PETROLOGICAL FEATURES OF DIAMONDIFEROUS MAGMATISM

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The facts of finding diamonds in rocks widely varying incomposition (kimberlites, lamproites, lamprophyres, alkalinebasaltoids) give rise to revised setting of a problem concerning the formation of mantle-derived diamondiferous rocksand their genetic interrelations. This problem is considered on the basis of estimation of thermodynamical parameters characterizing the formation of corresponding melts (temperature, pressure, oxygen fugacity) performed by means of a set of original thermobarometers and fugometers.

Kimberlitic melts are generated in 1300-1600 C temperature range (predominantly 1350-1450 C), 1.0-7.0 GPa pressure range (predominantly 5.5-6.5 GPa), and oxygen fugacity range between EMOD (QFM) and WM buffers. The character of kimberlite points distribution in PT diagramm corresponds to the configuration of the experimentally fixed solidus in peridotite - CO_2-H_2O system.

Kimberlitic magmas stem from comparatively high degrees of melting of carbonatized and metasomatized ilmenite-containing upper-mantle garnet lherzolite in the presence of carbonic acid -aqueous fluid. As the melting degree increases, comparatively low-parametric and low-magnesial high-carbonaceus kimberlitic melts give was to high-parametric and high-magnesial "water-enriched" melts. The melting process develops simultaneously throughout the whole vertical section of the magma-generating zone, thus resulting in the formation of numerous isolated portions of kimberlitic magma differing in composition (depending on P,T and melting degree, this latter being known to increase down the section). The "terminal" kimberlite constituting concrete pipes is a result of mixing of different melt portions.

A symmetrical substantial and thermodinamical zonation has been found to be present in the structure of kimberlite fields. This zonation is due to spatiotemporal evolution of magmatism within the boundaries of a kimberlite-controlling zone. Vertical thermal structure of kimberlite-generating zones has been revealed and examined.

Lamproitic magmas are generated in wide temperature (1100-1500 C) and pressure (0.6-6.5 GPa) ranges. Lamproites when considered as a whole are somewhat lower-baric and lower-temperature formations as compared to kimberlites; similar to kimberlites in these parameters are olivine lamproites of Australia and Prairy-Creeek (USA).

Lamproitic magmas are of polyformation nature. They are generated in the course of evolution of different-composition deep-seated alkali-ultrabasic - alcali-basaltoid melts enriched with carbonic acid-aqueous fluid as a result of the effect consisting in that the melts lose a large proportion of juvenile carbonic acid which is accompanied by a low-contrast magmatic splitting. The "residual" melts exibit lamproitic characteristics and are in balance with essentially aqueous fluid. The natural analogue of such a process would be the liquation splitting in the "kimberlite matrix-autolith" pair.