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THE PROPORTIONALITY OF QUARTZ IN MYRMEKITE

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A recent note by Hubbard (1967) has again stressed the connection between the composition of plagioclase in myrmekite and the amount of associated quartz. Despite the fact that this proportionality relationship was recorded by Becke (1908) very little quantitative data can be found in the literature, due, no doubt, to the scarcity of relatively coarse intergrowths and the technical difficulties inhibiting accurate measurement. By contrast the absence of quartz in pure albite of the rim and intergranular types is well substantiated.

Gneisses from Broken Hill, New South Wales, contain myrmekites in which the quartz-plagioclase intergrowths are relatively coarse: the quartz stems range roughly from 0.1 to 0.3 mm in length and are 0.01 to 0.02 mm wide. Further, the plagioclase is relatively calcic providing an opportunity for investigation in an uncommon composition range. The results of some detailed measurements for two major rock types are given here.

Quartz and plagioclase volumes were calculated from photomicrograph enlargements ($\times 500$) of about twenty-five intergrowths from each rock. The photographs were gridded with one or two inch squares and ran-

TABLE 1. ANALYTICAL DATA, PLAGIOCLASE COMPOSITIONS AND QUARTZ VOLUMES IN MYRMEKITE

	Augen gneiss	"Granite gneiss"[a]
Whole rock analyses		
SiO_2	67.80	65.30
Al_2O_3	15.91	15.77
Fe_2O_3	0.30	1.52
FeO	4.22	5.95
MgO	1.27	1.63
CaO	2.36	2.63
Na_2O	3.22	1.95
K_2O	4.00	3.60
H_2O+	0.36	0.24
H_2O-	0.14	0.16
TiO_2	0.67	0.91
P_2O_5	0.18	0.17
MnO	0.04	0.12
Total	100.47	99.95

	Augen gneiss	"Granite gneiss"
Norms		
Q	24.37	28.77
or	23.64	21.28
ab	27.25	16.50
an	10.53	11.94
hy	9.63	12.45
mt	0.43	2.20
il	1.27	1.73
ap	0.42	0.39
c	2.42	4.29
Normative An	27.88	41.98
Bulk Plagioclase by optical determination:[b]	An_{27-29}	An_{41-42}
Plagioclase composition in myrmekite:	An_{28} (An_{23} at some rims)	$An_{40.5}$
Theoretical quartz percentage by volume: (from Figure 1)	20	26.5
Measured associated quartz percentage:	21	27

[a] Rocks analysed by Avery and Anderson. Augen gneiss is rock 8108, "Granite gneiss" is rock 8107 in University of Sydney collections.

[b] Optical determinations were made by the normal to x method. Measurements were made from curves derived by Bordet (1963) *Bull. Soc. Franç. Minér.*, 86, 206–207.

dom squares (about four to eight from each photograph) were selected for measurement. Fields in which grain boundaries were poorly defined were rejected. Areal representation was obtained by cutting out the quartz areas and weighing the "quartz" and "plagioclase" portions. The method allows a large number of intergrowths from one rock type to be investigated and provides the means for obtaining a representative sample.

The theoretical relationship between quartz percent (by volume) in myrmekite and the An content of associated plagioclase based on an exsolution model (Phillips, 1964; Hubbard, 1966) is given in Figure 1. Measured plagioclase compositions, analytical data and quartz volumes are listed in Table 1. A comparison of the measured results and the theoretical values obtained from the figure indicates that a relationship between quartz volume and basicity of the associated plagioclase exists for these gneisses from Broken Hill. Measurements on more sodic myrme-

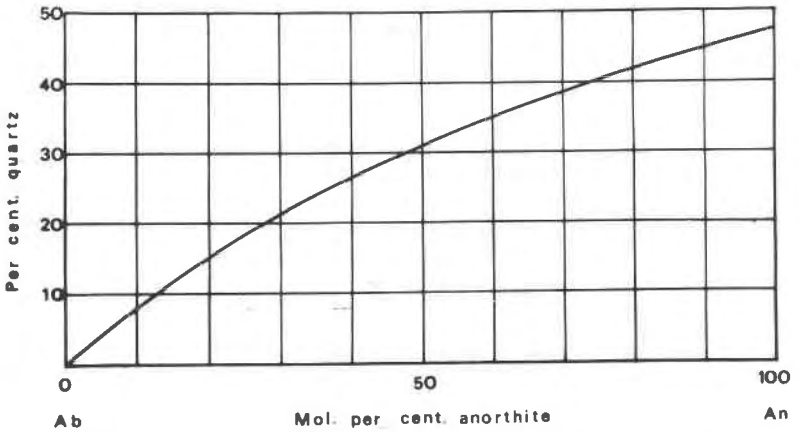

FIG. 1. Theoretical quartz percent (by volume) associated with plagioclase of varying An content. The curve is based on calculations involving the following unmixing relationships (Phillips, 1964): $NaAlSi_3O_8 \rightarrow NaAlSi_3O_8 + OSiO_2$, $Ca(AlSi_3O_8)_2 \rightarrow CaAl_2Si_2O_8 + 4SiO_2$.

kites from other areas may further substantiate this relationship. The project noted here forms part of a wider structural investigation at Broken Hill and this will be presented at a later date, Ranson(1968).

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POWDER DENSITY MEASUREMENT BY HYDROSTATIC WEIGHING

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INTRODUCTION

The hydrostatic method is usually used in the laboratories for the determination of solid and liquid densities (Hidnert and Peffer, 1950; Fahey, 1961; Thewlis, 1961; Guillemin, 1962), but it is not often used for