Petrogenetic activity at the mantle–plume interface from experiment up to 10 GPa: carbonatization and garnetization of the mantle peridotite, formation of diamond-producing carbonatitic magmas.

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The mantle-plume interface belongs to petrogenetically active regions of the dynamic Earth (Davies, 1995). Interaction of the mantle wallrocks and chemically active agents released by the plume is intriguing for experiment. The agents attacking the mantle peridotite are composed to close approximation by the K_2O – Na_2O – Al_2O_3 – SiO_2 – CO_2 system similar by composition to the "metasomatic"melts included in peridotites of the intraplate regions (Schiano and Glocchiotti, 1994).Along with the plume components, the mantle olivine and orthopyroxene make up the experimental system

Next data of the experiments within 4–10 GPa.are most important.

1. Processes of carbonatization of the mantle peridotite are developed in the reactions of akaline carbonate components K_2CO_3 and Na_2CO_3 with olivine and orthopyroxene of the peridotite above 4 GPa.
2. Processes of garnetization of the mantle peridotite are found in the reactions of alkaline alumosilicates $NaAlSi_2O_6$ and $NaAlSiO_4$ with olivine and orthopyroxene of the peridotite above 4.5 GPa.
3. Alkaline carbonate-silicate liquid immiscibility is originated as an effective mechanism of generation of primary magmas for alkaline basaltic, carbonatitic, kimberlitic, lamproitic rocks of the intraplate rock series, and formation of diamond-producing alkaline carbonatitic melts.
4. Successful high-pressure experiments within 6-10 GPa on diamond growth in simplified and multicomponent alkaline carbonatitic melts chemically close to fluid syngenetic micro-inclutions in natural diamonds substantiate the diamond-producing capability of the melts which may be generated in the mantle-plume interface and strengthen the carbonatitic version of diamond genesis.