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PETROGRAPHICAL AND MINERALOGICAL EXAMINATION OF FOUR ROCK SAMPLES FROM CANADIAN JOHNS-MANVILLE COMPANY LIMITED, ASBESTOS, QUEBEC

by

R.M. Buchanan
Industrial Minerals Division

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May 8th, 1958.

PETROGRAPHICAL AND MINERALOGICAL EXAMINATION OF FOUR ROCK SAMPLES FROM CANADIAN JOHNS-MANVILLE COMPANY LIMITED, ASBESTOS, QUEBEC.

Introduction

On March 21, 1958, four small rock fragments were received from Dr. Marcel Morin of Canadian Johns-Manville Co. Ltd. Three of the samples were accompanied by thin sections and an opinion was requested on some of the interpretations that had been made of the microscopic features of the rocks.

"SH-12-318, Shipton Township, Pinnacle Area DDH-12 @ 110'

This specimen contains serpentine minerals with anomalous birefringence. I have interpreted it to be a result of a higher calcium content than in normal types. Brucite is rare or non-existant.

The other specimen marked SH-12 differs from the above by the presence of what were originally pyroxene grains (enstatite or augite)".

"SH-23-460'

Same locality as above. A highly birefringent mineral tentatively identified as topaz is associated with pectolite (?), garnet, biotite, and sphene. Note also the micaceous mineral which seems to be intermediate between chlorite (?) of the next specimen and biotite (phlogopite)".

"13-10 Penhorwood Township, Northern Ontario

Is the main ground mass mineral a chlorite?".

Procedure

The thin sections were examined microscopically and X-ray powder photographs were made of materials selected from the fragments where necessary.

SH-12-318

This specimen is composed principally of serpentine with the characteristic mesh structure. There are some small grains of opaque material, most of which are likely magnetite, around the edges of individual serpentine masses and scattered grains, or aggregates of grains, showing anomalous blue interference colours. These features are shown in Figures 1 (a) and (b). The anomalous grains and aggregates could not be distinguished from the remainder of the section in plane light.

Usually such anomalous birefringence has been considered to occur only in certain chlorites and some members of the epidote group. Hess, Smith and Dengo[1] state, however, that this feature of anomalous interference colours " .... is one of the most distinctive features of most antigorite as compared to chrysotile". These authors describe an exhaustive X-ray, thermal and petrographic investigation of an antigorite occurrence in Venezuela and also their conclusions regarding the anomalous optical properties of this particular antigorite. However, I would say that it does not seem to be as general in antigorite as their statement suggests. Gabrielse[2] of the Geological Survey does not mention this property in the serpentines he has studied.

Our X-ray diffraction photographs suggest that the material is antigorite as they are nearly identical to that of our standard antigorite and distinctly different from that of chrysotile. There was no suggestion of a 14A° spacing which would indicate the presence of a chlorite. The only objection to this conclusion, I believe, is

the recent description, by Nelson and Roy(s) of "septechlorites" characterized, like the serpentine minerals, by a 7A° spacing.

I am not familiar with what is described as a serpentine with " ... a higher calcium content than in normal types", and I don't know of any situation in which the optical anomaly is attributed to compositional differences. Until further evidence comes to light, I would be forced to consider the material as antigorite showing anomalous interference colours.

SH-23-460! Shipton Township, Pinnacle Area.

This rock exhibits several unusual features. Microscopic examination in conjunction with X-ray powder photographs shows that it is composed of (1) elongate, spindle-shaped crystals of zoisite with high relief and low birefringence; (2) interstitial, anhedral platy masses of sillimanite with moderate birefringence and low relief. In addition there are (3) some scattered anhedral, colourless, dodecahedral crystals of garnet with about the same relief as zoisite; (4) interstitial rosettes of chlorite; (5) ragged books of brown biotite. There are also fine grained, felted, irregular masses of (6) muscovite and chlorite, apparently alteration products. These features are illustrated in Figures 2, 3 and 4. This mineral association is, I believe, rather unusual and the crystal habits of zoisite and sillimanite are both different from what is usually found. Zoisite normally occurs in blocky, equant, grains and sillimanite is usually found in delicately fibrous or acicular crystals.

