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Crystallization of Calc-Alkaline Andesite under Controlled High-Pressure Hydrous Conditions

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Table 1. *Comparison of analysis of andesite 68—66 (Gill, 1970) with glass prepared for this experimental work*

	68—66	Glass	Glass (recalculated to 100%, values based on chemical analyses)
SiO_2	59.39	60.27[a]	60.24
TiO_2	0.68	0.67[a]	0.69
Al_2O_3	16.73	16.95[a]	16.98
Fe_2O_3	3.66	0.87[b]	0.88
FeO	2.61	5.28[b]	5.35
MnO	0.13	0.13[c]	0.13
MgO	3.08	3.30[a]	3.14
CaO	7.12	7.34[a]	7.22
Na_2O	3.97	3.91[b]	3.91
K_2O	1.27	1.26[b]	1.26
P_2O_5	0.20	0.20[c]	0.20
Loss	0.55		
	99.39	100.18	100.00
Norms			
q	13.9	11.4	11.3
or	7.5	7.2	7.5
ab	33.6	33.0	33.1
an	24.1	25.1	25.0
di	7.9	8.2	8.0
hy	4.8	12.0	12.1
mt	5.3	1.3	1.3
il	1.3	1.5	1.3
ap	0.4	0.4	0.4

[a] Denotes content determined by electron microprobe analysis of glass fragments.
[b] Denotes content determined by chemical analysis (E. Kiss, A. N. U. analyst).
[c] Denotes content not determined; presumed same as analyzed in natural rock.

the aid of a microsyringe. A pressure correction of −10% to the nominal pressure was applied (Green *et al.*, 1966). For runs at temperatures less than 1100° C Ag-Pd capsules were used. Generally run times were between 12–24 hours for temperatures less than 950° C and from 6–12 hours at 950–1100° C. For temperatures above 1100° C Pt capsules were used and run times reduced to 1–4 hours (< 1300° C) or to less than 1 hour (> 1300° C).

At the conclusion of a run, the sample was examined optically and by X-ray diffraction. When crystal size was adequate, quantitative analyses of minerals present were obtained using an electron microprobe (A.R.L., EMX model) following the methods outlined by Sweatman and Long (1969) and Lovering and Ware (1970). The principal fractionation trends for differing pressures and water content were then determined, using these analyses.

Results

The results for the crystallization of the andesite glass from 9–36 kb for anhydrous conditions and 2, 5, and 10% by weight of water added are summarized in Figs. 1–4.