THE AMERICAN MINERALOGIST, VOL. 45, MARCH–APRIL, 1960

LAWSONITE METAGRAYWACKES IN NEW ZEALAND

D. S. Coombs, *Department of Geology, University of Otago.*

Lawsonite is a wide-spread mineral in low grade geosynclinal metamorphic rocks and is especially well known from various points in the circum-Pacific orogenic belt. Hitherto however it has not been recorded from rocks of the New Zealand Geosyncline.

The writer has recently found that lawsonite is constantly present in a belt, over two miles wide, of slates and volcanic graywackes of the Maitai Group (Permian) exposed in the Maitai Valley, Nelson, New Zealand. In spite of distinct slaty cleavage, delicate sedimentary structures are clearly preserved and from hand specimens perhaps few geologists would regard these rocks as metamorphic. Yet internal reconstitution is far advanced, and the rocks may be classified as lawsonite metagraywackes and slates. They contain the mineral assemblage albite-chlorite-lawsonite-quartz-calcite-muscovite with varying proportions of the constituents. Lawsonite marble has also been found. The lawsonite occurs as tablets, 0.1–0.01 mm. long, with typical transverse fractures, α1.662, β1.672, γ1.684. The tablets occur both in albitized plagioclase and in the matrix. These lawsonite metagraywackes recall the jadeite metagraywackes of the Franciscan group reported by Bloxam (1956) and McKee (1958), and like these are of regional extent. McKee found that the albite-lawsonite assemblages develop before jadeite-lawsonite-quartz or glaucophane during progressive alteration, a conclusion which accords with the occurrence of albite-lawsonite assemblages in Indonesia (de Roever, 1947) and elsewhere.

Jadeite and glaucophane have not yet been found in the Nelson district. Instead the known part of the lawsonite-bearing belt, which is at least 17 miles long, appears to pass at its southern end into prehnite—and pumpellyite-bearing assemblages of the prehnite-pumpellyite metagraywacke facies. Typical representatives of this new facies have been described elsewhere (Coombs, *et al.*, 1959) and it has been defined (Coombs, 1959) to include those assemblages produced under physical conditions in which the following are commonly formed: quartz-prehnite-chlorite, or quartz-albite-pumpellyite-chlorite, without zeolites and without the characteristic minerals of the glaucophane schist facies, jadeite or lawsonite. Similarly on its east side, the lawsonite belt is separated by some comparatively little-altered rocks containing spasmodic prehnite, from prehnite-bearing volcanic metagraywackes, tuffs and metavolcanics of the Te Anau group. It is in the Te Anau Group that the ultramafic rocks of the Dun Mountain belt have been emplaced.

REFERENCES

BLOXAM, T. W. (1956), Jadeite-bearing metagraywackes in California. *Am. Mineral.*, **41**, 488–496.

COOMBS, D. S. (1959), Lower grade mineral facies in New Zealand. (MS. prepared for publication)

COOMBS, D. S., ELLIS, A. J., FYFE, W. S., AND TAYLOR, A. M. (1959), The zeolite facies, with comments on the interpretation of hydrothermal syntheses. *Geochim. Cosmochim. Acta*, **17**, 53–107.

DE ROEVER, W. P. (1947), Igneous and metamorphic rocks in eastern Central Celebes. Geological explorations in the island of Celebes under the leadership of H. A. Brouwer, North Holland Publishing Co., pp. 65–173.

MCKEE, BATES (1958), Jadeite alteration of sedimentary and igneous rocks. *Bull. Geol. Soc. Amer.*, **69**, 1612 (abstr.).

THE AMERICAN MINERALOGIST, VOL. 45, MARCH–APRIL, 1960

FLUOCERITE AND ASSOCIATED MINERALS FROM THE BLACK CLOUD PEGMATITE, TELLER COUNTY, COLORADO*

E. WM. HEINRICH AND EUGENE B. GROSS, *Department of Mineralogy, The University of Michigan, Ann Arbor, Michigan.*

The Black Cloud pegmatite, which is exposed 800 feet north of U. S. Highway 24, 2.3 miles west of Divide in Teller County, Colorado, was studied in June 1957 and June 1958. Laboratory studies were completed between September 1958 and May 1959. Both field and laboratory work were supported by a grant from the Michigan Memorial-Phoenix Project Fund, Project 150. This study is part of a continuing investigation of the pegmatites of the South Platte–Pikes Peak area of Colorado, to which field work during the last three summers has been devoted (Heinrich, 1958), and represents an extension of a previous reconnaissance study of rare-earth pegmatites in Colorado (Heinrich, 1948).

The lensoid pegmatite, well exposed in two large open cuts, trends N. 40° W. with generally steeply dipping to vertical contacts with Pikes Peak granite. It is nearly 350 feet long, and at its bulbous northwestern nose it is 110 feet thick. The sharply defined internal structure includes:

1. Wall zone (quartz, oligoclase, microcline) as much as 25 feet thick, fine grained, with much graphic quartz-oligoclase rock.
2. Intermediate zone, 50–75 feet thick, masses of pink microcline with interspersed pods of white to gray quartz and scattered small beryl crystals.
3. Core of milky quartz, as much as 50 feet thick, studded with primary vugs 1–6 inches across enclosing clear, milky or smoky quartz crystals.

* Contribution No. 235 from the Department of Mineralogy, The University of Michigan, Ann Arbor.