ALKALINE REACTIONS OF THE MANTLE OLIVINE IN THE FORSTERITE-FAYALITE-JADEITE-ACMITE SYSTEM IN EXPERIMENTS AT 6.5 GPA: IMPLICATION FOR THE MECHANISM OF GRANATIZATION OF THE MANTLE PERIDOTITE

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Generation of chemically actiive fluidized and melted alkali-enriched agents within the dynamic Earth may be typical for the mantle-slab and the mantle-plume interfaces. Interaction of the active alkaline alumosilicate agents with the mantle peridotite is simulated with the forsterite(Mg2SiO4)-fayalite(Fe2SiO4)-jadeite(NaAlSi2O6)-acmite(NaFeSi2O6) system. Experimental data testify that forsterite disappears above 4.5 GPa in the course of forsterite-jadeite reaction and pyropic garnet is formed together with enstatite and NMS-phase of Na2Mg2Si2O7 composition (Gasparik and Litvin, Yu., 1997). The reaction is of key importance for garnetization of the mantle peridotite. Experimental data on the enstatite(Mg2Si2O6)-nepheline(NaAlSiO4) pseudobinary join at 6.5 GPa(Litvin V., et al, 2000)revealed that forsterite-jadeite assembly is stable at lower subsolidus temperatures. At higher temperatures forsterite-jadeite reaction mentioned takes place. Melting relations of the enstatite-nepheline join follow the peritectic reaction: forsterite+L(melt)=NMS-phase. The effects of garnetization of fayalite(Fe2SiO4) were revealed in the experiments at 6.5 GPa on the fayalite-jadeite, fayalite-acmite and forsterite-fayalite-jadeite-acmite joins when oxidizing state of experimental system favoured to a stability of two-valent form of iron. Together with almandite and Mg-Fe garnets, new alumina free phase Na2Fe4.7Si6.4O18.5 (NFS-phase) and Na2(mg,Fe)4.7Si6.4O18.5(NMFS-phase) are formed. Experimental evidence of formation of garnet phases at the sacrifice of olivine components testifies to the processes of garnetization of the mantle peridotite at the dynamic Earth's mantle.