	Compound%
F		n.d.			n.d.			n.d.			n.d.		
Na	Na2O	1.2	0.1	1.6	0.9	0.1	1.2	1.0	0.1	1.3	1.0	0.1	1.3
Mg	MgO	0.5	0.1	0.8	0.6	0.1	1.0	0.6	0.1	0.9	0.5	0.1	0.9
Al	Al2O3	1.7	0.1	3.1	1.6	0.1	3.1	1.7	0.1	3.1	1.6	0.1	2.9
Si	SiO2	17.9	0.2	38.4	18.0	0.2	38.5	18.2	0.2	39.0	18.1	0.2	38.6
P	P2O5	0.2	0.0	0.4	0.1	0.0	0.3	0.1	0.0	0.3	0.1	0.0	0.2
S	SO3	n.d.			n.d.			n.d.			n.d.		
K	K2O	1.0	0.0	1.2	1.0	0.1	1.2	1.0	0.1	1.2	1.0	0.1	1.2
Ca	CaO	2.5	0.1	3.5	2.7	0.1	3.7	2.5	0.1	3.5	2.5	0.1	3.6
Ti	TiO2	0.1	0.1	0.1	0.2	0.1	0.3	0.1	0.1	0.2	0.1	0.1	0.1
V	V2O5	0.1	0.1	0.1	n.d.			n.d.			n.d.		
Cr	Cr2O3	0.1	0.1		n.d.			n.d.			0.1	0.1	0.1
Mn	MnO	0.4	0.1	0.5	0.4	0.1	0.5	0.5	0.1	0.6	0.4	0.1	0.5
Fe	Fe2O3	5.7	0.1	8.2	5.7	0.1	8.1	5.8	0.1	8.3	5.7	0.1	8.1
Co	CoO	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2
Ni	NiO	n.d.			n.d.			n.d.			0.1	0.1	0.1
Cu	CuO	n.d.			n.d.			n.d.			0.1	0.1	0.1
Zn	ZnO	7.9	0.2	9.8	7.7	0.2	9.6	7.9	0.2	9.9	7.7	0.2	9.6
As	As2O3	0.1	0.1	0.1	0.1	0.1	0.1	n.d.			n.d.		
Ag	Ag2O	n.d.			n.d.			n.d.			n.d.		
Sb	Sb2O3	0.4	0.2	0.5	0.4	0.2	0.5	0.2	0.2	0.2	0.2	0.2	0.2
Ba	BaO	0.2	0.1	0.2	n.d.			0.2	0.1	0.2	n.d.		
Pb	PbO	30.1	0.3	32.5	30.9	0.3	33.3	30.6	0.3	32.9	30.9	0.3	33.3
O		30.9	0.3		30.9	0.3		31.2	0.3		30.7	0.3	
Totals		100.0			100.0			100.0			100.0		

Processing option : Oxygen by stoichiometry (Normalised)   n.d. = not detected
Number of iterations : 3
Sample is polished.
Sample is coated with Carbon - thickness (nm): 15.0, density (g/cm3): 2.25
Detector efficiency : Calculation

160: Site of interest 1 spectra analysis

SCANNING ELECTRON MICROSCOPY

Lead smelting slag | Sample — Botchergate 160 | Site of Interest 2

Element	Formula	Spectrum 1: Area Weight%	Weight% sigma	Compound%	Spectrum 2: Area Weight%	Weight% sigma	Compound%	Spectrum 3: Phase Weight%	Weight% sigma	Compound%	Spectrum 4: Phase Weight%	Weight% sigma	Compound%
F		n.d.			n.d.			n.d.			n.d.		
Na	Na2O	0.9	0.1	1.2	0.9	0.1	1.2	1.0	0.1	1.4	1.0	0.1	1.4
Mg	MgO	0.5	0.1	0.9	0.5	0.1	0.9	0.5	0.1	0.9	0.5	0.1	0.9
Al	Al2O3	1.6	0.1	3.1	1.6	0.1	3.1	1.7	0.1	3.2	1.6	0.1	3.0
Si	SiO2	17.3	0.2	37.1	17.9	0.2	38.3	17.4	0.2	37.2	18.0	0.2	38.6
P	P2O5	0.1	0.1	0.2	0.1	0.0	0.3	0.1	0.1	0.2	0.2	0.1	0.4
S	SO3	n.d.			n.d.			n.d.			n.d.		
K	K2O	0.9	0.1	1.1	1.0	0.1	1.2	1.0	0.1	1.2	1.0	0.1	1.1
Ca	CaO	2.4	0.1	3.3	2.4	0.1	3.4	2.4	0.1	3.4	2.5	0.1	3.5
Ti	TiO2	0.1	0.1	0.2	0.1	0.1	0.2	0.1	0.1	0.2	0.1	0.1	0.2
V	V2O5	n.d.			n.d.			0.1	0.1	0.1	n.d.		
Cr	Cr2O3	n.d.			n.d.			n.d.			n.d.		
Mn	MnO	0.4	0.1	0.5	0.4	0.1	0.5	0.4	0.1	0.5	0.4	0.1	0.5
Fe	Fe2O3	5.3	0.1	7.6	5.6	0.1	8.0	5.5	0.1	7.9	5.4	0.1	7.8
Co	CoO	n.d.			0.1	0.1	0.1	0.1	0.1	0.1	n.d.		
Ni	NiO	n.d.			n.d.			n.d.			n.d.		
Cu	CuO	0.1	0.1	0.1	n.d.			n.d.			n.d.		
Zn	ZnO	7.7	0.2	9.5	7.4	0.2	9.2	7.7	0.2	9.6	7.6	0.2	9.4
As	As2O3	n.d.			0.1	0.1	0.1	0.1	0.1	0.1	n.d.		
Ag	Ag2O	n.d.			n.d.			n.d.			n.d.		
Sb	Sb2O3	0.4	0.2	0.4	0.3	0.2	0.3	0.4	0.2	0.5	0.4	0.2	0.5
Ba	BaO	0.3	0.1	0.3	n.d.			0.2	0.1	0.2	n.d.		
Pb	PbO	33.9	0.3	36.6	32.6	0.3	35.2	32.7	0.3	35.2	31.7	0.3	34.1
O		29.9	0.3		30.5	0.3		30.1	0.3		30.9	0.3	
Totals		100.0			100.0			100.0			100.0		

Processing option : Oxygen by stoichiometry (Normalised)
Number of iterations : 3
Sample is polished.
Sample is coated with Carbon - thickness (nm): 15.0, density (g/cm3): 2.25
Detector efficiency : Calculation

n.d. = not detected

160: Site of interest 2 spectra analysis

Lead smelting slag		Sample		Botchergate 160	Site of interest 3

Spectrum 1: Area

Element	Formula	Weight%	Weight% sigma	Compound%
F				
Na	Na2O	n.d.		
Mg	MgO	0.1	0.1	0.1
Al	Al2O3	n.d.		
Si	SiO2	5.3	0.1	11.4
P	P2O5	0.1	0.1	0.2
S	SO3	n.d.		
K	K2O	n.d.		
Ca	CaO	0.1	0.1	0.1
Ti	TiO2	0.1	0.1	0.1
V	V2O5	n.d.		
Cr	Cr2O3	n.d.		
Mn	MnO	n.d.		
Fe	Fe2O3	0.1	0.1	0.1
Co	CoO	n.d.		
Ni	NiO	n.d.		
Cu	CuO	n.d.		
Zn	ZnO	0.1	0.2	0.1
As	As2O3	n.d.		
Ag	Ag2O	n.d.		
Sb	Sb2O3	0.2	0.2	0.2
Ba	BaO	0.1	0.2	0.2
Pb	PbO	84.2	0.7	90.7
O		11.6	0.3	
Totals		100.0		

