

Molecular orientation of poly(3-hexylthiophene)/fullerene composite thin films

Abstract

Focused on the relationship between the molecular orientation and the electrical performance of poly(3-hexylthiophene)/[6,6]-phenyl C₆₁-butyric acid methyl ester (P3HT/PCBM) composite thin films to elucidate the effect of changing amount of PCBM in P3HT:PCBM by weight ratio in organic solution has been studied. The P3HT/PCBM composite thin films were investigated by an electron spin resonance (ESR) and X-ray diffraction (XRD) to reveal the film molecular and structure orientation. It was observed that the composite films with a small amount of PCBM were capable of altering the molecular structure of P3HT. It was also observed that the presence of a small amount of PCBM molecules improved the device performance of P3HT thin film transistors (TFTs), which provide the mobility on the order of $10^{-3} \text{ cm}^2 \text{ V}^{-1} \text{ s}^{-1}$ with an on/off current ratio of 10^4 . The threshold voltage was also higher than of pure P3HT TFTs. © 2010 The Japan Society of Applied Physics.