The identifications were made by X-ray powder photographs and supported by the optical determinations that were made -- relief, optic sign and birefringence.

13-10, Penhorwood Township, Northern Ontario

The main component of this specimen, a fine-grained, homogeneous mass of material with low birefringence was found to be chlorite. An X-ray powder photograph has the characteristic strong 14A° reflection.

References

(1) Hess, H.H., Smith, R.J. and Dengo -- Antigorite from the vicinity of Caracas, Venezuela. Amer. Mineral Vol. 37, pp. 68 - 75, 1952.

(2) Gabrielse, H. -- Petrology and structure of the McDame ultramafic belt, British Columbia. Ph.D. thesis Columbia University, 1955.

(3) Nelson, B.W. and Roy, R. -- New data on the composition and identification of chlorites. Proceedings of the Second National Conference on Clays and Clay Minerals, 1953. - Pub. 327 Nat. Acad. Sci. - Nat. Res. Council, pp. 335 - 348, 1954.

R.M. Buchanan,
Mineralogist.

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Fig. 1 (a)

Fig. 1 (b)

Fig. 1 (a) Photomicrograph of thin section SH-12-318 showing mesh serpentine with opaque grains (black) and two grains with anomalous birefringence (c), plane transmitted light, magnification 70X

Fig. 1 (b) - as in 1 (a) with crossed nicols.

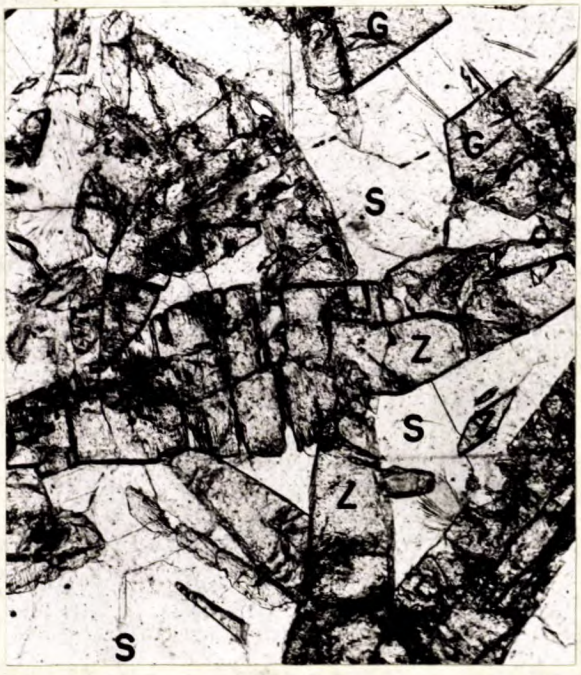

Fig. 2(a)

Fig. 2(b)

Fig. 2(a) - Photomicrograph of thin section SH-23-460 showing zoisite (Z), sillimanite (S) and garnet (G), plane transmitted light, magnification 70X.

Fig. 2(b) - As in 1 (a) with crossed nicols.

Fig.3(a)

Fig. 3(b)

Fig. 3(a) - Photomicrograph of thin section SH-23-460 showing a fine-grained mass of muxcovite and chlorite (M) Sillimanite (S), Garnet (G) and Biotite (B), some Zoisite grains are also present, plane transmitted light, magnification 70X

Fig. 3(b) - As in 3(a) with crossed nicols

Fig. 4(a)

Fig. 4(b)

Fig. 4(a) - Photomicrograph of thin section SH-23-460 showing a large translucent mass of sphene (Sp), Zoisite (Z), Chlorite (C), Sillimanite (S) and a fine grained micaceous alteration (M).

Fig. 4(b) - As in 4 (a) with crossed nicols.