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# Influence of the fluid composition on diamond dissolution forms in carbonate melts

**ALEXANDER F. KHOKHRYAKOV* AND YURI N. PAL'YANOV**

Sobolev Institute of Geology and Mineralogy, Siberian Branch of Russian Academy of Sciences, Koptyug Pr., 3, Novosibirsk 630090, Russia

## ABSTRACT

The influence of $CO_2$ and $H_2O$ on the morphology of diamond dissolution in carbonate melts was studied experimentally at pressure 5.7–7.0 GPa and temperature 1400–1750 °C, using a BARS multi-anvil apparatus. It has been established that diamond dissolution in fluid-free carbonate melts starts with the development of positive trigons on the {111} diamond faces, followed by truncation of crystal edges by trigon-trioctahedral surfaces, and finally by the transformation of diamond into spherical dodecahedroid-like morphology. Diamond dissolution in $CO_2$-bearing carbonate melts also begins with the formation of positive trigons on the {111} faces and development trigon-trioctahedron surfaces on the edges. Dissolution form changes from trigon-trioctahedron to dodecahedroid with increasing loss of initial weight. Addition of more than 8 wt% of $H_2O$ into the carbonate medium changes the orientation of the trigons and the secondary morphology of diamond. At the beginning of the process, negative trigons and ditrigonal (shield-shaped) dissolution layers developed on the {111} faces. Dissolution form of diamond in water-bearing melts is tetrahexahedroid, which is most similar to rounded natural diamonds. The results obtained allow us to regard the morphology of trigons and dissolution forms as an indicator of the composition of the diamond dissolution medium. The experiments suggest that the morphology of diamond during dissolution is controlled by the presence of water in a system. Our data show that the $CO_2/(CO_2+H_2O)$ ratio by weight value was <0.81 during natural diamond dissolution.

**Keywords:** Diamond dissolution, crystal morphology, etch forms, fluid in carbonate melts