Abstract Submitted
for the GEC10 Meeting of
The American Physical Society

Influences of Boron-Doping on Growth of Ultrananocrystalline Diamond·Hydrogenated Amorphous Carbon Composite Films by Pulsed Laser Deposition TSUYOSHI YOSHITAKE, SHINYA OHMAGARI, KENJI HANADA, AKIRA NAGANO, Kyushu University, RYOTA OHTANI, KAZUSHI SUMITANI, Saga Light Source, KYUSHU UNIVERSITY TEAM, SAGA LIGHT SOURCE TEAM — It has been reported that boron-doping improves the structural perfections of diamond crystals grown by chemical vapor deposition. In addition, whereas the crystal size is slightly decreased by increasing the amount of doped boron, the nucleation density is enhanced. Ultrananocrystalline diamond.·hydrogenated amorphous carbon composite (UNCD.·a-C:H) films possess a distinctive structure wherein UNCD crystallites with diameters less than 10 nm are embedded in an a-C:H matrix. Since UNCD crystallites can be regarded as nuclei, the growth must strongly be influenced by boron-doping and preparation method. In this study, we investigated influences of boron-doping on the growth of UNCD crystallites prepared by pulsed laser deposition. The crystallite size increased from 5 to 20 nm with a increase in the boron content up to 13 at.%. This evidently indicates that the boron-doping enhances the UNCD crystallite growth. The near-edge x-ray absorption fine structure measurement revealed the preferentially incorporation of boron atoms into grain boundaries. We consider that boron atoms facilitate the UNCD crystallite growth after the nucleation.

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Date submitted: 11 Jun 2010 Electronic form version 1.4