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by

W. PETRUK

MINERAL SCIENCES DIVISION

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Mines Branch Investigation Report No. IR 64-79

MINERALOGICAL INVESTIGATION OF A COPPER-NICKEL ORE FROM THE BELLETERRE AREA IN QUEBEC FOR LORRAINE MINING COMPANY LIMITED

by

W. Petruk*

SUMMARY OF RESULTS

The copper-nickel ore from the Lorraine Mining Company's property in the Belleterre area, Quebec, is composed of masses and disseminations of metallic minerals in gangue. The copper bearing mineral is chalcopyrite and the nickel bearing minerals are pentlandite and violarite. The pentlandite and violarite are intimately intergrown and occur largely as irregular grains in pyrrhotite and chalcopyrite.

Other minerals in the deposit are magnetite, goethtite, pyrite, marcasite, sphalerite, galena, rutile, and ilmenite.

*Senior Scientific Officer, Mineralogy Section, Mineral Sciences Division, Mines Branch, Department of Mines and Technical Surveys, Ottawa, Canada.

INTRODUCTION

Two samples of a copper-nickel ore from the Lorraine Mining Company's property near Belleterre, Quebec, were received from A. Stemerowicz of the Mineral Processing Division in March, 1964. Mr. Stemerowicz stated that the ore was submitted to the Mines Branch by J. M. Carter, Chief Metallurgist, McIntyre Porcupine Mines Limited, Suite 1500, 25 King Street West, Toronto 1, Ontario, and requested that the samples be studied mineralogically. As received one sample consisted of fragments about 1/4 inch in size and the other was crushed to about -10 mesh.

METHOD OF INVESTIGATION

Polished sections and oil immersion mounts were prepared from the samples and the minerals were identified by means of microscopical and X-ray diffraction studies. A portion of the crushed sample was separated into fractions by means of a heavy liquid with a specific gravity of 2.96. The sink fraction from this separation was sized. Polished sections were prepared from the sized fractions and a grain count was made on each sized fraction to determine the degree of liberation of the minerals.

RESULTS OF INVESTIGATION

The ore consists of masses and disseminations of metallic minerals in gangue. The metallic minerals are pyrrhotite, chalcopyrite, pentlandite, violarite, magnetite, goethtite, pyrite, marcasite, sphalerite, galena, rutile and ilmenite with hematite lamellae. The non-metallic minerals are quartz, chlorite, a carbonate (calcite) and feldspar.

The most abundant metallic minerals are chalcopyrite and pyrrhotite. The chalcopyrite occurs as masses, disseminations in gangue, and minute veinlets in gangue (see Figure 1) and magnetite. The masses contain small inclusions and veinlets of pyrrhotite, pentlandite and marcasite, and larger inclusions of magnetite.

The pyrrhotite occurs as masses and disseminations in gangue. The masses contain inclusions of pentlandite (see Figure 2), violarite, pyrite, magnetite and chalcopyrite. These inclusions range from about 5 microns to a millimeter in size with the majority being about 50 to 200 microns in size. In some places the pyrrhotite contains minute flame-like bodies of pentlandite and larger flame-like bodies of an unidentified mineral (see Figure 3). The latter is optically similar to pyrrhotite but is slightly lighter colored in reflected light. It is suggested that it may be nickeliferous pyrrhotite.

Pentlandite and violarite are present as irregular grains in pyrrhotite and chalcopyrite. These grains also range from about 5 microns to a millimeter in size. The pentlandite contains globules of violarite (see Figure 4). It is to be noted that violarite was found only in samples that contain significant amounts of marcasite and goethite (see Figure 5).

Pyrite and marcasite are present as irregular grains and as veinlets in pyrrhotite. Magnetite occurs as irregular grains in gangue and goethtite is present as masses.

Sphalerite, galena, rutile, and ilmenite with hematite lammellae were found only as isolated grains in polished sections of the sized fractions.

LIBERATION OF CHALCOPYRITE AND PENTLANDITE PLUS VIOLARITE

The approximate liberation characteristics of the chalcopyrite and pentlandite combined with violarite were determined by means of grain counts on polished sections of sized fractions. The results are given in Table 1.

TABLE 1

Liberation Characteristics of Chalcopyrite and Pentlandite Combined with Violarite from the Lorraine Mining Company's Ore

Grain size (Tyler mesh)	Pentlandite-violarite (amount as free grains) per cent	Chalcopyrite (amount as free grains) per cent
-10 + 20	00	00
-20 + 28	00	00
-28 + 35	00	00
-35 + 48	00	00
-48 + 65	00	45
-65 + 100	50	74
-100 + 150	50	71
-150 + 200	61	70
-200 + 270	71	81
-270 + 325	68	80

