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MINERALOGICAL INVESTIGATION OF HAND SAMPLES FROM THE STRATHCONA LEAD-ZINC DEPOSIT, BAFFIN ISLAND

by

L. J. CABRI

MINERAL SCIENCES DIVISION

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SUMMARY OF RESULTS

A mineralogical investigation of thirteen samples from the Strathcona Pb-Zn deposit shows that these are mineralogically simple, galena and sphalerite being the two minerals of economic interest. Pyrite is a common sulphide, and pyrrhotite is a very minor constituent. The minerals are largely coarse-grained and are not expected to present beneficiation problems with the exception of some pyrite inclusions in sphalerite and, more rarely, in galena. Galena is more closely associated texturally with pyrite than with sphalerite. The galena and pyrite have no detectable minor elements, whereas the sphalerite contains from 0.1 to 0.3 wt % Cd and 0.25 to 7.5 wt % Fe.

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INTRODUCTION

Thirteen hand samples were received on the 5th of January, 1973 from Mr. A.T. Griffis of Watts, Griffis & McOuat Ltd., Suite 911, 159 Bay Street, Toronto 1, with a request for a mineralogical investigation. The samples came from a bulk sample obtained from a small trench into bedrock at the location of Drill Hole No. 164.

METHOD OF INVESTIGATION

A polished section was prepared from each of the thirteen hand samples after preliminary investigation with a binocular microscope. Two polished thin sections were also prepared. These sections were examined with a microscope using both reflected and transmitted light to identify the minerals and examine their textural relations. The electron microprobe was used to search for minor elements in the sulphides and to determine their contents quantitatively.

MINERALOGY

Macroscopic Features

The hand samples varied considerably in appearance from coarsely banded sulphides (bands between 2 and 5 mm, occasionally over 1 cm), as shown in Figure 1, to massive coarse-grained sulphide mixtures containing numerous vugs. The vugs are either filled or partly filled with calcite, pyrite crystals, and minor quartz. The finer-grained (~1-mm) sphalerite-rich specimens are easily friable. One specimen consisted principally of massive pyrite with numerous clusters of well-formed cubic crystals up to about 7 mm a side (No. 13). Another sample consisted principally of galena (No. 3) with well-formed cubic crystals up to about 1 cm a side.

Microscopic and Compositional Features

The sulphide mineralogy is very simple and most textural features are coarse-grained. The principal sulphides present are sphalerite, pyrite, and galena with very minor pyrrhotite. The gangue consists mainly of calcite with minor quartz.

Sphalerite

The sphalerite is generally coarse-grained, usually over half a millimeter in diameter. It sometimes contains small (1 to 100-μ) inclusions of pyrite (Figure 2) and, more rarely, 10 to 150-μ inclusions of galena (Figure 3). Stringers of pyrite crystals can also be found between grain boundaries. The colour variation in sphalerite, from very pale yellow to a dark reddish brown, can be seen with transmitted light. This may appear as distinct zoning, either with the margins of sphalerite crystals being light-coloured (Figure 4) or as irregular dark and light areas.

The minor-element contents of sphalerite in two sections (No. 5 & 9) were established by electronprobe microanalysis. The only minor elements detected were Fe and Cd; Mn and In were especially sought but could not be detected. The electronprobe analyses for Cd and Fe were hindered by being unable to discriminate optically between the light and dark zones on a polished surface in contrast to the zoning visible with transmitted light in a thin section. Sufficient point counts were taken for separate zones of sphalerite in these two sections to determine that the Cd content was between 0.1 and 0.3 wt % and was not related to the Fe content. The iron content was much more variable, with areas of low iron-bearing sphalerite (0.25 to 0.6 wt %) in higher-iron containing zones (6 to 7 wt %).

Galena

The galena is generally coarse-grained (1 to 5-mm) but can be observed either as finer-grained intergrowths with pyrite (Figure 5) or as inclusions in sphalerite (Figure 3). In the coarsely banded specimens, galena is more closely associated with the pyritic layers than with those rich in sphalerite. Microprobe analysis failed to reveal any minor elements in galena.

Pyrite

Pyrite is one of the most common sulphides in the samples examined. It occurs as coarse bands (Figure 1), as both well-developed crystals (Figure 6) and as massive areas. The massive and the coarse-grained areas of pyrite usually contain numerous inclusions of gangue minerals. The textural relations between pyrite and sphalerite and galena suggest that they may have been deposited contemporaneously, but some replacement of pyrite by sphalerite and galena may have occurred. Some of the pyrite crystals growing on calcite crystals in vugs probably represent the latest sulphide deposition. No minor elements could be detected in pyrite by electronprobe microanalysis.

Pyrrhotite

Pyrrhotite is a very minor constituent of the samples and was only observed in pyrite as 1 to 50-μ inclusions. Electronprobe microanalysis showed it to be hexagonal pyrrhotite, Fe_9S_{10}.

