

The 433rd Geodynamics Seminar

Mineralogical and crystallographical study on the microtexture and genesis of polycrystalline diamond, carbonado

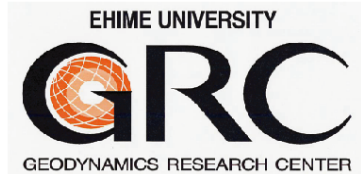
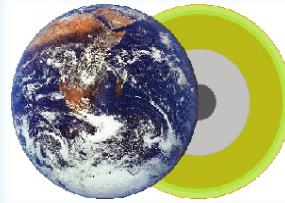
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Research Bldg 1, Ehime Univ.

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Abstract

Carbonado is a type of natural polycrystalline diamond, which shows grayish to black color and massive, undefined shape with porous internal texture. A recent study found several lines of evidence that H₂O-rich fluid is present within constituent diamond crystals of carbonado. It is assumed that its formation occurs in close association with C-H-O fluid in the Earth's mantle. However, the detail of the formation mechanism of carbonado, where and how it forms, is still unclear. In this study, we examine the microtexture and inclusions of carbonado from mineralogical and crystallographic viewpoints to give constraints to the formation mechanism and environments. In total 10 carbonado samples from the Central African Republic and Brazil are analyzed by using EBSD, SEM-EDS, and STEM observations.

Carbonado has a characteristic porphyritic texture composed mainly of several tens to hundreds micrometer-sized diamond crystals. The grain size histogram shows a sharp decrease in number with increasing grain size, suggesting that the individual grains in carbonado did not undergo significant annealing or ripening after the initial crystallization event. In addition, the crystallographic orientation of constituent grains of carbonado is basically random and no distinct preferred orientation was found. These textural features suggest that the unique porphyritic texture of carbonado is not a deformation texture, but a non-equilibrium growth texture formed under high driving force environments.

On cross-sections prepared by using cross section polisher, we found several primary inclusions with omphacitic compositions together with many negative crystals (fluid inclusions). This implies that carbonado may have formed in eclogitic source rocks as a result of a metasomatic reaction in the presence of C-H-O fluid either in the deep subduction zone or in the mantle keel.

詳細は当センターホームページ: <http://www.grc.ehime-u.ac.jp/> をご覧ください

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