Processing option : Oxygen by stoichiometry (Normalised)
Number of iterations : 3
Sample is polished.
Sample is coated with Carbon - thickness (nm): 15.0, density (g/cm3): 2.25
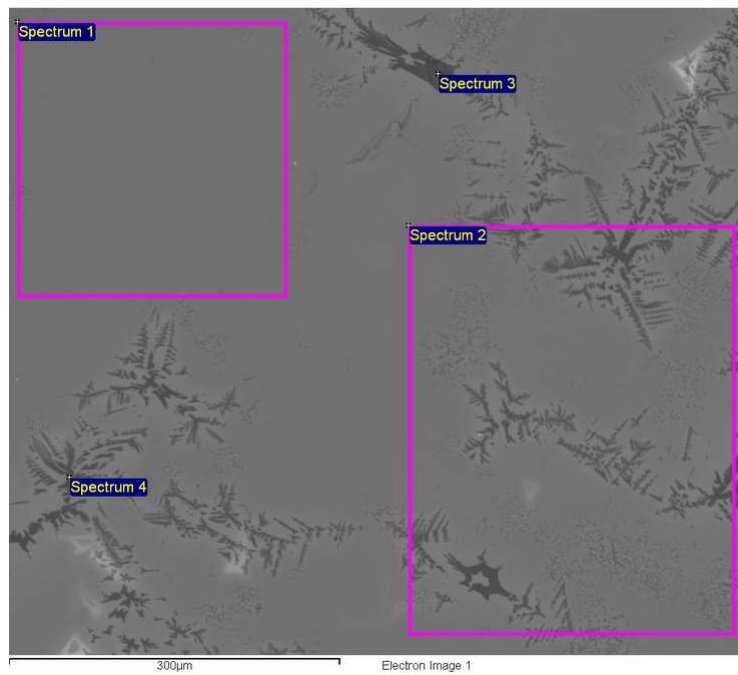Detector efficiency : Calculation

n.d. = not detected

160: Site of interest 3 spectra analysis

SCANNING ELECTRON MICROSCOPY

Sample: Lead smelting slag – Grinton Smeltings GS-C

Site of interest 1

Site of interest 2

Lead smelting slag

Element	Formula	Sample Spectrum 1: Area Weight%	Weight% sigma	Compound%	Grinton Smeltings GS-C Spectrum 2: Area Weight%	Weight% sigma	Compound%	Site of Interest 1 Spectrum 3: Phase Weight%	Weight% sigma	Compound%	Spectrum 4: Phase Weight%	Weight% sigma	Compound%
F		5.9	0.5	0.0	6.7	0.5	0.0	14.8	0.5	0.0	14.4	0.5	0.0
Na	Na2O	0.1	0.1	0.2	0.2	0.1	0.3	n.d.			0.1	0.1	0.1
Mg	MgO	0.3	0.1	0.6	0.3	0.1	0.5	0.1	0.0	0.1	n.d.		
Al	Al2O3	1.4	0.1	2.7	1.3	0.1	2.5	n.d.			n.d.		
Si	SiO2	13.9	0.1	29.8	14.0	0.1	29.9	14.5	0.1	31.0	14.5	0.1	31.1
P	P2O5	0.5	0.1	1.1	0.4	0.0	1.0	0.1	0.0	0.2	0.1	0.0	0.2
S	SO3	n.d.			n.d.			n.d.			n.d.		
K	K2O	0.6	0.0	0.8	0.6	0.0	0.7	n.d.			n.d.		
Ca	CaO	11.2	0.1	15.6	12.2	0.1	17.1	36.4	0.3	51.0	36.8	0.3	51.5
Ti	TiO2	0.1	0.1	0.1	0.1	0.1	0.2	n.d.			n.d.		
V	V2O5	n.d.			n.d.			n.d.			n.d.		
Cr	Cr2O3	n.d.			0.1	0.1	0.1	0.1	0.0	0.1	0.1	0.0	0.1
Mn	MnO	0.1	0.1	0.2	0.1	0.1	0.2	0.1	0.0	0.1	n.d.		
Fe	Fe2O3	1.9	0.1	2.7	1.9	0.1	2.8	0.1	0.0	0.2	0.1	0.0	0.1
Co	CoO	n.d.			n.d.			n.d.			n.d.		
Ni	NiO	n.d.			0.1	0.1	0.1	n.d.			n.d.		
Cu	CuO	0.1	0.1	0.1	n.d.			n.d.			n.d.		
Zn	ZnO	1.2	0.1	1.5	1.0	0.1	1.2	n.d.			n.d.		
As	As2O3	n.d.			n.d.			n.d.			n.d.		
Ag	Ag2O	n.d.			n.d.			0.1	0.1	0.1	n.d.		
Sb	Sb2O3	n.d.			n.d.			n.d.			0.1	0.2	0.1
Ba	BaO	18.2	0.2	20.3	18.0	0.2	20.1	0.8	0.1	0.9	0.8	0.1	0.9
Pb	PbO	17.6	0.3	18.9	15.8	0.2	17.0	1.7	0.1	1.8	1.7	0.1	1.8
O	O	27.1			27.4			31.5			31.6		
Totals		100.0			100.0			100.0			100.0		

n.d. = not detected

Processing option : Oxygen by stoichiometry (Normalised)
Number of iterations : 3
Sample is polished.
Sample is coated with Carbon - thickness (nm): 15.0, density (g/cm3): 2.25
Detector efficiency : Calculation

GS-C: Site of interest 1 spectra analysis
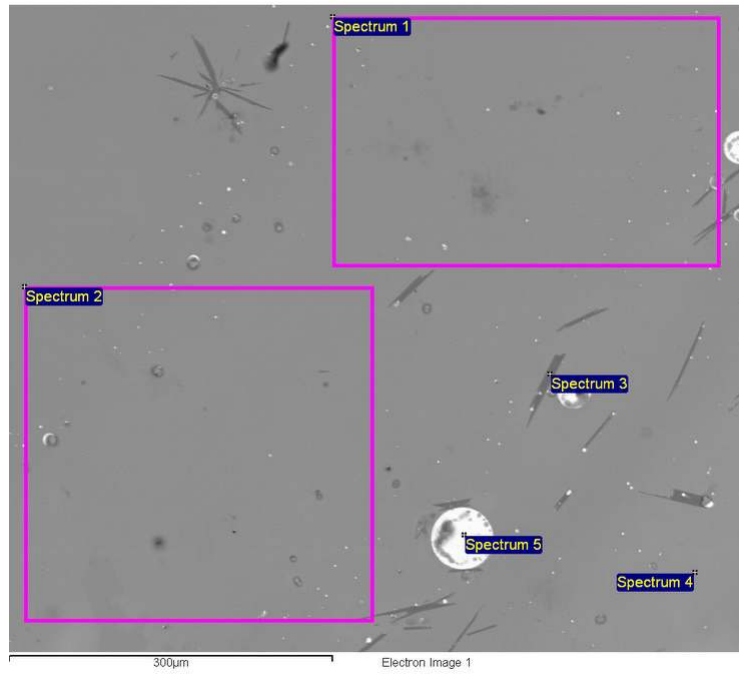
SCANNING ELECTRON MICROSCOPY

Lead smelting slag — Sample — Grinton Smeltings GS-C — Site of Interest 2

Element	Formula	Spectrum 1: Area Weight%	Weight% sigma	Compound%	Spectrum 2: Area Weight%	Weight% sigma	Compound%	Spectrum 3: Phase Weight%	Weight% sigma	Compound%	Spectrum 4: Phase Weight%	Weight% sigma	Compound%
F		6.3	0.5	0.0	6.4	0.5	0.0	17.9	0.5	0.0	13.4	0.5	0.0
Na	Na2O	0.1	0.1	0.2	0.2	0.1	0.3	n.d.			n.d.		
Mg	MgO	0.4	0.1	0.6	0.3	0.0	0.5	0.1	0.0	0.1	0.1	0.0	0.2
Al	Al2O3	1.4	0.1	2.7	1.4	0.1	2.6	n.d.			n.d.		
Si	SiO2	13.9	0.1	29.7	14.0	0.1	29.9	14.4	0.1	30.7	14.3	0.1	30.6
P	P2O5	0.3	0.0	0.8	0.4	0.0	1.0	0.1	0.0	0.1	0.2	0.0	0.5
S	SO3	n.d.			n.d.			n.d.			n.d.		
K	K2O	0.6	0.0	0.7	0.6	0.0	0.8	n.d.			n.d.		
Ca	CaO	11.2	0.1	15.7	11.8	0.1	16.4	35.3	0.3	49.4	35.8	0.3	50.1
Ti	TiO2	n.d.			0.1	0.1	0.1	n.d.			n.d.		
V	V2O5	n.d.			n.d.			n.d.			n.d.		
Cr	Cr2O3	0.1	0.1	0.1	n.d.			0.1	0.0	0.1	0.1	0.0	0.1
Mn	MnO	n.d.			0.1	0.1	0.1	n.d.			n.d.		
Fe	Fe2O3	2.0	0.1	2.8	1.8	0.1	2.6	0.1	0.0	0.2	0.2	0.1	0.2
Co	CoO	n.d.			n.d.			0.1	0.1	0.1	n.d.		
Ni	NiO	n.d.			n.d.			n.d.			n.d.		
Cu	CuO	n.d.			0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Zn	ZnO	1.0	0.1	1.2	1.0	0.1	1.2	n.d.			0.1	0.1	0.1
As	As2O3	n.d.			0.1	0.1	0.1	n.d.			n.d.		
Ag	Ag2O	n.d.			n.d.			n.d.			n.d.		
Sb	Sb2O3	0.1	0.2	0.1	n.d.			0.1	0.2	0.1	0.3	0.2	0.3
Ba	BaO	18.2	0.2	20.3	17.7	0.2	19.8	0.9	0.1	1.0	1.6	0.1	1.8
Pb	PbO	17.8	0.2	19.2	17.0	0.2	18.4	0.2	0.1	0.3	2.6	0.1	2.8
O		26.8	0.3		27.2	0.3		30.8	0.3		31.4	0.3	
Totals		100.0			100.0			100.0			100.0		

