EXPERIMENTAL STUDY OF FLUID CONDITIONS OF DIAMOND GROWTH

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One of the ways to reconstruct the fluid conditions of the diamond growth is to study the presented in diamond crystals admixtured gases. For that purpose the diamond crystals were heated and (or) crushed to decontaminate these admixtured gases. Then, composition of obtained gases was determined by methods of mass spectrometry or chromatography (Melton and Giardini, 1974,1981; Bartoshinskii et al., 1987; Bratus et al., 1990). However, for correct usage of those results two methodological questions should be solved:

- clarification of composition identity between the gasses, decontaminated from the diamonds and the forming fluid;
- appreciation of safety or character of changes in composition of the gases taken by the diamond crystals in the post-crystallization processes. This work is dedicated to the experimental solution of the first question.

A mixture of graphite and Fe-Ni alloy was put in a graphite ampoule, which was then soldered in a Pt-ampoule. After that, the Pt-ampoule was set into the cell of the high pressure apparatus of "split sphere" type and kept for 15-30 minutes at pressure 55 kbars and temperatures 1300-1350°C. After the experiment the Pt-ampoule was put into the special chromatographic set, heated up to 150° C, perforated and, decontaminated from the ampoule gases were analysed. Then the sample was taken out the ampoule. From the sample the synthesised diamond crystals and grains of metal alloy were picked. These crystals and grains were heated separately in the helium atmosphere up to 200° C and 600° C, and decontaminated gases were analysed (Osorgin et al., 1995).

The gas phase from the crystallization volume (Pt-ampoule) had the highly reduced composition and consisted of methane, hydrogen, water with small amounts of nitrogen, ethane, ethylene. Atomic radio H/(O+H) was 0.96-0.98. Gas mixture, obtained after degassing of the metal alloy, had H/(O+H)=0.7-0.8. Some more oxidized composition had the gases, decomposed from the heated diamond crystals. The ratio H/(O+H) was 0.6-0.7 and the main gas components were CO, CO_2, H_2O. Hydrogen presented in small amounts.

So, the admixtured gases in the synthetic diamonds have more oxidising composition in comparison with fluid phase of the crystallisation volume. It should be taken into consideration when reconstructing the redox conditions of the natural processes on data, obtained from study of content of volatiles in the samples.

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