[EE] Evening Poster | S (Solid Earth Sciences) | S-IT Science of the Earth's Interior & Tectonophysics

[S-IT25]Deep Carbon: Diamond formation and carbon speciation in Earth and planetary processes

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Diamonds are observed in various localities including terrestrial and extraterrestrial environments. However, there are several reports on the diamond localities from non-traditional sources including ultra-deep seated diamonds, ultrahigh pressure metamorphic rocks, various magmas, some meteorites and terrestrial craters. These diamonds might be formed by shock events, crystallization from fluids, magmas, or metallic melts, and CVD process. In this session, we welcome papers on occurrence and origin of diamonds from traditional and non-traditional sources in earth and meteorites. We also encourage the experimental studies on diamond genesis, speciation of carbon bearing compounds in terrestrial rocks and meteorites. We welcome papers on formation mechanisms of diamond in natural metal-carbon systems, chromatographic study of deep seated and experimental fluids. We also welcome papers dealing with behavior of organic materials at high pressure and high temperature corresponding to the deep earth and planets. In some chromitites, various enigmatic high pressure phases have been reported as inclusions together with diamond. We also encourage the presentations on descriptions and discussions on the origin of these materials.

[SIT25-P03]FIB-TEM study of the diamond-graphite boundary in K-bearing tourmaline (Kokchetav massif, Northern Kazakhstan)

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Ultrahigh pressure (UHP) terrains are the unique geological objects for the reconstruction of the carbon cycle in the lithosphere. Diamond and graphite coexist in all diamond bearing UHP terrains (e.g., Schertl and Sobolev, 2013). Graphite coating around metamorphic diamonds in UHP metamorphic rocks has been attributed to the partial replacement of diamond within the graphite stability field (Zhang et al., 1997; Ogasawara et al., 2000; Zhu and Ogasawara, 2002). Here we present the results of FIB-TEM study of the diamond-graphite interface. The focused ion beam technique (FIB) is an ideal tool for transmission electron microscopy (TEM) sample preparation and it allows studying the relationship between minerals on a submicron scale. Diamond-graphite intergrowth, occurring as inclusions in K-bearing tourmaline, was selected for this study. This tourmaline cannot be named maruyamaite (Lussier et al., 2016) due to low K_2O contents (up to 1.8 wt.%).

The diamond + graphite inclusion was located about 5 microns below the thin section surface. Graphite was detected in the contact only with one {111} diamond face, whereas all other diamond surfaces do not show any evidence of an existence of graphite. The grain boundary between diamond and graphite is very sharp. The dissolution features were detected neither on diamond nor on graphite crystals. Graphite has well-ordered structure. The lack of disordered graphite along diamond-graphite interface indicates clearly that the origin of the well-ordered graphite is not related to partial graphitization of diamond. Electronic diffraction patterns of the graphite and diamond crystals testify for their epitaxial growth. Thus, there are two

possible explanations for presence of the diamond-graphite intergrowth in UHP metamorphic rocks: (i) metastable graphite crystallization in the diamond stability field implies an UHP origin of K-bearing tourmaline or (ii) if graphite crystallization occurred in its own stability field, subsequently K-bearing tourmaline is not UHP mineral indicator.

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References

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