SHORT COMMUNICATIONS

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High Mg-smithsonite from Broken Hill, New South Wales, Australia

IN a carbonate suite from the Broken Hill mine, New South Wales, a magnesium-rich smithsonite was identified. Because smithsonite with more than 1 % MgO is not common, it was studied in detail.

The smithsonite studied is milky white, and occurs in small botryoidal aggregates. (The specimen described in this note is now deposited in the Mineralogical Collection, Geology Museum, Miami University, Oxford, Ohio, U.S.A.) With calcite, it forms coatings on coronadite, which has a porous rusty-yellowish-black core, identified as goethite (fig. 1). Some well-developed hexagonal flakes of calcite, up to 2 mm across with massive smithsonite cores, are embedded in coronadite and scattered through the specimen.

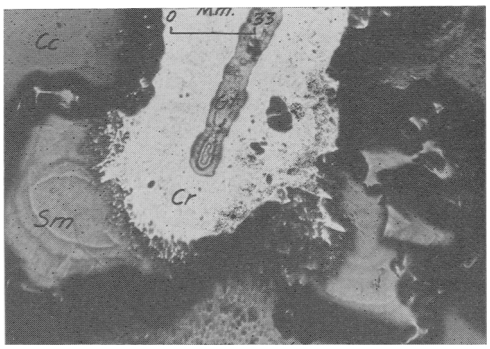

FIG. 1. Photomicrograph to illustrate mineral association. Cc: calcite, Sm: smithsonite, Gt: goethite, Cr: coronadite.

TABLE I. *Electron-microprobe analyses of high-Mg smithsonite and calcite*

	CaO	MgO	FeO	PbO	ZnO	MnO	NiO	CuO	CoO	CO_2	Sum
1*a*	0·90	7·56	Nil	Nil	53·16	0·34	—	—	—	37·91*	99·87
1*b*	1·24	7·65	Nil	Nil	53·23	0·12	—	—	—	38·17*	100·41
2*a*	52·81	0·57	0·02	4·11	0·14	Nil	0·09	Nil	0·05	43·03*	100·82
2*b*	52·49	0·38	0·02	3·64	0·15	0·21	0·12	0·08	0·02	42·54*	99·45

* Calculated to form RCO_3; Cd and Ti were not found in either specimen.
1: Smithsonite; *a*, inner portion; *b*, outer portion.
2: Calcite; *a*, inner portion; *b*, outer portion.

Electron-microprobe analysis using synthetic ZnS, NiS, CoAs, and CuS, Cd and Mn metals, Mg and Ca pyroxenes, galena, and ilmenite as standards, and reducing the raw data using a program written by Rucklidge and Gasparrini (1969), gave the results in Table I; Ti was not found in any analysis. A formula of

$$(Ca_{0\cdot02-0\cdot03}Mg_{0\cdot22}Zn_{0\cdot76-0\ 75})CO_3$$

is suggested.

X-ray powder diffraction data for the smithsonite agree well with PDF card S-449, and precession photographs lead to a cell size a 4·630 and c 14·994 Å. The refractive indices, $\epsilon = 1{\cdot}601$ and $\omega = 1{\cdot}815$, measured on spindle stage are, as expected, less than those of pure smithsonite.

The coronadite was identified by X-ray powder diffraction, which gave a pattern matching Hewett's data (1971). Under the carbonate coating the coronadite shows mixed brownish black and black layers; they gave identical X-ray powder patterns, but a preliminary electron-microprobe analysis indicates that the brownish black layer is richer in PbO.

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REFERENCES

HEWETT (D. F.), 1971. *Econ. Geol.* **66**, 164–77.
RUCKLIDGE (J. C.) and GASPARRINI (E. L.), 1969. *A computer program for processing electron microprobe analytical data.* Dept. Geol. Univ. Toronto.

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Two hydrous-rich aluminous hornblendes

PREVIOUS studies of aluminous hornblendes rich in alumino-tschermakite,

$$Ca_2Mg_3Al_2^{vi}Si_6Al_2^{iv}O_{22}(OH)_2,$$

have shown that no natural amphiboles are known that closely approach this composition (Leake, 1971). From a careful scrutiny of about 1500 analysed amphiboles with at least Ca 1·00 in the half unit cell and from reanalysis of a number of percipiently selected Al-rich samples, it was shown that the maximum possible Al^{vi} in natural amphiboles increased as Al^{iv} increased and it was suggested that the maximum possible Al^{vi} value in natural hornblendes when the half unit cell contained $Si_6Al_2^{iv}$ was not above 1·40 although the highest reliably determined Al^{vi} value known was only 1·35 (Leake, 1971).

Subsequently Bunch and Okrusch (1973) have described a quite extraordinary iron-poor aluminous amphibole (with 22·6 % Al_2O_3), which has

$$K_{0\cdot16}Na_{0\cdot54}Ca_{1\cdot99}Mg_{3\cdot35}Fe_{0\cdot01}Ti_{0\cdot16}Al_{1\cdot47}^{vi}Si_{5\cdot74}Al_{2\cdot26}^{iv}O_{22\cdot13}(OH,F,Cl)_{1\cdot87}.$$