The Effects of Electron Beam Dose on the Visible Spectroscopic Signatures of Thin C60 Films

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The aim of the present project was to determine the effects electron beam (EB) dose on the modification of C60 films by studying their visible spectra proceeding EB irradiation. While other studies have shown that EB irradiation can cause polymerization of C60, they have not shown the relationship between the electron dose and the visible absorption from the EB irradiated films. This would be of particular use in the field of organic photovoltaics, where fullerene based systems have shown promise. The present project began with thin films of C60 made by spin coating C60 dissolved in toluene onto glass substrates, keeping all parameters the same between samples. Films were placed in a vacuum chamber where a base pressure of 2.5E-5 torr was maintained. The samples were heated under vacuum to drive out any residual solvent left from spin coating. They were then irradiated using a hot-cathode, triode-type electron gun. The EB energy was kept at 2000eV for all tests, and the beam current was monitored using a Faraday plate. Films were irradiated with doses of 0.048C/cm^2, 0.096C/cm^2, and 0.192C/cm^2, corresponding to 1, 2, and 4 hours of exposure respectively. After irradiation, an absorption spectrum was taken of each of samples over the range of 380 to 900nm. Current data suggest that EB irradiated films have increased absorption in the red-NIR region of the spectrum compared with pristine films. Additionally, The absorption in the longer wavelengths increases with exposed films roughly proportionally to the received dose.

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