GSA DATA REPOSITORY 2015055

Appendix DR1: Sample Descriptions

8S08FW – This sample of massive pyrite was collected by Jamie Wilkinson from the southern part of the Lisheen Main Zone orebody (Panel 8, Stope 8; Fig. DR1) where the ore zone is very thick. The sample came from the footwall of the Killoran Fault at a depth of 176m, within the Lisduff Oolite Member of the Ballysteen Limestone Formation. Ore is locally developed in the footwall oolite at Lisheen and its approximate contiguity with the hangingwall ore zone has been used to argue for a post-faulting timing for mineralization (Hitzman et al., 2002). The sample processed (Fig. DR2) is primarily composed of massive pyrite that is crosscut by calcite veins. A minor amount of sphalerite and fine grained galena (<10 µm) is observed in thin section and back scattered electron images (Fig. DR2). Such pyrite-rich zones are typical within the high grade cores of the ore lenses at Lisheen (e.g. Fusciardi et al., 2003).

B15 – This sample was collected by John Ashton (Ashton, 1975) from the Silvermines Bzone in the barite ore zone (haulage 4932). The following description is based on his field notes of the sampling locality. The ore zone contains fine grained massive sulfide composed of ~40-45% pyrite, 5-10% galena, and a variable mixture of barite and sphalerite. Pyrite occurs typically as elongate crystals that occasionally show slight deformation. Sphalerite has replaced pyrite, and galena typically has replaced sphalerite. The sample processed (Fig. DR3) is composed of massive pyrite with cracks infilled by quartz and carbonate. No barite occurs within this sample and galena is present in cracks or as a replacement of pyrite. Pyrite-rich ore was often mined within the B zone at Silvermines, and this pyritic massive sulfide (Taylor and Andrew, 1978) is generally interpreted as an early main stage mineralization ore type.

B18 – This sample was collected by John Ashton (Ashton, 1975) from the Silvermines Bzone (Location: Stope Hanging Wall Drift 48-1S; Fig. DR1). The following description is based on his field notes of the sampling locality. The sample comes from the central part of the B zone in a Pb-rich area close to the B-fault where stratiform massive pyrite and semi-massive pyrite with dolomite breccia overlie siderite- or barite-hosted sulfides. Locally, the massive pyrite is mineralized and was mined. The sample processed (Fig. DR3) is composed primarily of fine grained (0.5-2mm), massive pyrite. Sphalerite and galena are present in smaller amounts and show the same general paragenesis as B15, with sphalerite after pyrite and galena typically postdating sphalerite. As with B15, this pyritic massive sulphide is generally interpreted as an early main stage mineralization ore type.



Figure DR1: Approximate sample locations for Lisheen sample 8S08FW (top) and Silvermines sample B18 (bottom). Modified from Andrew (1986).



Figure DR2: Lisheen sample 8S08FW (top right figure) and a representative backscattered electron image (top left figure) and reflected light images (bottom figures).



Figure DR3: Silvermines sample B15 (top left figure) and B18 (top right figure) and representative reflected light images of sample B18 (bottom figures).

Appendix DR2: Sample Preparation

All samples were prepared using a standardized procedure to ensure that a relatively pure pyrite separate was obtained. A bulk sample containing 5-20g of pyrite was crushed and sieved using metal-free equipment to produce 70-200 µm diameter material containing pyrite and several impurity minerals (e.g. sphalerite, galena, calcite, dolomite, and quartz). Heavy liquid separation using methylene iodide ($\rho = 3.32g/\text{cm}^3$) is used separate carbonate and silicates from the sulfides. To separate pyrite from galena and sphalerite a Frantz Isodynamic Separator was used. In the sphalerite-pyrite-galena system we typically observe $\chi_{\text{sphalerite}} > \chi_{\text{pyrite}} > \chi_{\text{galena}}$ ($\chi =$ magnetic susceptibility). These differences allow separation of pyrite from sphalerite (eliminated at low induced magnetization) and galena (eliminated at high induced magnetization). The final separate contains ~85-100% pyrite. The remaining impurities are typically found as inclusions or are the result of aggregates of multiple minerals not separated by the crushing process.

