

Ion Beam Modified Polyimide : A Study of the Irradiation Effect

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Abstract

Ion bombardment in the keV range is known to induce drastic chemical modifications in organic and inorganic molecular compounds. A degrading effects in organic materials such as the release of polymer components and the chemistry of the irradiation process, have been observed. The work to be described was carried out in order to understand the irradiation effect better.

The sample(polyimide : Kapton[®]) were irradiated by Ar⁺, Ne⁺, He⁺ ions, and electrons (3 keV) to fluence ranging from $\sim 1 \times 10^{15}$ ions/cm² to $\sim 1 \times 10^{17}$ ions/cm² at room temperature. The implant was usually rastered over an area of a few cm². These ion implantations were carried out in the UHV chamber of the electron spectrometer. The analysis was carried out in an electron spectrometer ESCA 5700 (PHI Ltd.) at a residual gas pressure of $\sim 5 \times 10^{-10}$ Torr. X-ray photoelectron spectroscopy(XPS) measurements were made using a monochromatized Al K α (1486.6 eV) excitation source. The photoemitted electrons were detected by hemispherical analyser with a pass energy of 23.5 eV. Core-level binding energies were referenced to the Fermi level. To avoid the charging effect, it was used the neutralizer.

We studied the irradiation effects on polyimide with Ar⁺, Ne⁺, He⁺ ions and electrons by XPS which can provide detailed information concerning the bonding-induced changes.

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