Growth of Heavily Boron-Doped Polycrystalline Superconducting Diamond

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The introduction of a high concentration of boron into polycrystalline diamond films is realized by the chemical vapor deposition of the films. The growth parameter α, which is determined as the growth direction, depends on growth conditions such as the methane concentrations and B/C ratio. With an increase in methane concentration or B/C ratio, <111>-faceted growth is frequently observed. From X-ray diffraction measurement, the <111>-textured growth of the film is confirmed under high-α conditions. The diamond film grown, which has an extremely low resistivity (1.23 mΩcm), shows a transition to superconductivity at 5.6 K. For films grown under high-α conditions, for which the surface energy of the {111} face is low, a higher $T_c$ is observed.

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