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Glancing Incidence X-ray Diffraction (GIXRD) analysis of induced nanocrystalline boron nitride (BN) on ion-implanted poly-crystalline hexagonal BN.

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This study examined changes in the properties of poly-crystalline hexagonal boron nitride (h-BN) samples implanted with light ions (He+, Li+, B+, and Ne+) at 150 keV and at a fluence of 1x1015 ions/cm2. We have previously reported the production of cubic boron nitride nanoparticles in a subsurface layer, accompanied by a measurable hardening. The GIXRD findings show a new peak at 46.45° characteristic of c-BN (111) on the XRD spectra of implanted samples. The as-grown h-BN lattice parameter, as determined from XRD, was 2.499 Å and the lattice parameters of samples implanted with He+, Li+, B+ and Ne+ ions were 2.581 Å, 2.514 Å, 2.508 Å and 2.509 Å, respectively. There is a transition to lower angles and expansion in the peak position, this is due to the residual stress caused by ion implantation since there is a difference in the lattice parameter ratios, i.e., one lattice parameter is shorter, the other is longer (a and c lattice parameters, respectively). This could mean a hexagonal stress-related phase change to cubic nanoparticles (nc-BN). The increase in hardness affects the attenuation of X-ray photons because the density of the material on the implanted surface is affected and the X-ray photons penetrate deep into the sample. The Scherrer equation was used to calculate the particle size of the induced nc-BN particles.

Apply to be considered for a student ; award (Yes / No)?

Yes

Level for award;(Hons, MSc, PhD, N/A)?

PhD

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