Gangue Minerals

The principal gangue mineral is calcite, filling spaces in the sulphide assemblages and lining vugs. Quartz is frequently associated with the calcite.

CONCLUSIONS

1. The principal minerals of economic interest are sphalerite and galena.

2. The coarse-grained sulphides and the simple mineral assemblages will present no beneficiation problems other than the liberation of some of the galena inclusions from sphalerite.

3. The only sulphide mineral with a detectable minor-element content is sphalerite that contains 0.1 to 0.3 wt % Cd and 0.25 to 0.5 wt % Fe.

ACKNOWLEDGEMENTS

The assistance of Messrs. Y. Bourgoin, D.R. Owens, and R.G. Pinard in polishing sections, electronprobe analysis, and photomicrography, respectively, is gratefully acknowledged.

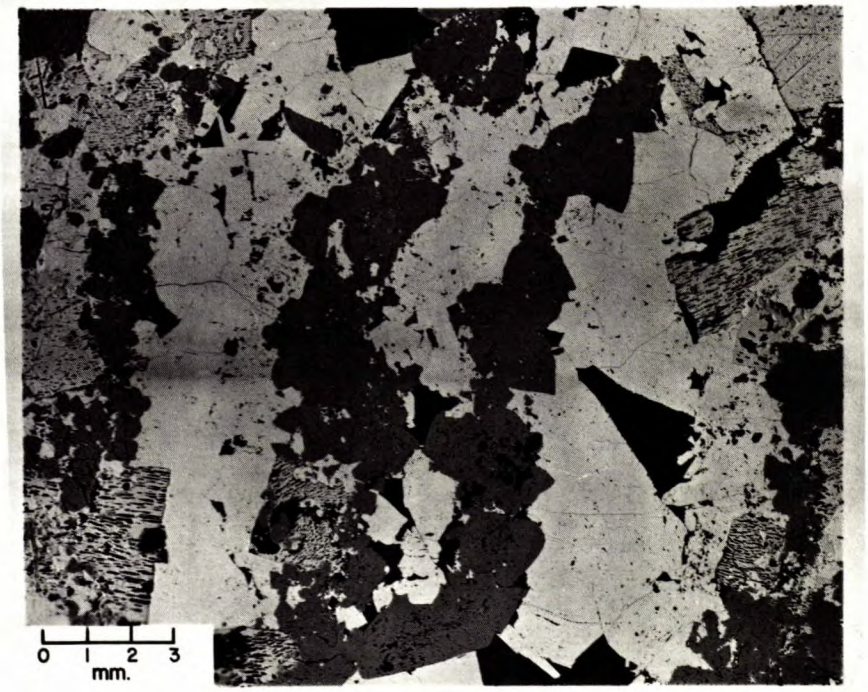

Figure 1. Photomicrograph showing coarsely banded sulphides. Pyrite (white) is associated with galena (light grey, heavily pitted), separated by bands of sphalerite (dark grey). The black areas are gangue minerals.

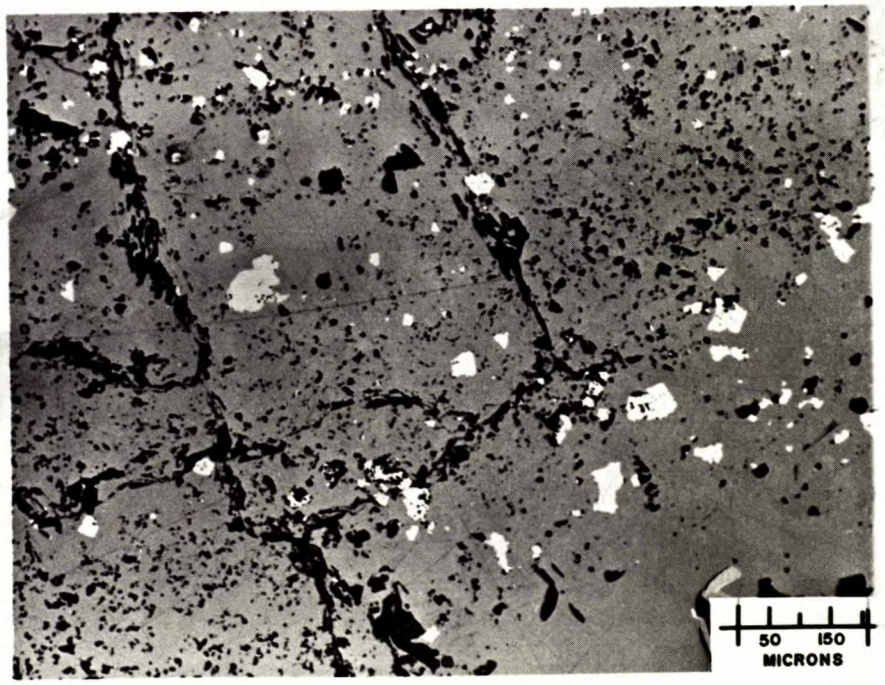

Figure 2. Photomicrograph showing pyrite inclusions in sphalerite. The black areas are pits while the dark grey areas are gangue.

