SHORT COMMUNICATIONS

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Corona structures formed by near-isochemical reaction between olivine and plagioclase in a metamorphosed dolerite

IN the Pottoyu Hills, immediately south of the Petermann Ranges in the extreme south-west of the Northern Territory, Australia, Precambrian granitic rocks are intruded by basic dykes ranging from a few metres to about 100 m across. Both the granite and the basic dykes have undergone upper greenschist or lower amphibolite facies metamorphism. At 25° 7′ S., 129° 16′ E. one of the largest of the basic bodies shows typical alteration to biotite–chlorite amphibolite at its margins, but, unlike the smaller-bodies, retains a coarse subophitic texture at the centre. Augite and lath-shaped plagioclase are largely unaltered, but relict olivine is separated from plagioclase by well-developed coronas (fig. 1). Immediately surrounding olivine is a rim (discontinuous in places) of fine-grained magnetite, which is itself surrounded by a continuous zone of cummingtonite prisms radiating from the olivine–magnetite core. Scattered anhedral grains of hypersthene occur within the cummingtonite zone. The outermost zone (in contact with plagioclase) is a continuous rim of pale blue-green, Ti-poor pargasitic hornblende containing a few small euhedral garnet crystals. Very fine flakes of biotite are scattered through the inner part of some of the hornblende rims, but probably make up less than 1 % of the corona material.

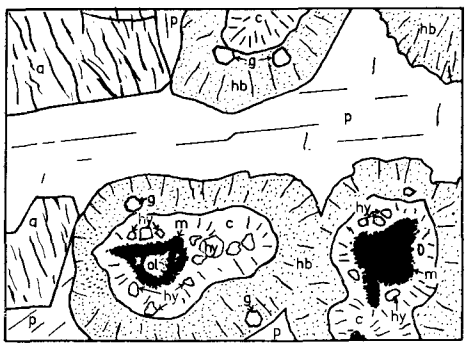

FIG. 1. Coronas formed between olivine and plagioclase. ol = olivine, m = magnetite, c = cummingtonite, hy = hypersthene, g = garnet, hb = hornblende, p = plagioclase, a = augite.

Microprobe analyses of hornblende, hypersthene, cummingtonite, and garnet were made at a number of different points, and their averages appear in Table I. These were combined with a point-count analysis of the corona material to obtain its average composition, which is then expressed as a CIPW norm (Table II). Molar volumes (Table II) used in the calculation were estimated from the data of Robie, Bethke, and Beardsley (1967). Fe^{3+} from magnetite was recalculated as Fe^{2+}.

Olivine (45·5 mol. % Fo) and plagioclase (65 mol. % An) make up 97 % of the

normative constituents of the corona material. Microprobe analyses of the primary igneous olivine and plagioclase yield average values Fo_{44} and An_{59}, respectively. The plagioclase laths are normally zoned from An_{53} to An_{64}, but a few small more sodic grains near the coronas were detected by electron probe and found to range in composition from An_{23} to An_{45}. It is possible that the more sodic grains and even some of

TABLE I. *Microprobe analyses: numbers of ions on the basis of an assumed number of oxygens*

	Hornblende (average of 14 points)	Hypersthene (average of 3 points)	Cummingtonite (average of 3 points)	Garnet (average of 3 points)	Olivine (average of 4 points)
Si	5·88	0·99	7·91	—	—
Al^{iv}	2·12	0·01	0·08	—	—
Al^{vi}	1·22	0·00	0·00	—	—
Ti	0·00	—	0·00	—	—
Fe*	1·99	0·44	2·62	1·98	1·12
Mn	0·01	—	0·03	0·09	—
Mg	2·07	0·56	4·33	0·60	0·88 (calc.)
Ca	1·71	0·00	0·08	0·30	—
Na	0·81	—	0·05	—	—
K	0·09	—	0·01	—	—
O (assumed)	23†	3	23†	12	4

* Total iron as Fe^{2+}. † Anhydrous basis.

TABLE II. *Composition of reaction rim material and related data*

	Vol. % in corona structures	Estd. molar volume (cm^3)	Mol. %	CIPW norm of corona material	
Hornblende	55·8	275	24·3	Ilm 0·02	
				Ab 12·6	
Hypersthene	12·8	32·2	47·6	An 27·3	41·3
				Or 1·5	
Cummingtonite	18·7	272	8·2	Di 1·3	3·2
				Hd 1·9	
Garnet	8·7	115	9·1	Fo 20·2	55·3
				Fa 35·1	
Magnetite	4·1	44·5	11·0	Ne 0·2	

the zoning are products of the corona-forming reactions, which could account at least partly for low normative An in the rest of the corona material. Whitney and McLelland (1973) report depletion of plagioclase in An component during formation of garnet-bearing coronas in metamorphosed anorthosites from the Adirondak Mountains.

The present results indicate that the coronas formed by near-isochemical reaction between olivine and plagioclase. Only small amounts of H_2O and O, and a very small amount of K (for biotite), need have been introduced. The occurrence of

hypersthene-bearing coronas is unusual in a terrain where epidote- and chlorite-bearing assemblages predominate in other basic rocks. Most coronites—for example those from the Adirondak Mountains, U.S.A. (Whitney and McLelland, 1973), Norway (Griffin, 1971; Mason, 1967), and India (Murthy, 1958)—occur in granulite or upper amphibolite facies terrains. It is possible that the corona structures described here are relics of an early high-grade event that have survived the relatively low-grade regional metamorphism. However, no independent evidence of an earlier high-grade event has been found in the area. Thus it seems probable that the corona structures developed during upper greenschist to lower amphibolite facies regional metamorphism under almost dry conditions in the central part of the basic body.

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REFERENCES

GRIFFIN (W. L.), 1971. *Journ. Petrology*, **12**, 219.
MASON (R.), 1967. *Min. Mag.* **36**, 504.
MURTHY (M. V. N.), 1958. *Bull. Geol. Soc. Amer.* **69**, 23.
ROBIE (R. A.), BETHKE (D. M.), and BEARDSLEY (K. M.), 1967. *U.S. Geol. Surv. Bull.* **1248**.
WHITNEY (P. R.) and MCLELLAND (J. M.), 1973. *Contr. Min. Petr.* **39**, 81–98.

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Recently formed gypsum from Co. Wicklow, Ireland

CRYSTALLIZED gypsum was found on the walls and roofs of railway tunnels south of Rathdrum, Co. Wicklow (GR T 192878). The deposit is 1 to 3 mm thick, with an intervening soot layer, and lies on hewn surfaces, indicating formation within the last hundred years or so.

The crystals are dark grey to black in colour due to the presence within individual crystals of several tens or hundreds of soot grains, not everywhere in contact with each other. The soot particles range from 3 to 150 μm across. Adjacent to the tunnel surfaces the crystals form an interlocking mass, but those standing proud of that zone have the normal tabular habit. The largest dimension, parallel to *a*, ranges from 0·3 to 1·0 mm: there is some preferred orientation with respect to the walls, the form {010} being usually perpendicular to them. Twinned crystals were not found.