

CANADA

DEPARTMENT OF MINES AND TECHNICAL SURVEYS

OTTAWA

MINES BRANCH INVESTIGATION REPORT IR 65-100

**MINERALOGICAL INVESTIGATION  
OF ORE SAMPLES FROM MOUNT NANSEN  
MINES, YUKON TERRITORY**

by

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**MINERAL SCIENCES DIVISION**

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COPY NO. 19

OCTOBER 19, 1965



Industrial Confidential

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METHOD OF INVESTIGATION

Eight polished and three thin sections were prepared from the hand specimens and examined under the ore and petrographic microscopes. The head sample was sized and the -65+325 mesh fraction was separated into sub-fractions by means of heavy liquids with specific gravities of 2.96, 3.33 and 3.70. The gravity float and sink sub-fractions were analysed by means of the X-ray diffractometer, and polished sections were prepared from the 3. SUMMARY OF RESULTS Minerals were identified by X-ray and microscopical studies.

A mineralogical study of ore samples from the Mount Nansen deposit in Yukon Territory shows that the ore is composed chiefly of siliceous rock and breccia, and contains minute grains of silver-bearing minerals. The silver-bearing minerals are freieslebenite, acanthite and native silver. Other minerals in the ore are arsenopyrite, pyrite, sphalerite, galena, chalcopyrite, bornite, pyrrhotite, covellite, quartz, pyroxene, rutile, calcite, arsenobismite, scorodite and goethite. These minerals occur as separate grains, and are present in such small quantities that only the silver-bearing minerals are likely to be of economic significance. It is to be noted that although gold was reported in the analysis of the sample, no gold-bearing minerals were found.

The silver-bearing minerals are freieslebenite ( $Pb_3Ag_5Sb_5S_{12}$ ), acanthite ( $Ag_2S$ ) and native silver ( $Ag$ ). The freieslebenite grains vary from about 10 to 200 microns in size (Figure 1) and the acanthite grains vary from about 1 to 100 microns in size. The larger acanthite grains contain inclusions of native silver (Figure 2).

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Arsenopyrite, pyrite and sphalerite are partially replaced by secondary minerals. The arsenopyrite grains are bordered and replaced by arsenobismite, scorodite, goethite and covellite, and the pyrite



## INTRODUCTION

Two samples of a silver ore from the Mount Nansen mines deposit in Yukon Territory were received from T.F. Berry of the Mineral Processing Division. Mr. Berry stated that the ore had been submitted to the Mines Branch by Mr. B.S. Imrie, Exploration Manager, Mount Nansen Mines Limited, 420-475 Howe St., Vancouver 1, B.C., and requested that it be studied mineralogically. The samples received consisted of a number of hand specimens and a head sample ground to about -10 mesh. It was reported that the head sample contains about 29.58 oz per ton Ag and 0.42 oz per ton Au.

## METHOD OF INVESTIGATION

Eight polished and three thin sections were prepared from the hand specimens and examined under the ore and petrographic microscopes. The head sample was sized and the -65+325 mesh fraction was separated into sub-fractions by means of heavy liquids with specific gravities of 2.96, 3.33 and 3.70. The gravity float and sink sub-fractions were analysed by means of the X-ray diffractometer, and polished sections were prepared from the 3.70 separation products. Minerals were identified by X-ray and microscopical studies.

## RESULTS OF INVESTIGATION

The hand specimens consist of a very fine-grained siliceous rock and breccia, both of which contain minute disseminated grains of metallic minerals. The metallic minerals are pyrite, arsenopyrite, sphalerite, freieslebenite, acanthite, native silver, galena, chalcopyrite, bornite, pyrrhotite and covellite. These minerals occur as separate grains, and are present in such small quantities that only the silver-bearing minerals are likely to be of economic significance. It is to be noted that although gold was reported in the analysis of the sample, no gold-bearing minerals were found.

The silver-bearing minerals are freieslebenite ( $\text{Pb}_3\text{Ag}_5\text{Sb}_5\text{S}_{12}$ ), acanthite ( $\text{Ag}_2\text{S}$ ) and native silver (Ag). The freieslebenite grains vary from about 10 to 200 microns in size (Figure 1) and the acanthite grains vary from about 1 to 100 microns in size. The larger acanthite grains contain inclusions of native silver (Figure 2), and occasionally are intergrown with galena.

