GARNET AND SPINEL PERIDOTITE XENOLITHS FROM THE LASHAINE VOLCANO IN NORTHERN TANZANIA

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A suite of nine garnet peridotites and eleven spinel (picrochromite) peridotite xenoliths from the Lashaine volcano in northern Tanzania have been studied petrographically and by electron microprobe techniques. The primary assemblages ol+opx+cpx+ga, ol+opx+ga, ol+opx+cpx, ol+opx+ga+sp, ol+opx+cpx+sp, ol+opx+sp, and ol+cpx+sp have been identified. With some exceptions the compositions of primary ol, opx, cpx, ga, and sp are the same in both ga and sp peridotite groups. Olivines are Ni-rich, very low Ca forsterites (Fo92); orthopyroxenes are low Ca, Al, Cr, Ti, Mn enstatites ($\sim Wo_1En_{92}Fs_7$); clinopyroxenes are low Al, Ti, Mn chrome-diopsides ($\sim Wo_{44}En_{52}Fs_4$, Al_2O_3 two weight percent); garnets are chrome-pyropes ($\sim Py_{75}Alm_{13}Gr_{12}$); and the spinels are Fe, Al picrochromites ($\sim Mg_{.7}Fe_{.4}Cr_{1.4}Al_{.5}O_4$).

The primary garnet lherzolite assemblages are stable at ~1100°C and 50kb., equivalent to a depth of ~150km. Ga and sp coexist in some samples and the ga and sp assemblages apparently have formed at essentially the same P-T conditions from different bulk compositions. The Lashaine spinels are distinct from the highly aluminous variety common in spinel peridotite inclusions in alkali basalts, and the Lashaine spinel peridotites are not the low P equivalents of the garnet peridotites.

Two types of secondary processes are evident in the Lashaine xenoliths.

1. Reaction rims around garnet illustrate the reaction ol+ga→Al opx + Al cpx + Al-sp that reflects the transition from ga peridotite to sp peridotite.

2. In several of the ga and sp peridotites there is evidence of partial melting. At some grain boundaries, particularly those involving cpx, local melting has occurred and the melt has quenched to produce the assemblage ol+opx+cpx+sp± glass (K-rich)±phlogopite. These secondary phases are texturally and compositionally distinct from the primary peridotite phases, and their compositions allow consideration of the nature of the liquids produced by small degrees of partial melting and of the physical environment under which they formed.