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Nanostructure Formation of Regioregular Poly(3-octylthiophene) in Thin Films: Effects of Solvents, Concentration and Temperature RUTTAYAPON POTAI, RAKCHART TRAIPHOL, Department of Chemistry, Faculty of Science, Naresuan University, Phitsanulok 65000, DVORA PERAHIA, Department of Chemistry, Clemson University, Clemson, SC — The orientation and packing of conjugated polymer chains in thin film crucially affects charge transport. This study focuses on the morphology of self-assembled regioregular poly(3-octylthiophene) (rr-P3OT) in thin film. Previous studies showed that this polymer cast from different solvents forms rod-like aggregates. Here we present the morphology of films cast from a mixed solvent, toluene and hexane where the ratio of the solvent tunes the morphology and absorption of the aggregates. Addition of hexane, a good solvent for octyl side chain and a poor solvent for the thiophene unit, selective interaction change the conformation of the rr-P3OT chain. Absorption measurements across 200-800 nm, exhibits distinct red-shifted peaks, with respect those in toluene. With increasing hexane concentration, the aggregates in solution transform from non-emissive to emissive. We attribute this behavior to the disruption of segmental stacking. AFM measurement of the film shows the formation nano aggregates that change in size and shape with concentration of hexane. Thermal annealing of the films leads to morphological changes as well. Further structural analysis using neutron and X-ray techniques is currently on the way.

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