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MINERALOGICAL INVESTIGATION OF TWO DIAMOND DRILL CORE SAMPLES FROM MOKTA (CANADA) LTÉE., MONTREAL, QUEBEC

by

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EXTRACTION METALLURGY DIVISION

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M.R. Hughson* and S. Kalman**

SUMMARY

Two diamond drill core samples of anorthosite rock, which had been submitted for mineralogical investigation of the occurrence of vanadium, were found by chemical and spectrographic analyses to contain no more than 0.003% V. No discrete vanadium-bearing mineral was observed. However, the present work indicates that the vanadium occurs as a trace constituent in ilmenite-hematite intergrowths and in pyroxene.

The sample consists mainly of plagioclase feldspars. In addition to minor amounts of pyroxene there are smaller amounts of chlorite, biotite, calcite, quartz, and rutile. Traces of pyrite are present as well as ilmenite and hematite.

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INTRODUCTION

In a letter dated November 17, 1965, Mr. René Chouteau, President, Mokta (Canada) Ltée. requested that the Extraction Metallurgy Division carry out a mineralogical investigation of two diamond drill core samples of anorthosite rock. The samples of split 1-5/8" core, designated UI, Hole No. 2, M. St. V., L-4, 122' and U2, Hole No. 3, M.M., L-56 respectively were received on November 19, 1965 and were given our Reference No. 11/65-4. The Company reported that the cores contained 0.30% V. The purpose of the investigation was to determine the nature of occurrence of vanadium in the two samples.

PROCEDURE AND RESULTS

Preliminary examination of the diamond drill core samples U1 and U2 with a low-power stereoscopic microscope showed that they are similar in appearance and consist of light coloured, medium-grained, equigranular rock sparsely intergrown with a greenish-black mineral. Sample U1 is pale pink in colour while sample U2 is a light grey colour. Small amounts of metallic minerals are present, chiefly black grains having a submetallic lustre.

Thin sections of the rock from each sample were examined with a petrographic microscope. The most abundant constituents are the intermediate soda-lime plagioclase feldspars, andesine and labradorite. Dark green pyroxene a minor constituent, is more abundant in sample U1 than sample U2. It is erratically disseminated in the feldspars and also occurs as groups of small subparallel lenses. The pyroxene is partly altered to chlorite. Also present are small amounts of biotite, calcite, quartz, and rutile.

Four polished sections of rock chips from the core samples were studied with an ore microscope. The most common metallic minerals are ilmenite and hematite which are intergrown with one another. The intergrowths show ex-solution texture and consist of large blebs of hematite in ilmenite, and very fine blades of ilmenite in the hematite blebs. The hematite-ilmenite intergrowths occur as irregular grains up to several millimetres in size. They are more abundant in sample U2 than in sample U1. Traces of pyrite were observed in each sample. No discrete vanadium mineral was identified either in polished or thin section.

In order to facilitate the investigation of the occurrence of vanadium, representative specimens of the drill core from samples U1 and U2 were pulverized and sized on Tyler screens. By means of gravity and magnetic separation methods the minus 65 plus 100 mesh fraction of each

sample was separated into three concentrates each of which consists predominantly of one mineral group, as follows: metallic minerals, mafic minerals, and plagioclase feldspars. The mineralogical composition of the concentrates is shown in Table 1.

Chemical and spectrographic analyses of the concentrates and a head sample of each drill core were carried out to determine whether there was a concentration of vanadium in a particular group of minerals. Since there was insufficient metallic concentrate from sample U1 for analysis a second larger metallic mineral concentrate was prepared of this sample and also of sample U2.

The analytical results in Table 1 show that there are only trace amounts of vanadium in the head samples. However, there is a concentration of vanadium in the metallic minerals which are chiefly ilmenite and hematite and in the mafic mineral concentrate which consists mainly of pyroxene.

TABLE 1

Vanadium Analyses of Drill Core Concentrates

Fraction	Description	Sample U1			Sample U2		
		Wt %	% V		Wt %	% V	
			Chemical *	Semi-quant. Spec.**		Chemical *	Semi-quant. Spec.**
Metallic Mineral Concentrate	ilmenite, hematite and minor pyrite	0.4	-	-	1.8	0.13	0.10
		-	0.27***	0.33***	-	0.15***	0.25***
Mafic Mineral Concentrate	pyroxene, chlorite and minor biotite, calcite, plagioclase, and traces of rutile	9.9	0.023	0.03	2.4	0.015	0.03
Plagioclase Feldspar Concentrate	plagioclase and minor quartz pyroxene, chlorite, biotite, and calcite	89.7	<0.003	N.D.	94.8	<0.003	0.003
Head Sample	-	100	<0.003	0.003	100	<0.003	0.003

* Performed by Chemical Analysis Section, Extraction Metallurgy Division, Analysis Reports EM-2789, -2799, -3019, -3020, -3080, -3081, -3367, -3368, -3369.

** Performed by Spectrographic Laboratory, Mineral Sciences Division, Internal Reports MS-AC-66-7 and MS-AC-66-9.

*** Analyses of a second metallic concentrate.

DISCUSSION AND CONCLUSIONS

Trace amounts of vanadium (<0.003%) are present in each of two drill core samples of anorthosite. No discrete vanadium mineral was identified. Chemical and spectrographic analyses of mineral concentrates indicate that the vanadium occurs as a trace constituent in ilmenite-hematite intergrowths and in pyroxene.

Vanadium has been previously reported to be a trace element of magnetite, ilmenite, and pyroxenes. L.R. Wagner and R.L. Mitchell[1] found it to be a characteristic constituent of these minerals from east Greenland; the parts per million are 2000, 600, and 200 respectively. T. Gjelsvik[2] also reports vanadium as a trace element of magnetite and ilmenite in titaniferous iron ores from the west coast of Norway.

ACKNOWLEDGEMENTS

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REFERENCES

1. L.R. Wager and R.L. Mitchell, "The distribution of trace elements during strong fractionation of basic magma - a further study of the Skaergaard intrusion, East Greenland", Geochimica and Cosmochimica Acta, Vol. 1, pp. 185-186, 1951.

2. T. Gjelsvik, "Geochemical and mineralogical investigations of titaniferous iron ores, west coast of Norway", Economic Geology, Vol. 52, pp. 492-493, 1957.