

The 459th Geodynamics Seminar

Exploring the origin of carbonado, natural polycrystalline diamond,
from its primary nano-inclusions

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Abstract

Carbonado is a type of natural polycrystalline diamond, which shows grayish to black color and a massive, undefined shape with a porous internal texture. A recent study (Ishibashi et al., 2010) found several lines of evidence that H₂O-rich fluid is present within constituent diamond crystals of carbonado, suggesting its formation 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 because of lack of direct evidences of its mantle origin.

In this study, we examine the microtexture and inclusions of carbonado from mineralogical and crystallographic viewpoints to give constraints to the formation mechanisms and environments. In total 10 carbonado samples from the Central African Republic (CAR) and Brazil were analyzed by using EBSD, SEM-EDS, and STEM observations.

The results showed that carbonado has a porphyritic-like texture with zigzag grain boundary and dominated by stacking faults along diamond (111) planes. Carbonado contains two types of inclusions: primary nano-inclusions of negative crystals in which a variety of euhedral minerals such as Fe-Mg-Al(-Ca) Garnets, rutiles, micas and omphacitic pyroxen are precipitated within individual grains, and secondary inclusions such as kaolinites and Ce-florencites at grain boundaries (ex.). The dominance of mineral assemblages in primary inclusions (negative crystals) in carbonado suggests its formation from eclogitic source materials i.e. subducted crustal origin. We are currently analyzing the details of the structure and chemical composition of those primary inclusions and trying to define the environment carbonado formed.

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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