

Synthesis of Nano-polycrystalline Diamond and Related Hard Materials using Multianvil Apparatus

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We synthesized pure polycrystalline diamond by direct conversion of graphite in multianvil apparatus, which turned out to be made of sintered nano-grains of cubic diamond and to possess very high Knoop hardness of 130-140 GPa [1]. Two distinct fine textures were recognized in TEM observations of the present diamond; granular particles with 10-20 nm and tabular crystals with dimensions of 100-200 nm in the elongated direction. The former crystals are interpreted to be formed via a nucleation and growth mechanism, while the latter parts may be formed by the two-step martensitic transitions [2].

Some mechanical tests have been conducted on thus synthesized polycrystalline diamonds, which exhibited significantly high abrasion resistance. Attempts to make sintered bodies of polycrystalline diamond with various forms of carbon, including carbon nanotubes, flurene, glassy carbon, etc. have been made using the present technique.

[1] Irifune T., Kurio A., Sakamoto S., Inoue T., Sumiya H., *Nature*, 2003, **421**, 599. [2] Sumiya H., Irifune T., *J. Mat. Sci.*, 2004, **39**, 445.

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