TABLE 18. Potassium Contents of Synthetic Clinopyroxenes and Garnets

Reactants	P, kb	T, °C	Duration, hours	H_2O %	Products	K in Clinopyroxene, ppm
Di + Anhy Phl (1:1)	15	1100	4	11.4	Di, Fo, Phl, Gl, gl	140
	30.5	1150	$3\frac{2}{3}$	13.1	Di, Fo, Phl, Gl, gl	90
	32	1000	4	4.6	Di, Phl, gl	70
	21	1450	$2\frac{1}{4}$	...	Di, Fo, Gl	140
Omph + Anhy Phl (1:1)	25	1000	$5\frac{1}{6}$	5.0	Omph, Phl	110
(2:1)	25	1000	6	40.0	Cpx, Phl, Fo, gl	50
(1:1)	26.5	1050	4	7.4	Cpx, Phl, Gl	<50
	30	1100	3	22.2	Cpx, Fo, Phl, gl	50
Rich + An_1Fo_1 (2:1)	20	1000	3	4.7	Rich, Phl, Cpx	120
Rich + Di (1:1)	24	1000	2	10.4	Rich, Cpx	<50
						K in garnet, ppm
Anhy Phl + An_1Fo_1 (1:4)	30	1100	3	12.6	Gt, Cpx, Phl	<50
Phl *	70	1500	$\frac{2}{3}$	...	Gt, Phl, q-Phl, X	<100

* Run prepared by Kushiro, Syono, and Akimoto (1967).

Abbreviations: Di, diopside; Anhy Phl, anhydrous phlogopite composition; Phl, phlogopite; Fo, forsterite; Gl, glass; gl, glass balls considered to be quenched vapor; Omph, omphacite; Cpx, clinopyroxene solid solution; Rich, potassic richterite; Gt, garnet; An_1Fo_1, crystalline mixture of anorthite and forsterite (1:1 by mole) = pyrope-grossular (2:1 by mole); q-Phl, quench phlogopite; X, unknown phase.

from liquid under anhydrous conditions and in the absence of phlogopite, nearly all the K has remained in the liquid, as measured by the K content of ~13% in the glass. At this stage it is not clear to what extent variations in temperature, pressure, and sodium content affect the substitution of potassium. These results seem in accord with the natural diopsides and low K omphacites previously discussed, and no experimental evidence has been found to explain the presence of 1000–1500 ppm K in omphacite. The most likely explanation appears to be that these high K contents are due to the presence of submicroscopic intergrowths of amphibole in the omphacite structure, as suggested by J. J. Papike (personal communication, 1968) on the basis of X-ray studies. This possibility has important implications regarding the genesis of eclogites and basaltic lavas, and requires further confirmation. In the runs with amphibole and pyroxene no reaction has occurred between these minerals.

Also given in Table 18 are measurements made on garnets produced in two runs. Potassium was not detected in either one. One of the runs had previously been analyzed with an electron probe, and up to 5.8% K was reported in the garnets (Kushiro, Syono, and Akimoto, 1967*b*). The original electron-probe section was available, and further study showed that the earlier analysis was in error. The discrepancy is most likely due to the beam overlapping high K mica in the original analysis. During the analysis of this section, one of the breakdown products of phlogopite was found to have a very high potassium content (phase X in Table 18). Semiquantitative analysis indicates that this phase has on the order of 29% K_2O and 32% MgO but an anomalously low SiO_2 content of 1% or less. Unfortunately, the fine-grained nature of this phase and poor surface of the section prevented proper analysis, and it is not possible at this stage to identify this phase. It seems clear that clinopyroxenes and garnets will not accept sufficient potassium in their structures, even at high temperatures and pressures, to provide that required to form basalt by simple partial