Processing option : Oxygen by stoichiometry (Normalised)   n.d. = not detected
Number of iterations : 3
Sample is polished.
Sample is coated with Carbon - thickness (nm): 15.0, density (g/cm3): 2.25
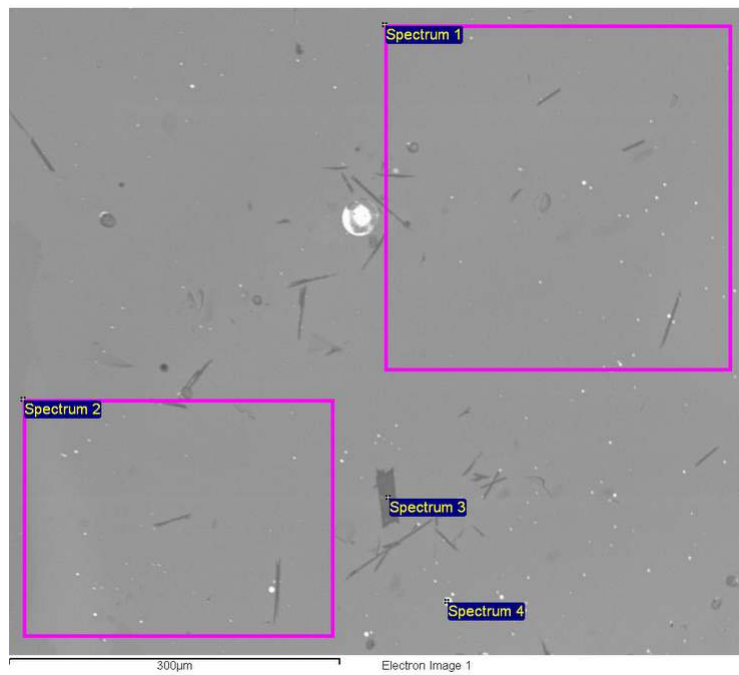Detector efficiency : Calculation

GS-C: Site of interest 2 spectra analysis

SCANNING ELECTRON MICROSCOPY

Sample: Lead smelting slag – Grinton Smeltings GS-K

Site of interest 1

Site of interest 2

Lead smelting slag	Sample			Grinton Smeltings GS-K			Site of interest 1									
		Spectrum 1: Area			Spectrum 2: Area			Spectrum 3: Phase			Spectrum 4: Phase			Spectrum 5: Phase		
Element	Formula	Weight%	Weight% sigma	Compound%	Weight%	Weight% sigma	Compound%	Weight%	Weight% sigma	Compound%	Weight%	Weight% sigma	Compound%	Weight%	Weight% sigma	Compound%
Na	Na2O	0.4	0.5	0.8	0.5	0.1	0.7	0.9	0.4	0.0	0.4	0.5	0.0	0.5	0.7	0.0
Mg	MgO	0.6	0.1	1.0	0.5	0.1	0.8	0.3	0.1	0.4	0.1	0.1	0.1	0.1	0.1	0.1
Al	Al2O3	1.6	0.1	3.1	1.7	0.1	3.1	0.1	0.0	0.2	0.2	0.1	0.3	n.d.		
Si	SiO2	15.2	0.1	32.5	15.3	0.1	32.7	8.9	0.1	16.9	0.6	0.0	1.1	n.d.		
P	P2O5	0.4	0.0	0.8	0.3	0.0	0.6	19.5	0.1	41.6	5.2	0.1	11.0	0.3	0.1	0.5
S	SO3	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.3
K	K2O	0.7	0.0	0.9	0.7	0.0	0.9	n.d.			6.7	0.1	16.8	n.d.		
Ca	CaO	4.7	0.1	6.6	4.7	0.1	6.6	2.9	0.1	3.5	0.3	0.1	0.4	n.d.		
Ti	TiO2	0.2	0.1	0.3	0.1	0.1	0.1	0.2	0.0	0.2	1.9	0.1	2.6	n.d.		
V	V2O5	n.d.			n.d.			0.1	0.1	0.2	0.2	0.1	0.3	n.d.		
Cr	Cr2O3	n.d.			n.d.			n.d.			n.d.			n.d.		
Mn	MnO	0.2	0.1	0.2	0.1	0.1	0.1	n.d.			n.d.			n.d.		
Fe	Fe2O3	8.9	0.1	12.7	9.0	0.1	12.8	2.4	0.1	3.5	0.1	0.1	0.2	0.1	0.1	0.1
Co	CoO	n.d.			0.1	0.1	0.2	n.d.			5.3	0.1	7.6	n.d.		
Ni	NiO	0.1	0.1	0.1	n.d.			0.1	0.1	0.1	n.d.			n.d.		
Cu	CuO	0.1	0.1	0.1	n.d.			n.d.			n.d.			0.1	0.1	0.2
Zn	ZnO	4.6	0.1	5.7	4.6	0.1	5.8	1.7	0.1	2.1	2.0	0.1	2.5	0.1	0.2	0.1
As	As2O3	n.d.			0.1	0.1	0.2	0.2	0.1	0.2	n.d.			n.d.		
Ag	Ag2O	n.d.			n.d.			n.d.			n.d.			n.d.		
Sb	Sb2O3	n.d.			n.d.			n.d.			n.d.			n.d.		
Ba	BaO	14.7	0.2	16.4	14.9	0.2	16.6	25.9	0.2	28.9	5.6	0.2	6.2	n.d.		
Pb	PbO	17.4	0.2	18.8	17.5	0.2	18.8	1.3	0.1	1.4	47.4	0.4	51.0	93.4	3.9	100.6
O		30.0	0.3		30.0	0.3		35.7	0.3		24.5	0.3		6.5	0.4	
Totals		100.0			100.0			100.0			100.0			100.0		100.6

Processing option : Oxygen by stoichiometry (Normalised)
Number of iterations : 3
Sample is polished.
Sample is coated with Carbon - thickness (nm): 15.0, density (g/cm3): 2.25
Detector efficiency : Calculation

n.d. = not detected

GS-K: Site of interest 1 spectra analysis

		Sample			Grinton Smeltings GS-K			Site of Interest 2					
Lead smelting slag		Spectrum 1: Area			Spectrum 2: Area			Spectrum 3: Phase			Spectrum 4: Phase		
Element	Formula	Weight%	Weight% sigma	Compound%	Weight%	Weight% sigma	Compound%	Weight%	Weight% sigma	Compound%	Weight%	Weight% sigma	Compound%
F		0.5	0.5	0.0	n.d.			1.5	0.4	0.0	0.1	0.6	0.0
Na	Na2O	0.6	0.1	0.8	0.5	0.1	0.7	0.2	0.1	0.2	n.d.		
Mg	MgO	0.5	0.1	0.9	0.6	0.1	1.0	0.1	0.0	0.2	n.d.		
Al	Al2O3	1.7	0.1	3.3	1.7	0.1	3.2	9.9	0.1	18.6	0.1	0.0	0.2
Si	SiO2	15.1	0.2	32.4	15.5	0.1	33.1	18.2	0.1	38.9	0.8	0.1	1.8
P	P2O5	0.3	0.1	0.8	0.3	0.0	0.8	n.d.			n.d.		
S	SO3	0.1	0.1	0.3	0.2	0.1	0.5	n.d.			10.6	0.2	26.6
K	K2O	0.7	0.0	0.8	0.7	0.0	0.9	2.0	0.0	2.4	n.d.		
Ca	CaO	4.6	0.1	6.4	4.6	0.1	6.5	0.1	0.0	0.1	0.3	0.1	0.4
Ti	TiO2	n.d.			0.1	0.1	0.2	0.1	0.1	0.1	n.d.		
V	V2O5	n.d.			n.d.			n.d.			n.d.		
Cr	Cr2O3	n.d.			n.d.			n.d.			n.d.		
Mn	MnO	0.2	0.1	0.2	0.1	0.1	0.1	2.5	0.1	3.6	n.d.		
Fe	Fe2O3	9.0	0.1	12.8	8.8	0.1	12.6	0.1	0.1	0.1	1.2	0.1	1.7
Co	CoO	n.d.			0.1	0.1	0.1	n.d.			n.d.		
Ni	NiO	0.1	0.1	0.1	0.1	0.1	0.1	n.d.			n.d.		
Cu	CuO	n.d.			0.1	0.1	0.1	n.d.			0.2	0.1	0.2
Zn	ZnO	4.3	0.2	5.4	4.4	0.1	5.4	1.0	0.1	1.2	0.6	0.1	0.7
As	As2O3	n.d.			0.1	0.1	0.1	0.1	0.1	0.2	n.d.		
Ag	Ag2O	n.d.			n.d.			n.d.			n.d.		
Sb	Sb2O3	n.d.			n.d.			n.d.			n.d.		
Ba	BaO	14.7	0.2	16.4	14.6	0.2	16.3	29.6	0.2	33.0	1.0	0.2	1.2
Pb	PbO	17.7	0.3	19.0	17.5	0.2	18.9	0.2	0.1	0.2	62.7	0.5	67.5
O	O	30.0	0.3		30.4	0.3		34.8	0.3		22.7	0.3	
Totals		100.0			100.0			100.0			100.0		