Analytical Data:

Sample Name	Re ppb	Os ppt	¹⁸⁷ Re / ¹⁸⁸ Os	±2σ	¹⁸⁷ Os / ¹⁸⁸ Os	±2σ	Rho	% Re Blank	% ¹⁸⁷ Os Blank	% ¹⁸⁸ Os Blank
8508FW	3.70	33.24	919.25	9.14	5.588	0.058	0.845	0.19	0.19	4.67
8508FW M1.0	6.18	46.72	1249.60	9.21	7.484	0.056	0.841	0.10	0.10	3.40
8508FW M1.0-2	5.98	47.94	1119.67	7.98	6.735	0.052	0.778	0.10	0.10	3.15
8508FW M1.2	5.78	44.61	1204.48	9.68	7.254	0.067	0.758	0.11	0.11	3.51
8508FW M1.5	3.88	33.29	995.53	9.42	6.034	0.062	0.818	0.16	0.16	4.41
8508FW NM1.5	2.73	31.87	609.76	5.07	3.784	0.031	0.817	0.23	0.22	3.78
8508FW NM1.5-6N	2.44	27.46	643.64	7.13	3.963	0.045	0.820	0.29	0.29	5.09
8508FW NM1.5-10N	2.28	25.53	651.82	14.85	4.077	0.098	0.869	0.50	0.93	9.56
8508FW B	4.31	37.79	952.61	7.54	5.734	0.047	0.815	0.14	0.14	3.66
8508FW B M0.8	8.10	55.94	1501.95	16.05	8.955	0.103	0.861	0.13	0.13	5.15
8508FW B NM1.0	4.14	39.18	837.80	10.33	5.076	0.104	0.561	0.15	0.15	3.36
8508FW B NM1.2	2.52	31.38	556.09	5.01	3.478	0.031	0.797	0.27	0.26	4.08

Table DR1: Lisheen Re-Os data

Table DR2: Silvermines Re-Os data

Sample Name	Re ppb	Total Os ppt	187Re/188 Os	± 2σ	187/188 Os	± 2 σ	rho	% Re Blank	% ¹⁸⁷ Os Blank	% ¹⁸⁸ Os Blank
B18 A	1.28	156.97	42.106	0.185	0.6743	0.0030	0.396	0.21	0.02	0.08
B18 A M0.7-F	1.37	392.10	17.719	0.085	0.5489	0.0018	0.301	0.32	0.02	0.05
B18 A NM0.7-F	0.63	144.86	22.148	0.200	0.5752	0.0022	0.188	0.79	0.05	0.15
B18 A NM 0.9	0.93	156.82	30.538	0.168	0.6335	0.0030	0.274	0.38	0.03	0.10
B18 A NM 1.0	1.24	178.58	35.616	0.180	0.6519	0.0040	0.599	0.13	0.09	0.30
B18 A NM 1.0-F	1.25	189.07	33.864	0.146	0.6380	0.0019	0.325	0.26	0.02	0.08
B18 A NM 1.2	1.21	159.77	39.011	0.173	0.6675	0.0024	0.342	0.26	0.02	0.09
B18 A NM 1.55	1.59	181.03	45.575	0.231	0.7076	0.0042	0.628	0.12	0.09	0.33
B18 A NM 1.55-F	1.25	90.99	72.681	0.294	0.8589	0.0025	0.370	0.22	0.03	0.14
B18 A NM 2.0-10/5	1.87	108.67	92.002	0.368	0.9701	0.0031	0.384	0.20	0.03	0.16
B18 A NM 2.0-F	1.72	118.02	77.250	0.305	0.8888	0.0031	0.390	0.18	0.02	0.12
B18 A NM 2.0-10/3	2.32	84.80	151.998	0.571	1.2975	0.0045	0.430	0.13	0.02	0.17
B15	0.53	120.22	22.355	0.115	0.5811	0.0021	0.283	0.36	0.02	0.07

Table DR3: Re-Os blank data

Blank	n(Re)	n(Os)	Re (pg)	±2σ	Os (pg)	±2σ	187/188 Os	±2σ
Lisheen	4	4	2.5	1.5	0.34	0.03	0.23	0.05
Silvermines	9	8	1.1	0.6	0.05	0.01	0.18	0.16

n(Re) = number of blank analyses for Re blank determination; n(Os) = number of blank analyses for Os blank determination

References:

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