



Contribution ID: 327

Type: **Oral Presentation**

Characterization of the Phase Transition of h-BN - c-BN Nanoparticles by Ion Implantation

Friday, 15 July 2011 12:15 (15 minutes)

The synthesis of the c-BN (cubic boron nitride) has developed great interest due to its excellent physico-electrochemical properties. These include; high hardness values (73 GPa) second after diamond, wide band gap (6.4 eV), optical transparency in a wide region of the electromagnetic spectrum, high temperature stability (1200 oC) and chemical inertness. These properties enable c-BN to be very useful for various industrial and electrical applications such as in cutting and grinding, fabrication of high temperature high frequency devices among many others. In this work, ion irradiation effect of the soft graphitic boron nitride (h-BN) is investigated from characterization with Raman Spectroscopy before and after implantation. This was to investigate a possible phase transformation of h-BN to c-BN. Boron, lithium and helium ions were implanted into the hot pressed h-BN samples at 150keV, and with fluences ranging from 1×10^{14} ions/cm² to 1×10^{16} ions/cm². Raman Spectroscopy showed that implantation of all the three ions led to an h-BN to a possible c-BN phase transition, evident from the longitudinal optical (LO) Raman phonon features occurring at 1303cm⁻¹ in the implanted samples' spectra. The nature of the phonon peaks and their downshifting is explained using the spatial phonon correlation model. The extent of these peaks was found to depend on the mass of the incident ion and the fluence, where high ion mass required low fluence compared with the low ion masses.

**Level (Hons, MSc,
 PhD, other)?**

PhD

**Consider for a student
 award (Yes / No)?**

Yes

**Would you like to
 submit a short paper
 for the Conference
 Proceedings (Yes / No)?**

Yes

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Session Classification: Applied

Track Classification: Track F - Applied and Industrial Physics