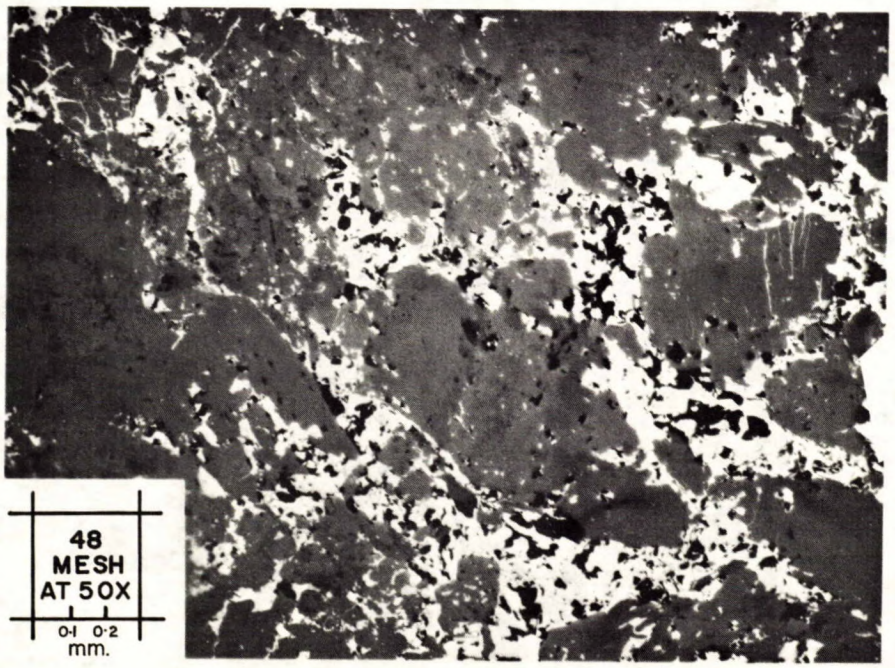

Figure 1 - Photomicrograph of a polished section showing disseminations and veinlets of chalcopyrite (white) in gangue (grey).

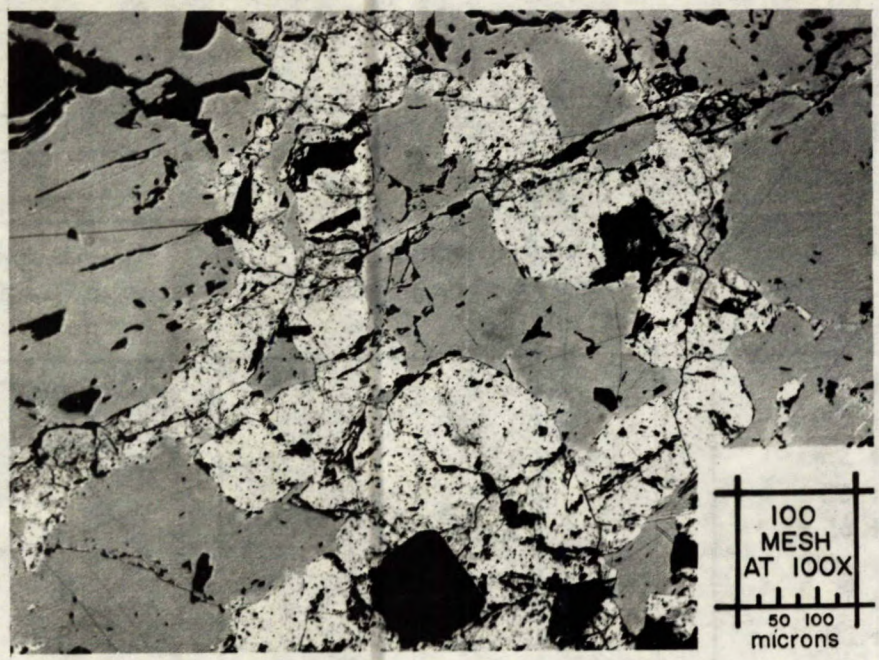

Figure 2 - Photomicrograph of a polished section showing irregular grains of pentlandite (white) in pyrrhotite (grey). The black spots represent gangue and pits on the polished surface.

