

006199

MICROPROBE ANALYSIS OF ANVIL COMPOSITE ZINC CONCENTRATE SAMPLES

January 1972 Through April 1973

Enclosed please find the computer printout results of the microprobe analysis and seven microprobe scan photographs.

The procedure followed in this analysis is as follows:

1. A portion of each of the 13 composite samples was mounted in epoxy and polished.
2. Each of the mounted and polished samples was coated with a thin film (about 200 Angstroms) of evaporated carbon to render the surface conductive.
3. About 10 individual grains of sphalerite in each specimen was subjected to microprobe analysis (JOEL model JXA-3A) for Zn, Fe, and Mn. A minimum of four individual areas of each grain was probed, first for Zn and Fe, and subsequently for Zn and Mn, resulting in four counts for Fe and Mn and eight counts for Zn. Before and after analysis of each of the thirteen specimens, counts were taken on pure Fe, Zn, and Mn standards and background counts were taken.
4. Since each individual grain (with an exception) showed a remarkable uniformity within itself, the four (or eight) individual counts for each element were averaged and the averages submitted to the University computer to calculate weight and atomic compositions from the observed X-Ray count data. All sulphur compositions were determined by difference.

10 x 4
84

5. On a few clean sphalerite grains (chosen at random) continuous X-Ray Spectrometer plots were made to see if any elements other than Mn, Zn, Fe, and S were detectable. The range of this Spectrometer scan was such that any element of atomic number higher than Neon could be detected if present in any significant concentration.
6. On two or three of the mounted samples, large area searches for Mn rich grains were carried out to determine if any manganese based mineral grains were present.
7. On one interesting mineral grain found in the April 1973 Specimen, electron backscatter and absorption image photographs as well as characteristic X-ray emission image photographs were prepared.

RESULTS

1. Quantitative Analysis for Mn, Zn, and Fe.

Please refer to the computer printout sheets. The analysis of each one month composite sample appears on a separate stapled group of computer sheets. The pertinent results appear in the first two columns of the tabulated results and the sample averages appear on a subsequent page (and in Table I).

On looking at all the results it is clear that the zinc and iron contents in the sphalerite are remarkably constant throughout, averaging at 54.49 wt.% and 9.07 wt.% respectively.

The Mn content of the individual grains vary widely throughout. The overall grand total average of all Mn results is 0.762 wt.% but individual monthly averages range from 0.05 wt.% Mn (April 1973) to

1.17 wt.% Mn (January 1973) and within each sample the scatter is very wide (note the two sigma deviations on the computer sheets).

One possible explanation of the varying Mn content might be that the Mn content in the ore body varies from one part of the pit to another and that each one month composite sample contains mineral grains from widely varying parts of the pit. One observation, however, seems to be contrary to this argument (see below).

2. Spectrometer Plots on Clean Sphalerite Grains.

X-Ray Spectrometer scans on clean sphalerite grains did not indicate the presence of any elements other than Zn, Fe, Mn, and S. The technique is capable of detecting any element from sodium to uranium present in significant concentrations (say 0.01% more or less depending on the particular element). It was decided that spectrometer scans on every specimen would not yield data worth the added cost.

3. Search for Mn Rich Mineral Grains.

Large area searches for specific Mn rich mineral grains were negative, implying that the presence of separate Mn mineral grains was highly unlikely. A few lead base and copper base mineral grains were detected but this is, of course, to be expected.

4. April 1973 Specimen.

In the search for Mn rich areas, an unusual mineral grain was observed. Note that the April 1973 Specimen showed an unusually low Mn content (average 0.05% Mn), however, one separate mineral grain was

observed to have a very non-uniform composition. Looking at the two electron image photographs (labelled BEI and AEI), one cannot see any indications of grain boundaries yet the X-Ray emission photographs of the same area indicate that one portion of the grain is high in copper and iron and free of zinc while a second portion is zinc rich and very low in manganese. (In the X-Ray image photographs, the white areas represent areas rich in that particular element.)

The highest manganese content of any of the grains analysed in this work was observed in the manganese rich area of this one grain (3.67% Mn). This observation seems unexplainable and, indeed, is probably of no real significance.

T A B L E I

AVERAGE COMPOSITIONS PER MONTH JANUARY 1972 THROUGH APRIL 1973

Sample	Zn wt. %	Fe wt. %	Mn wt. %	S* wt. %	
Jan. 1972 ✓	53.77	9.39	0.71	36.13	63.87
Mar. 1972 ✓	54.37	9.80	Note ①	35.83	64.17
Apr. 1972 ✓	55.54	8.84	1.04	34.58	65.42
July 1972 ✓	52.31	9.42	1.13	37.14	62.88
Aug. 1972 ✓	55.46	9.35	0.67	34.51	65.49
Sep. 1972 ✓	54.84	9.37	0.98	34.81	65.19
Oct. 1972 ✓	56.93	8.03	0.61	34.43	65.57
Nov. 1972 ✓	55.25	9.15	0.86	34.74	65.26
Dec. 1972 ✓	54.94	9.65	0.66	34.74	65.26
Jan. 1973 ✓	53.31	8.97	1.17	36.56	63.46
Feb. 1973 ✓	55.48	8.92	0.44	35.16	64.84
Mar. 1973 ✓	54.33	9.23	0.81	35.63	64.37
Apr. 1973	51.81	7.75	0.05	40.39	59.61
Average:	54.49%	9.07%	0.762%		

* Sulphur determined by difference

Note ① - No Mn readings taken. Mn assumed to be 0%.