ZIRCON-BASED SOLID SOLUTIONS IN DIAMONDS

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RESUMO: Multicomponent solid solutions and their intermediate exsolutions hold a special place among syngenetic xenogenic mineral inclusions in diamonds. None of the presently known natural isomorphous mixtures reproduce their composition. Their main characteristic is crystallochemical incompatibility of mixed components under crustal conditions of mineral formation.The xenogenic mineral inclusions were studied on a JSM6400 (Jeol) scanning electron microscope equipped with an energy-dispersive analyzer (ISIS 300 software package) and a wavelength-dispersive spectrometer. The results showed that the zircon-type phase contains 18 components mainly represented by ZrO2, SiO2, TiO2, Al2O3, and FeO providing from 78 to 100 wt %. The subordinate compounds are represented by HfO2, Sc2O3, Y2O3, and P2O5, which are known as geochemical signatures of zircon from diamondiferous rocks, as well as ThO2 and UO2, which are considered "forbidden" components for mantle zircons. In addition, the inclusions contain significant amounts of Ca, Mg, Zn, Cu, and S, which are atypical for zircon.This discovery suggests a rather wide range of metastability of not only diamond but also syngenetic associated minerals under mantle conditions. Since attainment of a general minimum of internal energy is not required for the phase instability state, the corresponding crystallization products can be realized as solid phase solutions of diverse molecular configuration. The solid phase mixtures of peculiar components, which are crystallochemically incoherent under conditions of the Earth's crust, in monocrystal and micropolycrystal diamonds, probably represent a unique state of natural crystalline matter typical of only high-pressure mineral formation in the mantle.This work was supported by the Program's Presidium RAS №27 (09-P-5-1028) and Department of Science Earth SB (09-S-5-1022).

PALAVRAS-CHAVE: ZIRCON; DIAMOND; GENESIS.