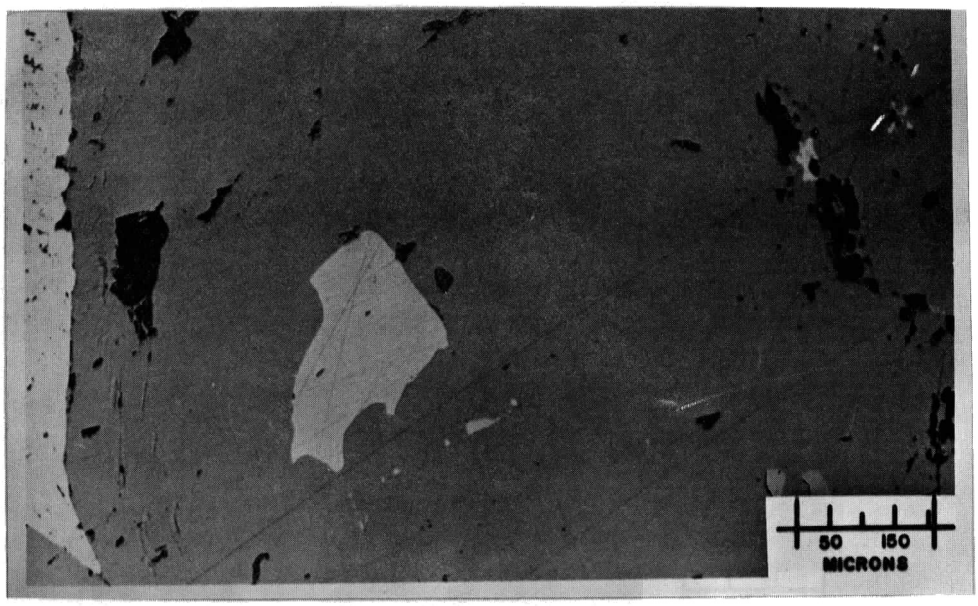

Figure 3. Photomicrograph showing galena inclusions in sphalerite. The light-coloured area on the left is pyrite. Black areas are pits.

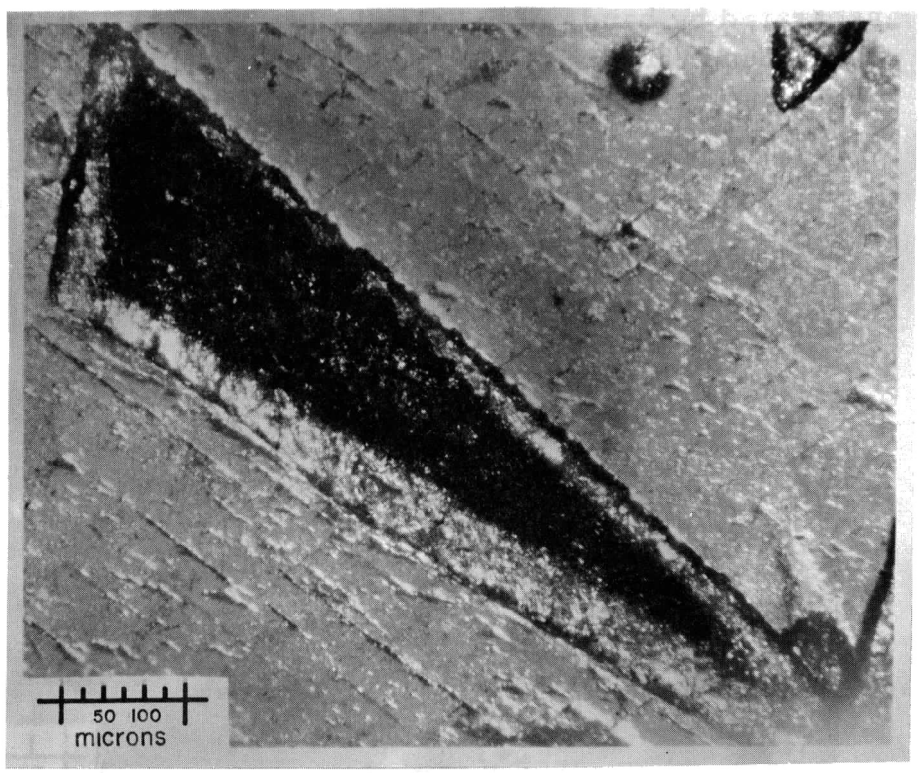

Figure 4. Photomicrograph of a polished thin section showing a wedge-shaped sphalerite crystal in calcite. The zoning along the edge of the sphalerite crystal is due to the lower iron content.

