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MINES BRANCH INVESTIGATION REPORT IR 62-58

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**MINERALOGICAL REPORT ON A SAMPLE OF
NORMAL MILL FEED ORE FROM
KERR-ADDISON GOLD MINES LTD.,
VIRGINIATOWN, ONTARIO**

by

M. R. HUGHSON & S. KAIMAN

EXTRACTION METALLURGY DIVISION

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AUGUST 8, 1962

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SUMMARY OF RESULTS

Native gold occurs primarily as inclusions in grains of pyrite in a light to dark grey, fine-grained rock composed principally of carbonates and silicates. Only a few particles of native gold occur apart from the pyrite as inclusions in the non-opaque minerals. The size of particles of native gold ranges from <1 to 30 microns.

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INTRODUCTION

A 100 lb sample of 3/4 in. "normal mill feed ore" from Kerr-Addison Gold Mines Ltd., Virginiatown, Ontario was received by the Extraction Metallurgy Division of the Mines Branch on June 12, 1962. It was given our Reference No. 6/62-6. A sample weighing approximately 1250 g was taken for the mineralogical investigation. The purpose of the mineralogical study was to compare the occurrence of gold with that in the company's "graphitic ore" (see Investigation Report IR 62-30).

Assays and chemical analyses of a head sample show that the ore contains 0.375 oz Au/ton, 0.05 oz Ag/ton, 14.4% CO₂(evolution), 15.0% CO₂(combustion) and 0.2% elemental carbon (calculated).

The mineralogical investigation consisted of a preliminary examination, with a stereoscopic microscope, of the rock chips as received, followed by a detailed study of thin sections of rock with a petrographic microscope, and of polished sections of mineralized rock chips with an ore microscope. All mineral identifications were confirmed by x-ray diffraction methods.

MINERALOGY

The sample of mill feed ore consists chiefly of a light to dark grey, fine grained rock which is composed mainly of carbonates and silicates. The essential constituents are dolomite, plagioclase feldspar and quartz, which occur as intimately intermixed anhedral grains. Minor constituents include chlorite, magnesite, sericite, sulphides, rutile and gold.

Sericite gives an emerald green colour to some of the lighter coloured rock chips in which it occurs in fractures. A few white to smoky grey rock chips consist of quartz and only small amounts of plagioclase feldspar, dolomite and magnesite.

A small amount of dark grey, fine-grained, gneissic rock containing densely spaced thin black seams was also observed. It resembles the "graphitic ore" (see Investigation Report IR 62-30) and apparently represents the small amount of elemental carbon present in the normal mill feed.

Pyrite is the most abundant metallic mineral. It occurs as fine euhedral crystals and fragments of crystals, some of which are irregularly disseminated through the rock and some of which are concentrated into bands. Minute grains of rutile are thinly disseminated throughout much of the rock. Rutile also occurs as aggregates of grains, particularly where bands of pyrite are present. To a lesser extent rutile is intergrown in grains of pyrite.

Very small amounts of chalcopyrite, pyrrhotite, gersdorffite (NiAsS) and native gold are present. Chalcopyrite occurs as sparsely disseminated, anhedral grains usually in non-opaque minerals but also intergrown in grains of pyrite. Very fine particles of pyrrhotite were observed in some of the pyrite grains. Fine, euhedral crystals of gersdorffite are rare. They occur as free crystals or may be attached to grains of pyrite.

Gold occurs in this ore sample as fine-grained irregular particles of the native element. The particles are usually enclosed in grains of pyrite (Figure 1). Fifty-one particles of native gold were observed in seven of the polished sections which were traversed with the ore microscope. Forty-five of these particles are enclosed in pyrite grains, three are attached to grains of pyrite (Figure 2) and three appear to be surrounded by non-opaque minerals (Figure 2). Of the forty-five particles of gold enclosed within grains of pyrite three were associated with chalcopyrite or pyrrhotite. The fifty-one particles of native gold vary considerably in grain size: the maximum dimension observed in the polished sections was 30 microns and the minimum dimension observed was less than one micron.

No gold was observed in four of the polished sections examined. These sections were characterized by a lower pyrite content than those in which native gold was recognized.

