A MANGANESE OCCURRENCE ON QUEEN CHARLOTTE ISLANDS, B.C.[1]

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INTRODUCTION

The occurrence of manganese in the Queen Charlotte Islands first came to the attention of the writer in August, 1960, and so far as is known it is the first occurrence of manganese from this area which has been studied mineralogically. At that time a shipment was received by the Mines Branch in Ottawa from the owner of the property. Samples from this shipment were studied in connection with mill tests.

The deposit occurs on Klashwun Point on the north side of Graham Island. According to H. R. Morris[3], who very briefly examined the property in company with W. H. Myres[4], the manganese occurs along a shear zone that varies from 5 to 10 feet in width, and consists essentially of gouge and breccia. Manganite and pyrolusite occur as a cementing medium in the breccia, forming pods of manganese-bearing material up to 30 feet in length. It was estimated by Mr. Morris that, in the pods, the manganese minerals comprised up to 35 per cent of the rock by volume. The mineralized shear zone occurs in the proximity of the contact between shales and silts of Cretaceous age with intrusive basalt, and in part, lies along this contact.

MINERALOGY

To the unaided eye the samples appear to be composed chiefly of black material and fault gouge. The black material occurs as masses and frequently exhibits a colloform structure.

Polished sections of the black material, when viewed under the microscope, are seen to be crystalline. The crystals are creamy-white to bluish-white in reflected light, are strongly anisotropic, and occur in two distinct sizes. The smaller crystals range between one and six microns, the larger between ten and 60 microns in diameter. The former, which were identified as manganite by means of *x*-ray diffraction, are segregated

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[1] Published by permission of the Director, Mines Branch, Department of Mines and Technical Surveys, Ottawa, Canada.

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[3] Personal communication from H. R. Morris of the firm of Morris and Morris (Mineral Exploitation Consultants) Ltd., Calgary, Alberta.

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into small rounded bodies. The latter, identified as pyrolusite, occur as concentric layers surrounding the manganite (Fig. 1); the layers frequently grade into massive aggregates.

Spectrochemical analyses were performed on relatively clean samples of each mineral to determine the trace element distribution in the man-

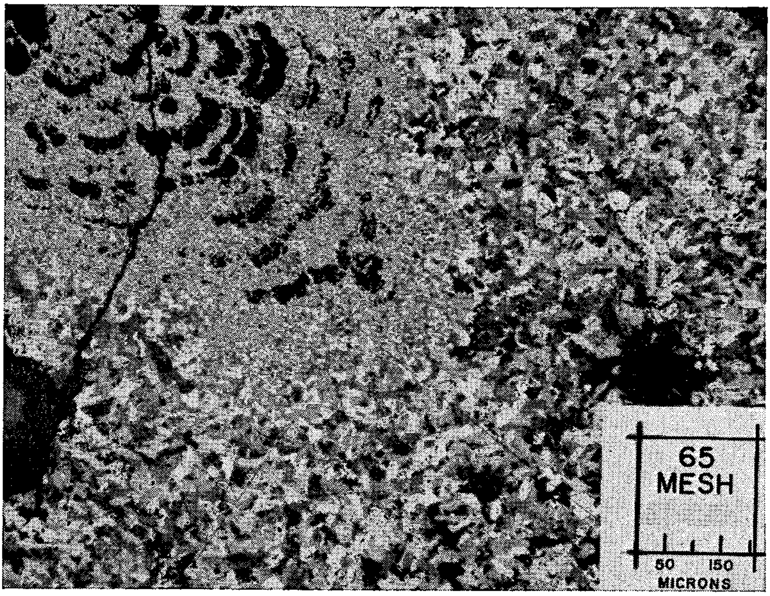

FIG. 1. Photomicrograph of a polished section showing very fine grained manganite (upper left corner) surrounded by relatively coarse pyrolusite. Photomicrograph taken with nicols crossed.