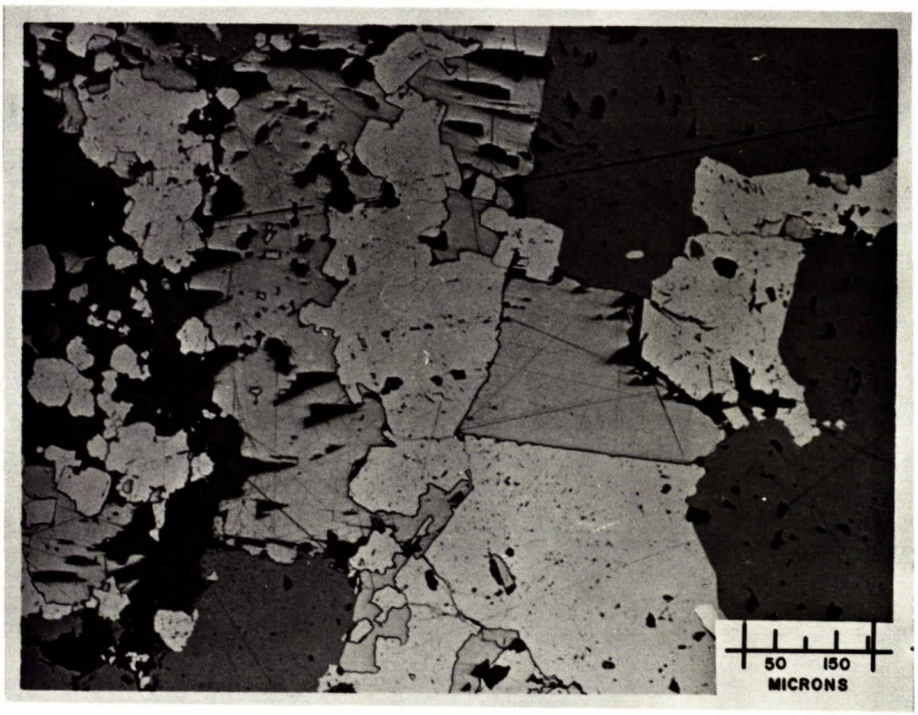

Figure 5. Photomicrograph showing intergrowth between pyrite (white) and galena (light grey). The dark grey areas are gangue minerals, while the black areas are pits. Sphalerite (medium grey) can be seen on the right-hand side and in the lower left of the photomicrograph.

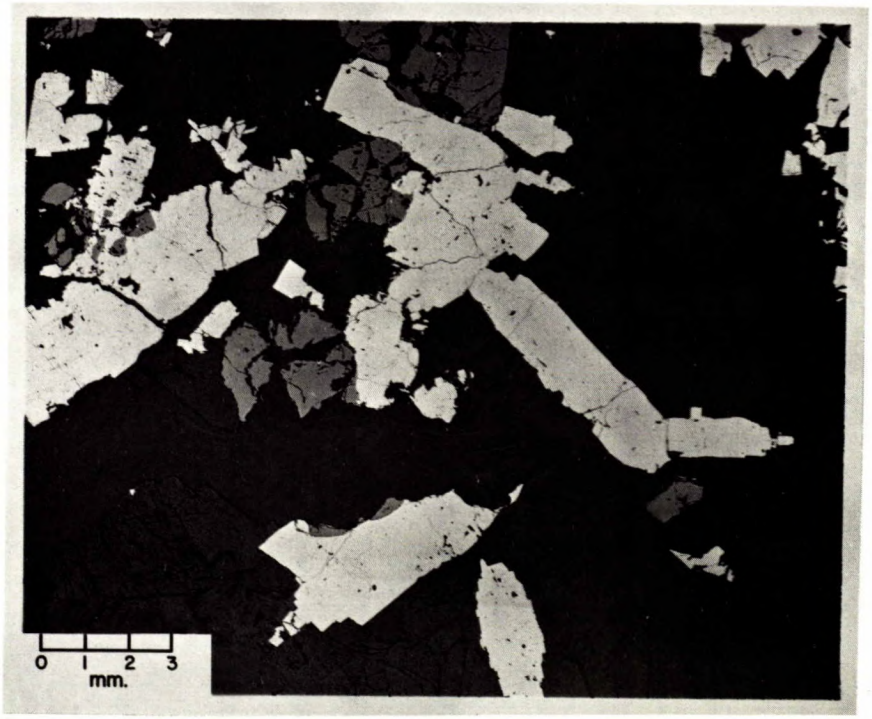

Figure 6. Photomicrograph showing crystals of pyrite in calcite gangue and a few smaller crystals of sphalerite (medium grey).