

X-ray Topography and Tomography Studies of Surface Damage in Etched Diamond-Crystal Plates*

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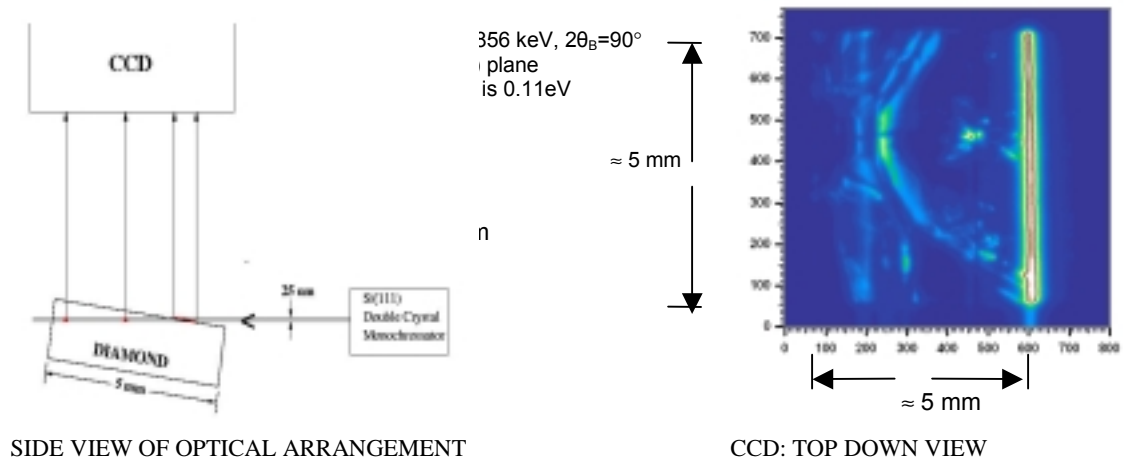
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To characterize diamond monochromators for synchrotron radiation beamlines, images for a region within 25 microns of the surface were obtained. It is possible to narrow the rocking-curve width of diamonds by chemical etching [1]. The samples were synthetic type Ib (yellowish due to nitrogen impurities) and measured approximately 5 mm by 5 mm. The thicknesses were 0.5 mm or 1 mm. Measurements were made using unfocused monochromatic bending magnet radiation at the Advanced Photon Source. The energies were 13 and 12 keV. As shown in the figure below, images of a Bragg diffracted beam for a scattering angle of 90 deg were obtained with a CCD area detector from asymmetric reflections incident at 8 and 9 deg for plates having surface normals aligned along (111) and (100). Detailed data analyses were concentrated to a region near the surface in order to study surface damage. Images of the full surface were constructed from tomographs taken at various heights of the diamond sample. The six diamonds we studied had been subjected to different surface treatments upon receipt by us. They were obtained from Harris Corp./Drukker International. Comparisons of data obtained before and after subsequent chemical etching performed by us in our laboratory will be presented.

Reference

[1] J. Maj, F. Krasnicki, A.T. Macrander, P.B. Fernandez, Rev. Sci. Instrum. 73, 1546 (2002).

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SIDE VIEW OF OPTICAL ARRANGEMENT

CCD: TOP DOWN VIEW