TABLE 1. SPECTROCHEMICAL ANALYSES FOR TRACE ELEMENTS IN MANGANITE AND PYROLUSITE

Element	Weight per cent in manganite	Weight per cent in pyrolusite
Ba	0.04	0.04
Be	0.004	0.004
B	0.01	0.01
Cr	tr	ND
Al	0.3	0.2
Mg	0.4	0.3
Fe	0.3	0.3
V	0.02	0.02
Si	2	1
Mo	0.004	0.003
Cu	0.06	0.04
Ti	0.02	0.009
Sr	0.06	0.07
Co	0.007	0.005
Ni	0.004	0.004

ganite and pyrolusite. The results, given in Table 1[5], show that the trace element contents of the manganite and pyrolusite are remarkably similar.

The fault gouge consists of crushed dolomite, feldspar and quartz. Scattered through this are tiny isolated grains, a few of which are hausmannite, while the others are a mixture of maghemite, ilmenite and hematite, a fact that is apparent only under high powers of magnification (Fig. 2). It is obvious from the relationships of these three minerals that residual maghemite, which predominates in quantity, has been partially altered to hematite and that the loci of alteration are the numerous parallel ilmenite lamellae that transect the grains in several directions. From the x-ray diffraction patterns of this material it was calculated that the cell edge of the maghemite is 8.33 Å. This places it at the γFe_2O_3 end of the γhematite-magnetite solid solution series (Basta, 1959).

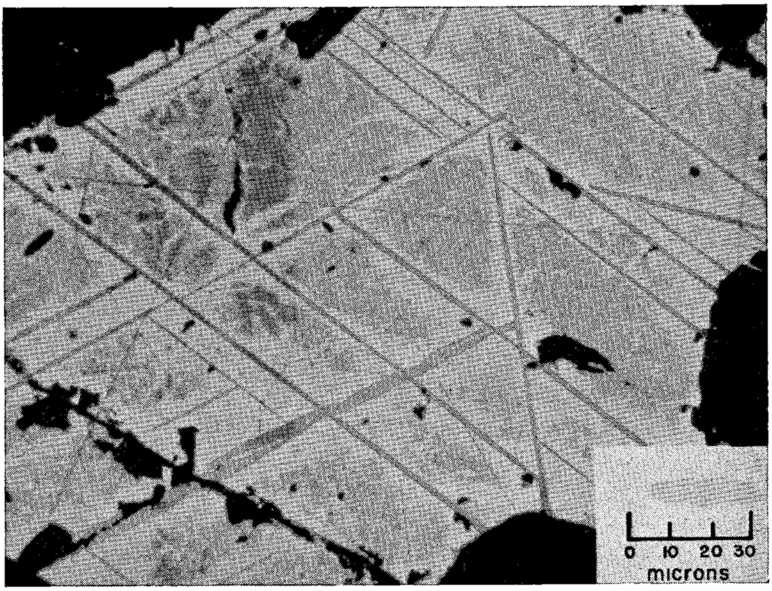

FIG. 2. Photomicrograph of portion of a grain consisting of hematite (white) and maghemite (gray) within a grid of ilmenite lamellae (dark gray). The irregular pattern of the maghemite and the location of it and of the hematite indicate that the hematite resulted from the alteration of the maghemite. This grain was selected to display these features and has a higher hematite content than is normal for this deposit.

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[5] Report No. SL-60-305 by E. M. Kranck, Mineral Sciences Division, Mines Branch.

DISCUSSION

Evidence of oxidation at this deposit is apparent. Recrystallization of manganite ($MnO(OH)$) to pyrolusite (MnO_2), a process that involves oxidation and dehydration, is indicated by the distinctly different grain sizes of these minerals as well as by the remarkable similarity in their trace element content. In addition the maghemite is regarded as having formed as the result of oxidation of original magnetite.

Some inferences may be drawn as to temperatures prevailing at a certain stage in the history of the deposit. The presence of ilmenite lamellae and their pattern of distribution suggests that the grains were originally titaniferous magnetite. If so, the magnetite portion has been oxidized to maghemite, a process which is believed to take place between 200° C. and 530° C. Maghemite however, is generally unstable between 400° C. and 530° C., and Basta (1959) states that if magnetite is oxidized at temperatures higher than 400° C. it will be converted directly to hematite. Hence no maghemite will be formed. From these figures it may be inferred that the temperature prevailing at the time of oxidation of the magnetite in this deposit was probably below 400° C. and above 200° C. It is possible that the manganite was also oxidized at this time under similar conditions.

ACKNOWLEDGMENTS

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