

Study of P3HT and PCBM Thin Films Prepared by UHV Electrospray Deposition

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We investigated the thin films of poly(3-hexylthiophene) (P3HT) and C61-butyric acid methylester (PCBM) prepared by ultrahigh vacuum (UHV) electrospray deposition (ESD) by using in-situ XPS, UPS and ambient-pressure AFM. The morphology, chemical structures, and interface properties of these materials, most widely used for bulk heterojunction organic solar cells, were studied depending on the ESD solution compositions and concentrations. We found that the solution conductivity and flow rate as well as applied voltage are the important parameters for stable electrospray and film formation. These results suggest that UHV ESD is a viable method for the deposition of multilayers of polymers under UHV condition. We also discuss the energy level alignment for the various deposition conditions at the interface, which is one of the most important operating parameters of the bulk heterojunction organic solar cells.

Keywords: PCBM, P3HT, electrospray, UHV, AFM, XPS