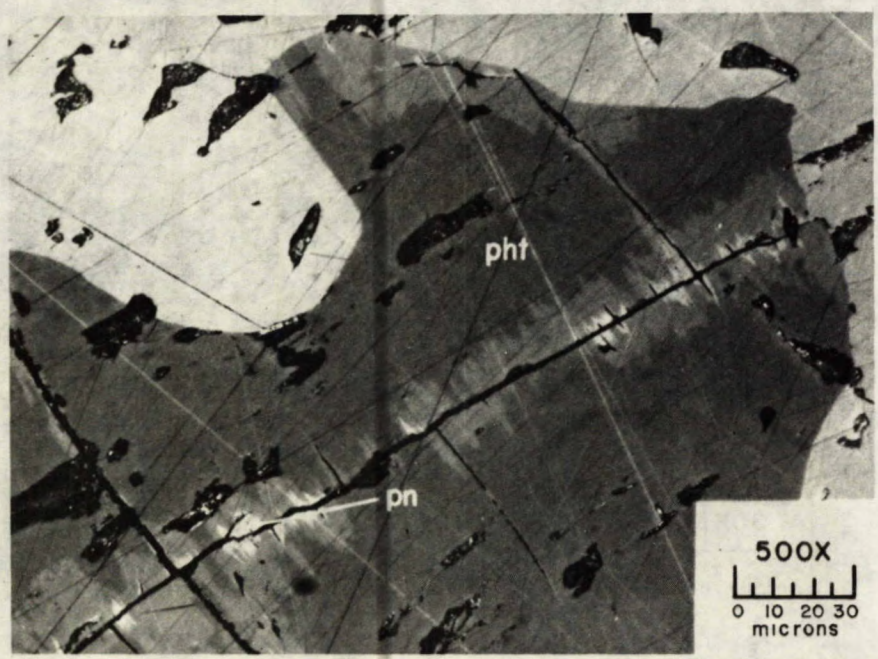

Figure 3 - Photomicrograph of a polished section showing pyrrhotite (pht), chalcopyrite (cp) and pentlandite (pn), and the larger flame-like bodies in pyrrhotite.

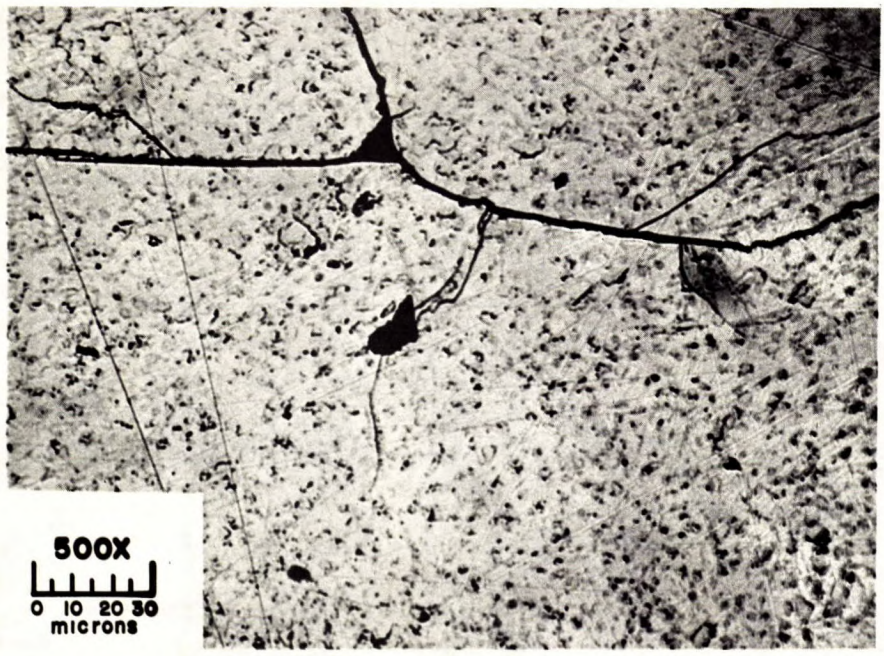

Figure 4 - Photomicrograph of a polished section showing numerous minute globules of violarite in pentlandite.

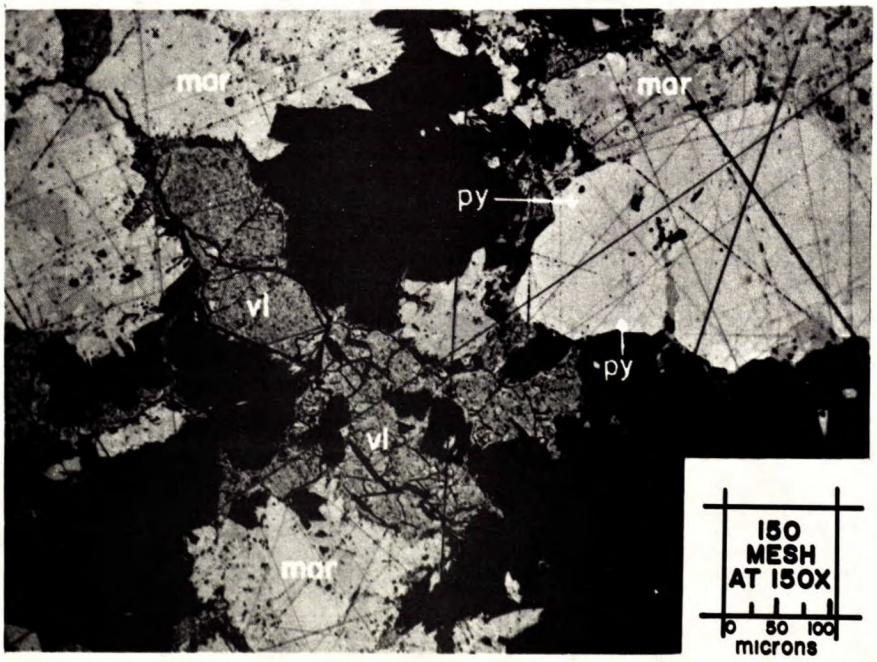

Figure 5 - Photomicrograph of a polished section showing an irregular grain of violarite (vl) in marcasite (mar), pyrite (py) and gangue (black).