Nano- and micro-scale Morphology of E-cast MEH-PPV by Small Angle Scattering

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Invention of electroluminescence from organic materials has led to the realisation of flexible electronic displays. Poly(phenylenevinyle) (PPV) and polyfluorenones (PFO) based polymers are extensively studied candidates of soft electronic materials. MEH-PPV is a soluble derivative of PPV which emits in the red regions has excellent mechanical and photophysical properties. Even though the commercial applications have already been achieved using this polymer, the relationship between morphology and electro-optical properties are still under discussion. MEH-PPV is supposed to have different morphologies depending on its processing conditions such as solvents, film-casting methods, temperature and external forces such as the application electric field during the vaporisation of the solvents. In this report, we discuss the nano scale morphology revealed by X-Ray scattering measurements performed at NSRRC. Optical quality thick films[1] (as-cast) having thickness around 4 um has been prepared by drop-casting method on pre-cleaned ITO coated glasses. In another batch, an external electric field was applied during the vaporisation of the solvents and hence denoted as "E-cast".[2] An Al electrode was deposited on the top to perform charge transport measurements by time-of-flight (TOF) method. X-ray scattering measurements were performed at the beam lines 17A and 17B of NSRRC. Devices prepared from different solvents exhibited identical photoluminescence and different charge transport properties. The X-ray reflectivity (XR) data providing information on depth density profile, gracing incident wide (GI-WAXS) on short-range chain packing

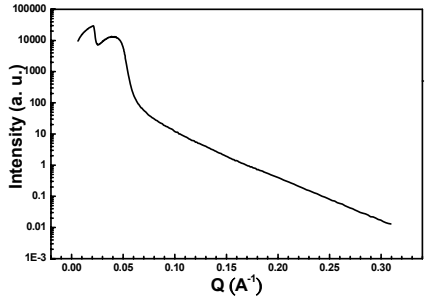

Figure 1. X-ray reflectivity profile of the E-cast film

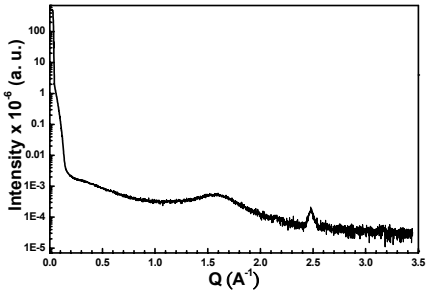

Figure 2. WAXS profile of the E-cast film

Detailed analysis of these results will be discussed.

1. A.R. Inigo, H.C. Chiu, W.S. Fann,Y.S. Huang, U.S. Jeng, T.L. Lin, C.H. Hsu, K.Y. Peng and S.A. Chen, "Disorder controlled mobility in MEH-PPV", *Physical Review B*. 69, 075201 (2004).
2. A.R. Inigo, C.C. Chang, W.S. Fann, J.D. White, Y.S. Huang, U.S. Jeng, H.S. Sheu, K.Y. Peng S.A. Chen, et al, "Enhanced hole mobility in MEH-PPV by elimination of nano-meter sized domains", *Adv. Mater.,* 17, 1835 (2005).