Processing option : Oxygen by stoichiometry (Normalised)
Number of iterations : 3
Sample is polished.
Sample is coated with Carbon - thickness (nm): 15.0, density (g/cm3): 2.25
Detector efficiency : Calculation

n.d. = not detected

GS-K: Site of interest 2 spectra analysis

SCANNING ELECTRON MICROSCOPY

Sample: Lead smelting slag – Grinton Smeltings GS-B

Site of interest 1

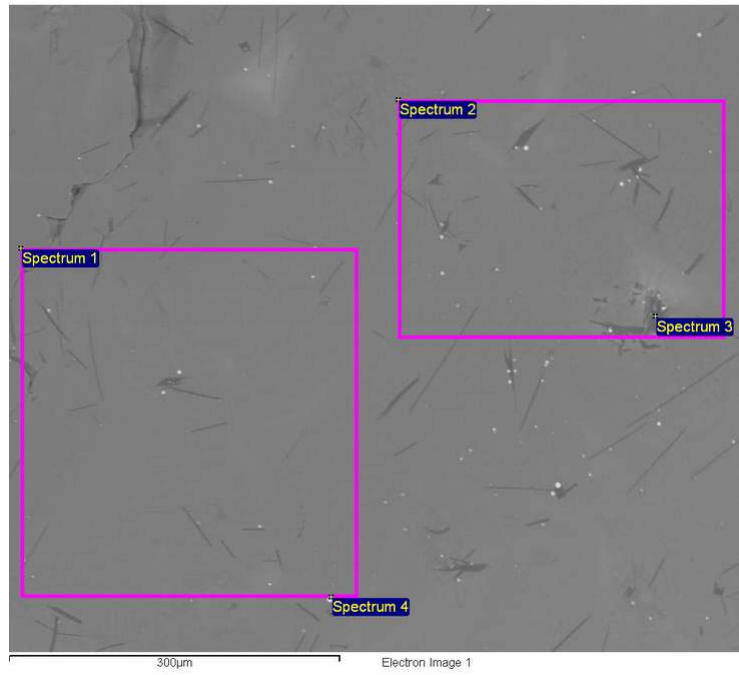Site of interest 2

SCANNING ELECTRON MICROSCOPY

Lead smelting slag   Sample   Grinton Smeltings GS-B   Site of Interest 1

Element	Formula	Spectrum 1: Area			Spectrum 2: Area			Spectrum 3: Phase			Spectrum 4: Phase		
		Weight%	Weight% sigma	Compound%	Weight%	Weight% sigma	Compound%	Weight%	Weight% sigma	Compound%	Weight%	Weight% sigma	Compound%
F		0.9	0.5	0.0	1.4	0.5	0.0	1.0	0.5	0.0	1.4	0.5	0.0
Na	Na2O	0.7	0.1	1.0	0.7	0.1	1.0	1.1	0.1	1.5	0.7	0.1	0.9
Mg	MgO	0.4	0.1	0.7	0.4	0.1	0.7	0.4	0.0	0.7	0.5	0.1	0.8
Al	Al2O3	1.6	0.1	3.0	1.7	0.1	3.2	4.1	0.1	7.8	1.2	0.1	2.3
Si	SiO2	14.5	0.1	31.0	14.7	0.1	31.3	17.6	0.1	37.6	14.6	0.1	31.2
P	P2O5	0.4	0.0	0.8	0.3	0.0	0.8	0.1	0.0	0.2	0.4	0.0	0.9
S	SO3	0.1	0.1	0.2	0.1	0.1	0.3	n.d.			0.1	0.1	0.2
K	K2O	0.6	0.0	0.7	0.7	0.0	0.8	0.9	0.0	1.1	0.6	0.0	0.7
Ca	CaO	6.6	0.1	9.3	6.6	0.1	9.3	11.3	0.1	15.8	7.2	0.1	10.1
Ti	TiO2	0.1	0.1	0.2	0.2	0.1	0.3	0.1	0.1	0.2	0.1	0.1	0.2
V	V2O5	n.d.			n.d.			n.d.			n.d.		
Cr	Cr2O3	n.d.			n.d.			0.1	0.1	0.1	n.d.		
Mn	MnO	0.1	0.1	0.1	n.d.			n.d.			0.2	0.1	0.2
Fe	Fe2O3	6.0	0.1	8.6	5.9	0.1	8.4	2.4	0.1	3.5	6.0	0.1	8.6
Co	CoO	n.d.			0.1	0.1	0.1	n.d.			0.1	0.1	0.1
Ni	NiO	0.1	0.1	0.1	n.d.			n.d.			0.1	0.1	0.1
Cu	CuO	n.d.			0.1	0.1	0.2	n.d.			n.d.		
Zn	ZnO	6.2	0.2	7.7	5.9	0.1	7.4	8.2	0.2	10.2	6.3	0.1	7.8
As	As2O3	0.1	0.1	0.1	0.1	0.1	0.2	0.1	0.1	0.1	n.d.		
Ag	Ag2O	0.1	0.1	0.1	0.1	0.1	0.1	n.d.			n.d.		
Sb	Sb2O3	0.2	0.2	0.3	0.2	0.2	0.2	n.d.			0.2	0.2	0.3
Ba	BaO	18.6	0.2	20.8	18.3	0.2	20.4	15.0	0.2	16.7	17.8	0.2	19.8
Pb	PbO	13.5	0.2	14.5	13.0	0.2	14.0	3.4	0.1	3.7	13.5	0.2	14.6
O		29.3	0.3		29.5	0.3		34.3	0.3		29.3	0.3	
Totals		100.0			100.0			100.0			100.0		

Processing option : Oxygen by stoichiometry (Normalised)   n.d. = not detected
Number of iterations : 3
Sample is polished.
Sample is coated with Carbon - thickness (nm): 15.0, density (g/cm3): 2.25
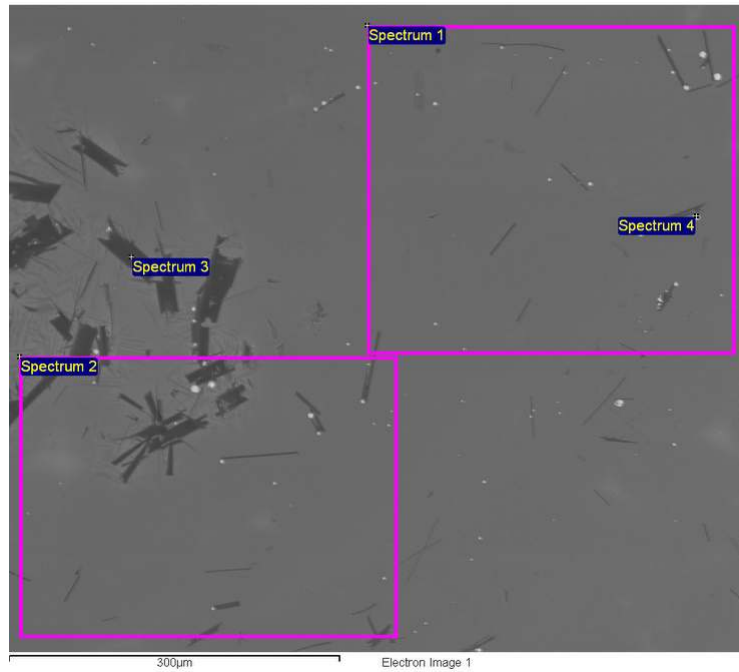Detector efficiency : Calculation

