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"Effect of Polyalkylthiophene Microstructure on Physical and Optoelectronic Properties" MICHAEL J. MINKLER JR., BRYAN S. BECKINGHAM, Auburn University — Conjugated polymers have been of widespread interest as flexible semiconductors for organic electronic devices such as solar cells, field effect transistor,s and light-emitting diodes. Of particular interest have been alkyl-substituted polythiophenes due to their well-controlled synthesis, favorable optoelectronic properties, and solubility in organic solvents. Importantly, relatively small changes to the chemical microstructure in poly(3-alkylthiophenes) (P3ATs) can have a significant effect on the resulting physical and optoelectronic properties. For instance, the addition of aliphatic side chains onto unsubstituted polythiophene provides solubility but also greatly decreases conductivity in comparison to unsubstituted polythiophene (PT). In this work, we use Grignard metathesis polymerization to synthesize poly(3-hexylthiophene) (P3HT), PT, and statistical copolymers (P[3HT-co-T]) over a range of compositions. We examine the physical properties (melting temperature, crystallinity, etc) by differential scanning calorimetry and wide angle X-ray scattering, optoelectronic properties by UV/Vis spectroscopy, and solubility in organic solvents of these copolymers in order to gain insights into the interplay of microstructure and properties in this class of materials.

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