Arsenopyrite, pyrite and sphalerite are partially replaced by secondary minerals. The arsenopyrite grains are bordered and replaced by arsenobismite, scorodite, goethite and covellite, and the pyrite



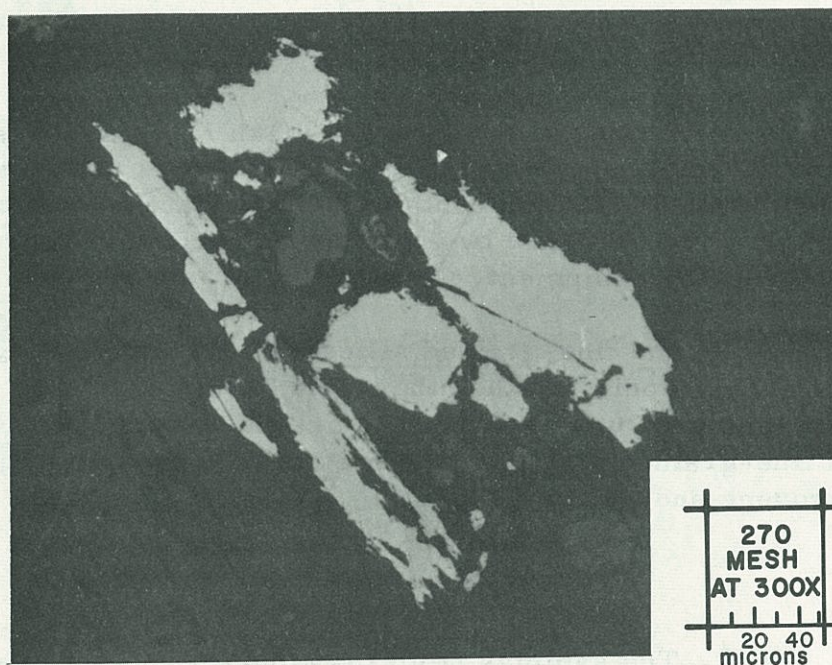


Figure 1 - Photomicrograph of a polished section of the 3.70 gravity sink fraction showing a grain of freieslebenite (white) and several grains of gangue (grey).

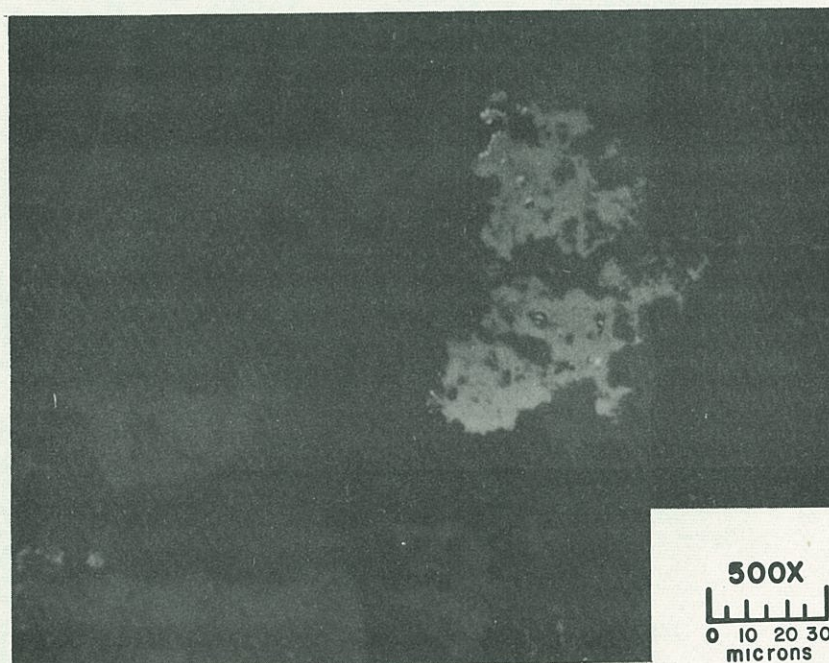


Figure 2 - Photomicrograph of a polished section of the 3.70 gravity sink fraction showing acanthite (light grey) with minute inclusions of native silver (white). The dark grey grains represent gangue.



and sphalerite grains are partially replaced by goethite and covellite, respectively.

A study of the -65+325 mesh 3.70 gravity sink sub-fraction shows that most of the metallic mineral grains are intergrown with gangue and that this sub-fraction contains a significant amount of native iron, much of which is bordered by goethite; this probably represents tramp iron from the crushing equipment.

The fine-grained siliceous rock consists largely of quartz and feldspar. The breccia, on the other hand, consists of rock fragments, irregular pyroxene and rutile grains, and arsenobismite and scorodite veinlets in a fine-grained matrix. The matrix is composed of quartz, feldspar, pyroxene and calcite.

### CONCLUSIONS

The samples from the Mount Nansen deposit consist of siliceous rock and breccia and contain a number of fine-grained silver-bearing minerals. The silver-bearing minerals are freieslebenite, acanthite and native silver. It is expected that very fine grinding would be required to effect substantially complete liberation.

Figure 5 - Photomicrograph of polished section of the 3.70 gravity sink fraction showing magnetite (light grey) with minute inclusions of native silver (white). The dark grey grains represent gangue.