GS-B: Site of interest 1 spectra analysis

SCANNING ELECTRON MICROSCOPY

Lead smelting slag — Sample — Grinton Smeltings GS-B — Site of Interest 2

Element	Formula	Spectrum 1: Area Weight%	Weight% sigma	Compound%	Spectrum 2: Area Weight%	Weight% sigma	Compound%	Spectrum 3: Phase Weight%	Weight% sigma	Compound%	Spectrum 4: Phase Weight%	Weight% sigma	Compound%
F		1.5	0.5	0.0	1.8	0.5	0.0	n.d.			0.7	0.5	0.0
Na	Na2O	0.7	0.1	0.9	0.7	0.1	1.0	1.6	0.1	2.1	0.2	0.1	0.3
Mg	MgO	0.4	0.1	0.6	0.4	0.1	0.7	0.7	0.1	1.1	0.1	0.1	0.1
Al	Al2O3	1.5	0.1	2.9	1.6	0.1	2.9	0.3	0.0	0.6	0.3	0.0	0.5
Si	SiO2	14.5	0.1	31.0	14.5	0.1	30.9	17.9	0.2	38.2	3.3	0.1	7.1
P	P2O5	0.2	0.0	0.5	0.4	0.0	0.8	n.d.			0.1	0.0	0.2
S	SO3	0.1	0.1	0.3	0.1	0.1	0.3	n.d.			8.1	0.1	20.3
K	K2O	0.7	0.0	0.8	0.6	0.0	0.8	0.2	0.0	0.2	0.2	0.1	0.2
Ca	CaO	6.6	0.1	9.3	6.6	0.1	9.3	20.4	0.2	28.6	2.2	0.1	3.1
Ti	TiO2	n.d.			n.d.			n.d.			n.d.		
V	V2O5	n.d.			n.d.			n.d.			n.d.		
Cr	Cr2O3	n.d.			n.d.			n.d.			n.d.		
Mn	MnO	0.1	0.1	0.1	0.1	0.1	0.1	n.d.			n.d.		
Fe	Fe2O3	5.8	0.1	8.3	5.7	0.1	8.2	2.5	0.1	3.6	3.0	0.1	4.3
Co	CoO	n.d.			0.1	0.1	0.1	0.1	0.1	0.1	n.d.		
Ni	NiO	n.d.			n.d.			n.d.			n.d.		
Cu	CuO	0.1	0.1	0.1	n.d.			n.d.			0.1	0.1	0.2
Zn	ZnO	5.7	0.1	7.1	6.0	0.1	7.4	13.9	0.2	17.3	2.2	0.1	2.8
As	As2O3	0.1	0.1	0.1	n.d.			0.1	0.1	0.1	n.d.		
Ag	Ag2O	n.d.			n.d.			n.d.			n.d.		
Sb	Sb2O3	0.4	0.2	0.5	0.1	0.2	0.1	n.d.			n.d.		
Ba	BaO	18.9	0.2	21.1	18.6	0.2	20.8	3.4	0.1	3.8	5.5	0.2	6.1
Pb	PbO	14.0	0.2	15.1	13.9	0.2	15.0	4.8	0.2	5.2	50.4	0.4	54.3
O		28.9	0.3		29.0	0.3		35.1	0.3		23.7	0.3	
Totals		100.0			100.0			100.0			100.0		

Processing option : Oxygen by stoichiometry (Normalised)
Number of iterations : 3
Sample is polished.
Sample is coated with Carbon - thickness (nm): 15.0, density (g/cm3): 2.25
Detector efficiency : Calculation

n.d. = not detected

GS-B: Site of interest 2 spectra analysis

SCANNING ELECTRON MICROSCOPY

Sample: Lead smelting slag – Pentre Farm PFCT/YD 14

Site of interest 1

Site of interest 2

SCANNING ELECTRON MICROSCOPY

Lead smelting slag — Sample — Pantre Farm PFCT/YD-14 — Site of Interest 1

Element	Formula	Spectrum 1: Area Weight%	Weight% sigma	Compound%	Spectrum 2: Area Weight%	Weight% sigma	Compound%	Spectrum 3: Phase Weight%	Weight% sigma	Compound%	Spectrum 4: Phase Weight%	Weight% sigma	Compound%	Spectrum 5: Phase Weight%	Weight% sigma	Compound%
Na	Na2O	0.4	0.1	0.5	0.4	0.1	0.5	n.d.			0.9	0.5	0.1	n.d.		
Mg	MgO	0.7	0.1	1.2	0.7	0.1	1.1	0.8	0.0	1.3	0.8	0.1	1.3	0.4	0.1	0.5
Al	Al2O3	1.7	0.1	3.2	1.5	0.1	2.9	n.d.			n.d.	0.0		0.7	0.1	1.1
Si	SiO2	19.7	0.2	42.2	20.1	0.2	42.9	24.8	0.2	53.1	24.7	0.2	52.9	1.9	0.1	3.8
P	P2O5	0.1	0.0	0.3	0.1	0.0	0.2	n.d.			n.d.			16.5	0.2	41.7
S	SO3	n.d.			n.d.			0.1	0.0	0.1	n.d.			0.1	0.0	0.1
K	K2O	1.0	0.1	1.2	0.8	0.0	0.9	n.d.			n.d.			n.d.		
Ca	CaO	7.8	0.1	10.9	10.1	0.1	14.2	30.6	0.2	42.9	30.5	0.2	42.6	1.0	0.1	1.3
Ti	TiO2	0.2	0.1	0.2	0.1	0.1	0.2	n.d.			n.d.			5.3	0.1	7.4
V	V2O5	n.d.			n.d.			n.d.			n.d.			0.2	0.1	0.3
Cr	Cr2O3	n.d.			n.d.			0.1	0.0	0.2	0.1	0.0	0.1	n.d.		
Mn	MnO	0.2	0.1	0.2	0.2	0.1	0.2	0.2	0.0	0.3	0.3	0.0	0.4	0.1	0.1	0.1
Fe	Fe2O3	1.2	0.1	1.7	1.3	0.1	1.8	0.5	0.1	0.7	0.5	0.1	0.6	1.4	0.1	2.0
Co	CoO	n.d.			n.d.			n.d.			n.d.			n.d.		
Ni	NiO	n.d.			0.1	0.1	0.1	n.d.			n.d.			n.d.		
Cu	CuO	n.d.			n.d.			n.d.			n.d.			n.d.		
Zn	ZnO	1.6	0.1	1.9	1.5	0.1	1.8	0.3	0.1	0.4	0.3	0.1	0.3	1.9	0.1	2.3
As	As2O3	n.d.			n.d.			n.d.			n.d.			0.1	0.1	0.1
Ag	Ag2O	n.d.			n.d.			n.d.			n.d.			n.d.		
Sb	Sb2O3	0.2	0.2	0.2	n.d.			n.d.			0.2	0.2	0.2	0.1	0.2	0.1
Ba	BaO	0.1	0.1	0.1	0.1	0.1	0.1	n.d.			n.d.			0.1	0.2	0.1
Pb	PbO	34.7	0.3	37.4	31.7	0.3	34.2	1.0	0.1	1.1	0.8	0.1	0.9	38.3	0.4	41.3
O	O	31.1	0.3		32.1	0.3		41.6	0.3		41.3	0.3		30.2	0.3	
Totals		100.0			100.0			100.0			100.0			100.0		

Processing option : Oxygen by stoichiometry (Normalised)
Number of iterations : 2
Sample is polished.
Sample is coated with Carbon - thickness (nm): 15.0, density (g/cm3): 2.25
Detector efficiency : Calculation

