Supporting information

The Effect of Electric-field on Phase Separation of Semiconductor/Insulator Composite Film

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Experiment Methods

Regular poly(3-hexylthiophene) (P3HT) was synthesized according to the literature (J. Polym. Sci. Part A: Polym. Chem. 2012, 50, 2762.). Poly(methyl methacrylate) (PMMA) was purchased from J & K company (Mn=15000 by GPC). The solvent of o-dichlorobenzene (ODCB) was purchased from Aldrich (chromatographic pure) and used as received. Sheet resistance of Indium tin oxide (ITO) glass was 30~40 ohm per square which can be received from Normal commercial channels.

The mixture solution of P3HT and PMMA (molar ratio 1:1) was dissolved in o-dichlorobenzene (ODCB) solvent, ensuring the solid content can be kept at 5%. Indium tin oxide (ITO) glass was etched by laser etching machine, the width of the channel was 200 μm, and the depth was nearly 175 nm, which was just the thickness of ITO (as shown in Fig. S1), the P3HT/PMMA mixed solution was filled the channel by spin-coating (800 rpm, 1 min at room temperature), rapidly, 10 V DC electric field was added as shown as Fig. 1a in the text until the solvent evaporated completely.

Samples for atomic force microscopic (AFM) measurements were prepared by spin-coating (800 rpm, 1 min at room temperature) of P3HT/PMMA mixed solution as mentioned above, all of which whether the electric-field (EF) treatment or not were filmed by volatilization at room temperature. AFM images were acquired in tapping mode with a Digital Instruments Dimension 3100 Scanning Probe Microscope performed at room temperature in air using standard silicon cantilevers with a nominal spring constant of 50 N m^{-1} and resonance frequency of ~300 kHz. The images were acquired at a scan frequency of 1 Hz in 5×5μm^2 scan areas.

Polarizing optical microscopic observations were carried out with an E600POL polarizing optical microscope (Nikon, Tokyo, Japan) equipped with a DS-5 M CCD camera (Nikon) connected to a DS-L1 control unit (Nikon).

Table of Contents

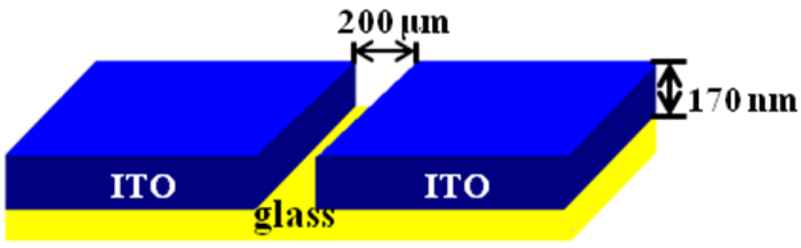

Figure S1. The ITO glass etched by laser etching machine.