

The 486th Geodynamics Seminar

Phase transition and texturing mechanism of graphite to lonsdaleite/diamond

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Abstract

Direct conversion of graphite to diamond under high pressure and high temperature has been extensively studied by high-pressure experiments, which eventually led to an invention of nano-polycrystalline diamond (NPD) characterized by the excellent hardness and optical transparency. Recently, a natural counterpart of NPD has been identified in impact diamond found in a large meteoritic crater (Popigai crater) in Russia. The microstructure and formation process of the natural NPD were found to be well comparable to those of synthetic one, although a few differences such as the presence of preferred orientation of the constituent grains were noted. I have studied Yakutite, a black and massive diamond found in Siberia, Russia and compared its mineralogical and crystallographic features to those of Popigai impact diamond. Our result showed many common points between them, suggesting that Yakutite is a product of long-distance outburst from the Popigai crater. Now, I have been studying the origin of the unique microtexture and single-crystal like diffraction patterns shown by some of the impact diamond (including Yakutite) and am also planning to perform high pressure experiments using single crystal graphite as a starting material to understand the real phase transition mechanism of graphite to lonsdaleite/diamond.

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