n.d. = not detected

PFCT/YD-14: Site of interest 1 spectra analysis

SCANNING ELECTRON MICROSCOPY

Lead smelting slag   Sample   Pentre Farm PFCT/YD-14   Site of Interest 2

Element	Formula	Spectrum 1: Area Weight%	sigma	Compound%	Spectrum 2: Area Weight%	sigma	Compound%	Spectrum 3: Phase Weight%	sigma	Compound%	Spectrum 4: Phase Weight%	sigma	Compound%
F		n.d.			n.d.			0.1	0.5	0.0	n.d.		
Na	Na2O	0.4	0.1	0.6	0.4	0.1	0.6	0.1	0.1	0.1	0.3	0.1	0.5
Mg	MgO	0.5	0.0	0.9	0.5	0.1	0.9	0.8	0.0	1.3	0.5	0.0	0.8
Al	Al2O3	1.3	0.0	2.4	1.5	0.1	2.9	n.d.			1.2	0.0	2.2
Si	SiO2	21.1	0.2	45.2	22.1	0.2	47.2	24.7	0.2	52.9	21.7	0.2	46.3
P	P2O5	0.1	0.0	0.2	n.d.			0.1	0.0	0.1	0.1	0.0	0.2
S	SO3	n.d.			n.d.			n.d.			n.d.		
K	K2O	0.7	0.0	0.8	0.8	0.1	1.0	n.d.			0.7	0.0	0.8
Ca	CaO	7.3	0.1	10.2	5.3	0.1	7.4	30.5	0.2	42.6	4.7	0.1	6.5
Ti	TiO2	0.1	0.1	0.1	0.2	0.1	0.3	n.d.			0.1	0.1	0.2
V	V2O5	0.1	0.1	0.2	n.d.			n.d.			n.d.		
Cr	Cr2O3	n.d.			0.1	0.1	0.1	n.d.			0.1	0.1	0.1
Mn	MnO	0.1	0.1	0.1	0.1	0.1	0.1	0.3	0.0	0.4	0.1	0.1	0.2
Fe	Fe2O3	1.1	0.1	1.6	1.2	0.1	1.7	0.6	0.1	0.9	1.2	0.1	1.8
Co	CoO	n.d.			n.d.			n.d.			n.d.		
Ni	NiO	0.1	0.1	0.1	0.1	0.1	0.1	n.d.			0.1	0.1	0.1
Cu	CuO	n.d.			n.d.			n.d.			n.d.		
Zn	ZnO	1.4	0.1	1.7	1.5	0.1	1.8	0.3	0.1	0.4	1.8	0.1	2.2
As	As2O3	n.d.			n.d.			n.d.			n.d.		
Ag	Ag2O	n.d.			n.d.			n.d.			n.d.		
Sb	Sb2O3	0.1	0.2	0.1	n.d.			n.d.			n.d.		
Ba	BaO	0.1	0.1	0.1	n.d.			0.1	0.1	0.1	n.d.		
Pb	PbO	34.0	0.3	36.6	34.9	0.3	37.6	1.1	0.1	1.2	36.9	0.3	39.8
O		32.2	0.3		32.6	0.3		41.5	0.3		31.5	0.3	
Totals		100.0			100.0			100.0			100.0		

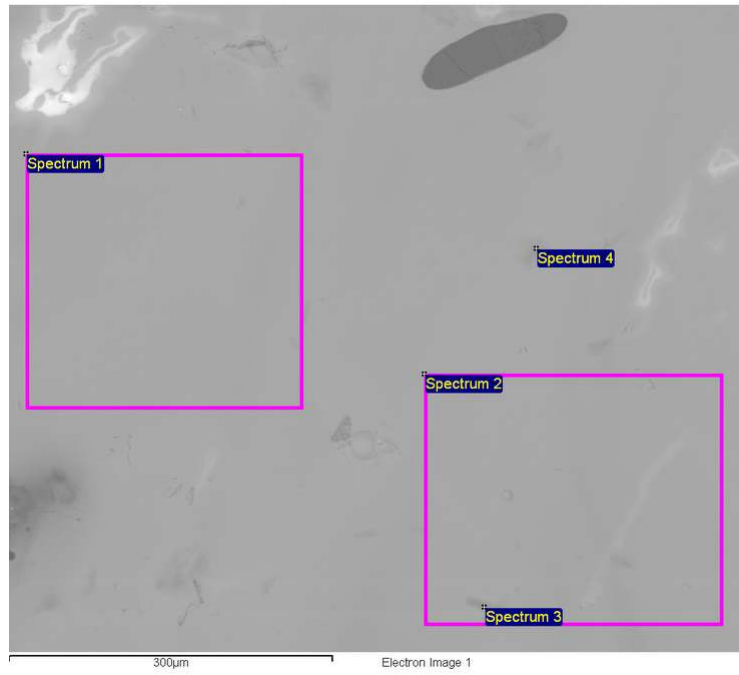Processing option : Oxygen by stoichiometry (Normalised)   n.d. = not detected
Number of iterations : 2
Sample is polished.
Sample is coated with Carbon - thickness (nm): 15.0, density (g/cm3): 2.25
Detector efficiency : Calculation

PFCT/YD-14: Site of interest 2 spectra analysis

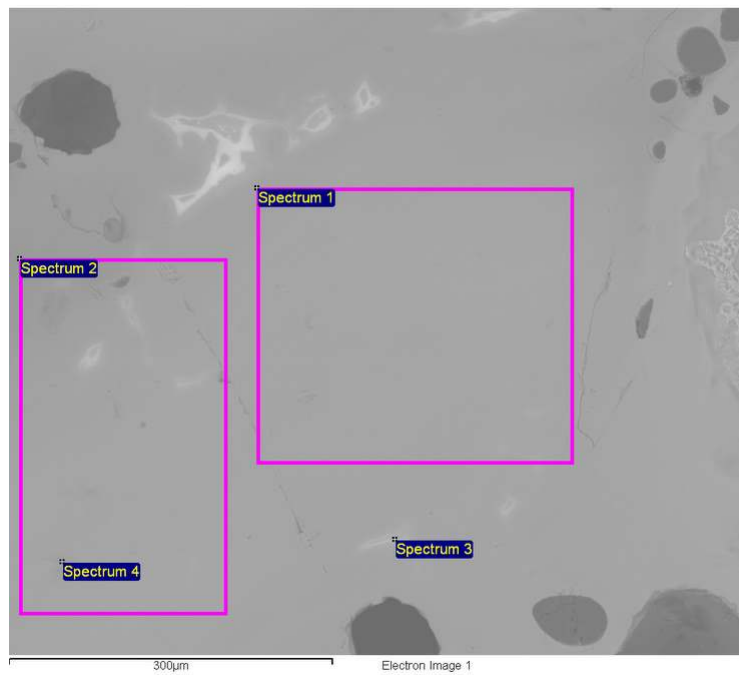**SCANNING ELECTRON MICROSCOPY**

Sample: Lead smelting slag – Pentre Farm PF8-31

Site of interest 1

Site of interest 2

SCANNING ELECTRON MICROSCOPY

Lead smelting slag   Sample   Pentre Farm PF8-31   Site of Interest 1

Element	Formula	Spectrum 1: Area			Spectrum 2: Area			Spectrum 3: Phase			Spectrum 4: Phase		
		Weight%	Weight% sigma	Compound%	Weight%	Weight% sigma	Compound%	Weight%	Weight% sigma	Compound%	Weight%	Weight% sigma	Compound%
F		0.3	0.5	0.0	0.4	0.5	0.0	n.d.			0.6	0.6	0.0
Na	Na2O	0.3	0.1	0.4	0.4	0.1	0.5	0.3	0.1	0.4	0.4	0.1	0.6
Mg	MgO	0.3	0.1	0.4	0.3	0.1	0.4	0.2	0.1	0.3	0.3	0.1	0.5
Al	Al2O3	1.9	0.1	3.7	1.9	0.1	3.6	2.0	0.1	3.7	1.8	0.1	3.3
Si	SiO2	20.5	0.2	43.8	20.6	0.2	44.1	20.3	0.2	43.5	19.8	0.2	42.4
P	P2O5	n.d.			n.d.			0.1	0.1	0.3	0.2	0.1	0.4
S	SO3	n.d.			n.d.			n.d.			n.d.		
K	K2O	1.0	0.1	1.3	1.0	0.1	1.3	1.0	0.1	1.2	0.9	0.1	1.1
Ca	CaO	0.5	0.1	0.6	0.5	0.1	0.7	0.6	0.1	0.9	0.7	0.1	1.0
Ti	TiO2	0.1	0.1	0.2	0.2	0.1	0.4	0.1	0.1	0.2	0.1	0.1	0.2
V	V2O5	n.d.			n.d.			0.1	0.1	0.2	n.d.		
Cr	Cr2O3	n.d.			n.d.			n.d.			n.d.		
Mn	MnO	n.d.			0.1	0.1	0.1	0.1	0.1	0.1	n.d.		
Fe	Fe2O3	1.2	0.1	1.7	0.9	0.1	1.3	1.1	0.1	1.6	1.1	0.1	1.5
Co	CoO	n.d.			n.d.			n.d.			n.d.		
Ni	NiO	n.d.			n.d.			0.1	0.1	0.1	n.d.		
Cu	CuO	0.1	0.1	0.2	n.d.			0.1	0.1	0.1	n.d.		
Zn	ZnO	0.1	0.1	0.2	n.d.			n.d.			n.d.		
As	As2O3	n.d.			n.d.			0.1	0.1	0.1	n.d.		
Ag	Ag2O	n.d.			n.d.			n.d.			n.d.		
Sb	Sb2O3	n.d.			0.2	0.1	0.2	0.1	0.2	0.1	0.1	0.2	0.1
Ba	BaO	n.d.			0.1	0.2	0.1	n.d.			0.2	0.2	0.2
Pb	PbO	45.5	0.4	49.0	44.8	0.4	48.2	45.4	0.4	48.9	46.1	0.4	49.7
O		29.0	0.3		29.3	0.3		29.2	0.3		28.5	0.3	
Totals		100.0			100.0			100.0			100.0		