PHOTOMICROGRAPHS

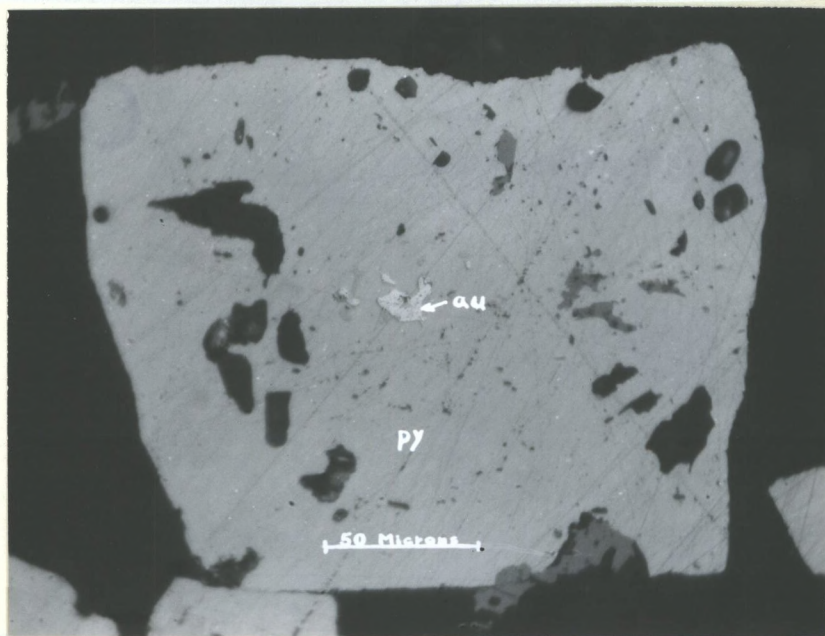


Figure 1. A grain of pyrite (py), containing inclusions of native gold (au), is surrounded by non-opaque minerals. The light grey inclusions in the grain of pyrite are rutile and the dark grey inclusions are non-opaque minerals. X400.

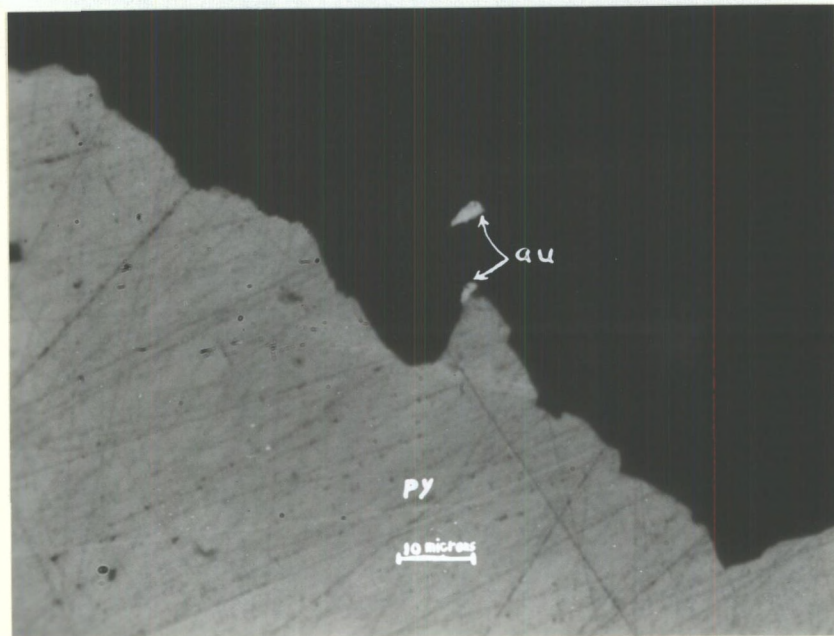


Figure 2. A particle of native gold (au) is adjacent to a grain of pyrite (py) and a second particle is completely surrounded by non-opaque minerals. X1000.

DISCUSSION AND CONCLUSIONS

Very fine-grained particles of native gold are associated with pyrite in a light to dark grey rock consisting chiefly of carbonates and silicates. In most occurrences the gold is completely enclosed in grains of pyrite but a few particles were observed which were attached to grains of pyrite or occurred entirely in the non-opaque minerals.

The occurrence of gold in the mill feed sample, as fine particles of the native element and mainly as inclusions within grains of pyrite, is similar to that of the "graphitic ore". Table I shows that a higher proportion of native gold in the normal mill feed is enclosed by pyrite than is the case in the "graphitic ore". In general, the gold particles also appear to be somewhat smaller. In the "graphitic ore" some of the gold was found to occur as veinlets in pyrite and as particles in fractures within grains of pyrite; no such occurrences were observed in the present sample.

The almost complete absence in the normal mill feed ore of the dark grey gneissic rock characteristic of the "graphitic ore" is confirmed by the low elemental carbon content of 0.2%. In the "graphitic ore" the elemental carbon content was found to be 4.05% (see IR 62-30).

TABLE 1

Occurrence of Native Gold in Two Ore Samples from
Kerr-Addison Gold Mines Ltd.

Nature of Occurrence	Graphitic ore (IR 62-30)		Normal mill feed ore	
	Number of Particles (7 polished sections)	Size range in microns	Number of Particles (11 polished sections)	Size range in microns
in pyrite	21	2 to 113	45	<1 to 30
in non-opaque minerals	9		6	
Totals	30		51	