Processing option : Oxygen by stoichiometry (Normalised)
Number of iterations : 2
Sample is polished.
Sample is coated with Carbon - thickness (nm): 15.0, density (g/cm3): 2.25
Detector efficiency : Calculation

n.d. = not detected

PF8-31: Site of interest 1 spectra analysis

SCANNING ELECTRON MICROSCOPY

Lead smelting slag		Sample			Pentre Farm PF8-31			Site of Interest 2					
		Spectrum 1: Area			Spectrum 2: Area			Spectrum 3: Phase			Spectrum 4: Phase		
Element	Formula	Weight%	sigma	Compound%	Weight%	sigma	Compound%	Weight%	sigma	Compound%	Weight%	sigma	Compound%
F		n.d.			0.2	0.5	0.0	n.d.			0.5	0.5	0.0
Na	Na2O	0.3	0.1	0.4	0.5	0.1	0.6	0.5	0.1	0.7	0.3	0.1	0.5
Mg	MgO	0.2	0.0	0.4	0.3	0.0	0.5	0.2	0.1	0.4	0.2	0.0	0.3
Al	Al2O3	2.1	0.1	4.0	2.4	0.1	4.5	2.7	0.1	5.2	2.2	0.1	4.2
Si	SiO2	22.2	0.2	47.4	22.4	0.2	48.0	22.6	0.2	48.4	21.7	0.2	46.4
P	P2O5	n.d.			n.d.			n.d.			n.d.		
S	SO3	n.d.			n.d.			n.d.			n.d.		
K	K2O	0.9	0.1	1.1	1.0	0.1	1.2	1.0	0.1	1.3	0.9	0.1	1.1
Ca	CaO	0.3	0.1	0.4	0.3	0.1	0.4	0.1	0.1	0.1	0.2	0.1	0.3
Ti	TiO2	0.2	0.1	0.4	0.3	0.1	0.4	0.2	0.1	0.3	0.2	0.1	0.4
V	V2O5	n.d.			0.1	0.1	0.1	n.d.			n.d.		
Cr	Cr2O3	n.d.			n.d.			n.d.			0.1	0.1	0.1
Mn	MnO	n.d.			n.d.			n.d.			n.d.		
Fe	Fe2O3	1.2	0.1	1.7	1.2	0.1	1.7	1.0	0.1	1.4	1.1	0.1	1.5
Co	CoO	n.d.			0.1	0.1	0.1	n.d.			n.d.		
Ni	NiO	n.d.			n.d.			n.d.			n.d.		
Cu	CuO	0.1	0.1	0.1	n.d.			n.d.			n.d.		
Zn	ZnO	n.d.			n.d.			0.1	0.1	0.1	0.1	0.1	0.1
As	As2O3	n.d.			n.d.			0.2	0.1	0.3	0.1	0.1	0.1
Ag	Ag2O	n.d.			n.d.			n.d.			0.1	0.1	0.1
Sb	Sb2O3	n.d.			0.1	0.1	0.2	0.2	0.2	0.2	n.d.		
Ba	BaO	n.d.			n.d.			0.1	0.2	0.1	n.d.		
Pb	PbO	42.7	0.4	46.0	39.9	0.4	43.0	39.7	0.4	42.8	42.0	0.4	45.3
O		31.0	0.3		31.8	0.3		32.0	0.3		30.7	0.3	
Totals		100.0			100.0			100.0			100.0		

Processing option : Oxygen by stoichiometry (Normalised)
Number of iterations : 2
Sample is polished.
Sample is coated with Carbon - thickness (nm): 15.0, density (g/cm3): 2.25
Detector efficiency : Calculation

n.d. = not detected

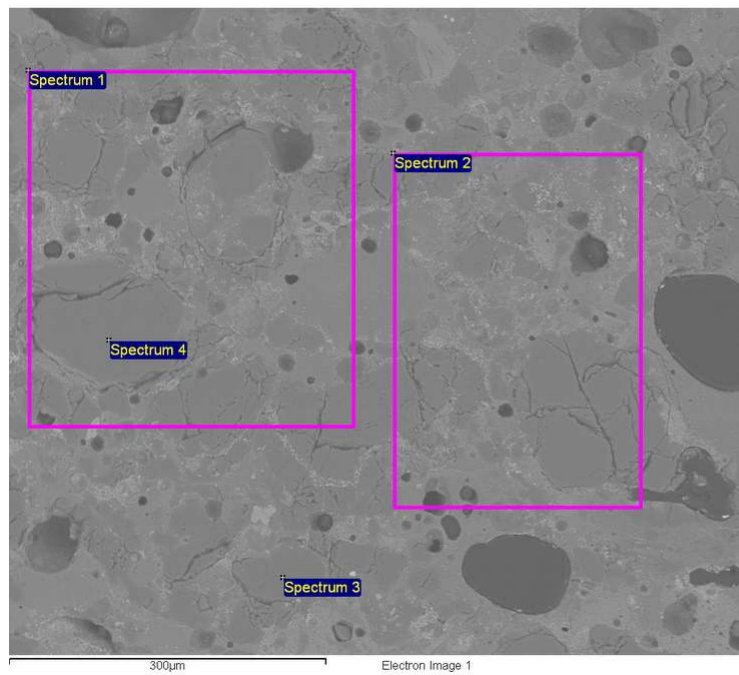PF8-31: Site of interest 2 spectra analysis
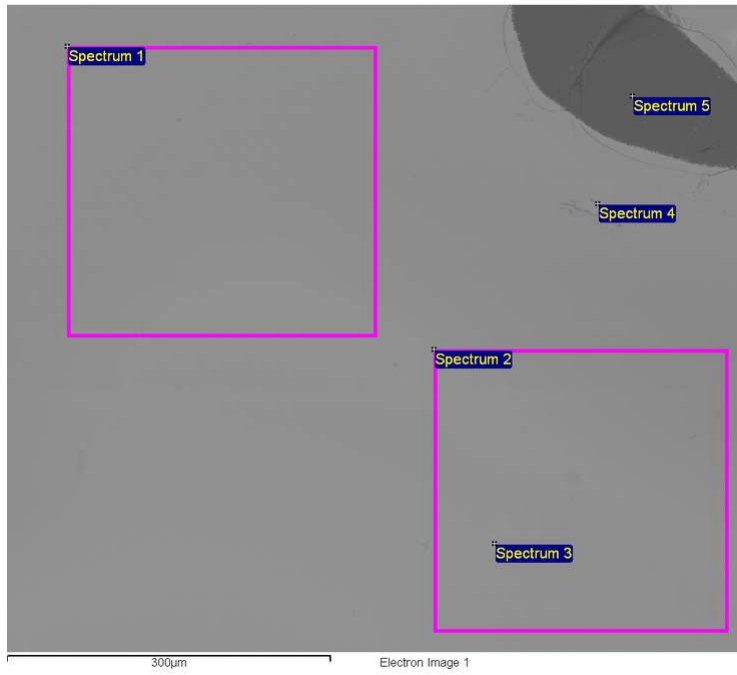
27

SCANNING ELECTRON MICROSCOPY

Sample: Lead smelting slag – Pentre Farm PF7-46

Site of interest 1

Site of interest 2

Site of interest 3

SCANNING ELECTRON MICROSCOPY

		Sample			Pentre Farm PF7-46			Site of Interest 1					
		Spectrum 1: Area			Spectrum 2: Area			Spectrum 3: Phase			Spectrum 4: Phase		
Element	Formula	Weight%	sigma	Compound%	Weight%	sigma	Compound%	Weight%	sigma	Compound%	Weight%	sigma	Compound%
F		n.d.			n.d.			n.d.			0.3	0.6	0.0
Na	Na2O	0.3	0.1	0.4	0.4	0.1	0.5	0.3	0.1	0.4	0.3	0.1	0.4
Mg	MgO	0.3	0.1	0.5	0.3	0.1	0.5	0.2	0.1	0.4	0.2	0.1	0.3
Al	Al2O3	1.9	0.1	3.6	1.8	0.1	3.4	1.7	0.1	3.3	2.0	0.1	3.7
Si	SiO2	20.1	0.2	42.9	21.6	0.2	46.1	21.7	0.2	46.4	20.0	0.2	42.9
P	P2O5	n.d.			n.d.			0.1	0.1	0.1	n.d.		
S	SO3	n.d.			n.d.			n.d.			n.d.		
K	K2O	0.8	0.1	0.9	0.8	0.1	0.9	0.8	0.1	0.9	0.7	0.1	0.9
Ca	CaO	0.3	0.1	0.4	0.8	0.1	1.1	1.0	0.1	1.3	0.1	0.1	0.2
Ti	TiO2	0.2	0.1	0.4	0.2	0.1	0.4	0.1	0.1	0.2	0.2	0.1	0.3
V	V2O5	n.d.			n.d.			n.d.			0.1	0.1	0.1
Cr	Cr2O3	n.d.			n.d.			n.d.			n.d.		
Mn	MnO	n.d.			n.d.			n.d.			n.d.		
Fe	Fe2O3	1.0	0.1	1.5	1.1	0.1	1.5	1.1	0.1	1.5	1.0	0.1	1.4
Co	CoO	n.d.			n.d.			n.d.			0.1	0.1	0.1
Ni	NiO	n.d.			n.d.			n.d.			n.d.		
Cu	CuO	0.1	0.1	0.1	n.d.			n.d.			n.d.		
Zn	ZnO	0.4	0.1	0.5	0.5	0.1	0.7	0.7	0.1	0.8	0.2	0.1	0.2
As	As2O3	n.d.			0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2
Ag	Ag2O	n.d.			n.d.			n.d.			n.d.		
Sb	Sb2O3	n.d.			n.d.			n.d.			n.d.		
Ba	BaO	n.d.			0.1	0.2	0.1	n.d.			n.d.		
Pb	PbO	46.9	0.4	50.5	42.8	0.4	46.1	42.5	0.4	45.8	46.9	0.4	50.5
O	O	28.7	0.3		30.7	0.3		30.6	0.3		28.6	0.3	
Totals		100.0			100.0			100.0			100.0		

Processing option : Oxygen by stoichiometry (Normalised)
Number of Iterations : 2
Sample is polished.
Sample is coated with Carbon - thickness (nm): 15.0, density (g/cm3): 2.25
Detector efficiency : Calculation

n.d. = not detected

PF7-46: Site of interest 1 spectra analysis

SCANNING ELECTRON MICROSCOPY

Lead smelting slag   Sample   Pentre Farm PF7-46   Site of Interest 2

Element	Formula	Spectrum 1: Area			Spectrum 2: Area			Spectrum 3: Phase			Spectrum 4: Phase		
		Weight%	Weight% sigma	Compound%	Weight%	Weight% sigma	Compound%	Weight%	Weight% sigma	Compound%	Weight%	Weight% sigma	Compound%
F		0.1	0.5	0.0	n.d.		0.0	0.5	0.4	0.0	0.6	0.4	0.0
Na	Na2O	0.8	0.1	1.1	0.8	0.1	1.1	n.d.			n.d.		
Mg	MgO	0.8	0.0	1.3	1.1	0.0	1.8	n.d.			n.d.		
Al	Al2O3	3.7	0.1	7.0	4.9	0.1	9.3	n.d.			n.d.		
Si	SiO2	37.6	0.2	80.5	35.9	0.2	76.8	46.8	0.2	100.0	46.6	0.3	99.8
P	P2O5	0.1	0.0	0.3	0.2	0.0	0.5	n.d.			0.1	0.0	0.1
S	SO3	0.1	0.0	0.2	0.1	0.0	0.1	n.d.			0.1	0.0	0.2
K	K2O	1.4	0.0	1.7	1.5	0.0	1.8	n.d.			n.d.		
Ca	CaO	0.1	0.0	0.1	0.1	0.0	0.1	n.d.			n.d.		
Ti	TiO2	0.2	0.0	0.4	0.2	0.0	0.3	n.d.			n.d.		
V	V2O5	n.d.			n.d.			n.d.			n.d.		
Cr	Cr2O3	0.1	0.0	0.1	n.d.			n.d.			0.1	0.0	0.1
Mn	MnO	n.d.			n.d.			n.d.			n.d.		
Fe	Fe2O3	5.2	0.1	7.4	6.4	0.1	9.1	0.2	0.0	0.2	n.d.		
Co	CoO	0.1	0.1	0.1	n.d.			n.d.			n.d.		
Ni	NiO	n.d.			n.d.			n.d.			n.d.		
Cu	CuO	n.d.			n.d.			n.d.			n.d.		
Zn	ZnO	n.d.			n.d.			n.d.			n.d.		
As	As2O3	n.d.			0.1	0.1	0.1	n.d.			0.1	0.1	0.1
Ag	Ag2O	n.d.			n.d.			n.d.			n.d.		
Sb	Sb2O3	n.d.			n.d.			n.d.			n.d.		
Ba	BaO	0.1	0.1	0.1	0.1	0.1	0.1	n.d.			n.d.		
Pb	PbO	n.d.			n.d.			0.1	0.1	0.1	n.d.		
O		49.9	0.3		49.8	0.3		53.3	0.3		53.2	0.3	
Totals		100.0			100.0			100.0			100.0		

Processing option : Oxygen by stoichiometry (Normalised)   n.d. = not detected
Number of iterations : 3
Sample is polished.
Sample is coated with Carbon - thickness (nm): 15.0, density (g/cm3): 2.25
Detector efficiency : Calculation

PF7-46: Site of interest 2 spectra analysis

SCANNING ELECTRON MICROSCOPY

Lead smelting slag — Sample — Pantre Farm PF7-46 — Site of Interest 3

Element	Formula	Spectrum 1: Area Weight%	Weight% sigma	Compound%	Spectrum 2: Area Weight%	Weight% sigma	Compound%	Spectrum 3: Phase Weight%	Weight% sigma	Compound%	Spectrum 4: Phase Weight%	Weight% sigma	Compound%	Spectrum 5: Phase Weight%	Weight% sigma	Compound%
Na	Na2O	0.4	0.5	0.5	0.1	0.5	0.0	n.d.		0.0	0.4	0.5	0.4	0.2	0.5	0.0
Mg	MgO	0.3	0.1	0.5	0.3	0.1	0.5	0.3	0.1	0.4	0.3	0.1	0.6	n.d.		
Al	Al2O3	2.2	0.1	4.1	2.0	0.1	3.7	1.9	0.1	3.6	2.2	0.1	4.2	n.d.	0.3	
Si	SiO2	21.0	0.2	45.0	20.3	0.2	43.3	20.1	0.2	42.9	21.8	0.2	46.7	46.9		100.4
P	P2O5	n.d.			0.1	0.0	0.2	n.d.			n.d.			n.d.		
S	SO3	n.d.			n.d.			n.d.			0.8	0.1	0.9	0.1	0.0	0.2
K	K2O	0.8	0.1	1.0	0.7	0.1	0.9	0.7	0.1	0.8	0.6	0.1	0.9	n.d.		
Ca	CaO	0.3	0.1	0.4	0.2	0.1	0.3	0.3	0.1	0.4	0.2	0.1	0.4	n.d.		
Ti	TiO2	0.1	0.1	0.2	0.1	0.1	0.2	0.2	0.1	0.3	n.d.			n.d.		
V	V2O5	n.d.			n.d.			0.1	0.1	0.1	n.d.			n.d.		
Cr	Cr2O3	0.1	0.1	0.1	n.d.			n.d.			n.d.			n.d.		
Mn	MnO	n.d.			0.1	0.1	0.1	n.d.			n.d.			n.d.		
Fe	Fe2O3	1.2	0.1	1.7	1.1	0.1	1.6	1.1	0.1	1.5	1.4	0.1	2.0	n.d.		
Co	CoO	n.d.			n.d.			n.d.			0.1	0.1	0.1	n.d.		
Ni	NiO	n.d.			0.1	0.1	0.1	n.d.			n.d.			n.d.		
Cu	CuO	n.d.			0.1	0.1	0.1	n.d.			n.d.			n.d.		
Zn	ZnO	0.4	0.1	0.5	0.3	0.1	0.4	0.5	0.1	0.6	0.4	0.1	0.5	0.1	0.1	0.1
As	As2O3	0.1	0.1	0.1	0.1	0.1	0.1	n.d.			0.1	0.1	0.1	n.d.		
Ag	Ag2O	n.d.			n.d.			n.d.			n.d.			n.d.		
Sb	Sb2O3	n.d.			n.d.			n.d.			n.d.			n.d.		
Ba	BaO	n.d.			n.d.			n.d.			n.d.			n.d.		
Pb	PbO	43.5	0.4	46.9	45.6	0.4	49.2	47.1	0.4	50.7	40.8	0.4	43.9	n.d.	0.3	
O	O	29.9	0.3		29.1	0.3		28.5	0.3		31.0	0.3		53.5		
Totals		100.0			100.0			100.0			100.0			100.0		
	Cation sum															

Processing option : Oxygen by stoichiometry (Normalised)
Number of iterations : 2
Sample is polished.
Sample is coated with Carbon - thickness (nm): 15.0, density (g/cm3): 2.25
Detector efficiency : Calculation

n.d. = not detected

PF7-46: Site of interest 3 spectra analysis