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Control of Rod-Rod Interactions in Poly(3-alkylthiophenes) VICTOR HO, BRYAN W. BOUDOURIS, RACHEL A. SEGALMAN, University of California, Berkeley — Poly(3-hexylthiophene) is a commonly used semiconducting polymer because of its relatively high charge transport ability, low band gap, and solution processiblity. Strong intermolecular interactions lead to the formation of nanofibers during crystallization, which prevents long-range microstructural ordering. We show rod-rod interactions, parameterized by the Maier-Saupe parameter, can be controlled by rational polythiophene side chain design. Effects of side chain passivation are evidenced by a depressed melting temperature and the presence of a liquid crystalline region. Additionally, the Maier-Saupe parameters are estimated for poly(3-dodecylthiophene) and poly(3-ethylhexylthiophene); the relative magnitudes of each are related to the interchain spacings obtained by x-ray diffraction experiments. The systematic tuning of the rod-rod interactions in polythiophenes allows for manipulation of the ratio of Maier-Saupe to the Flory-Huggins parameter, a crucial value in obtaining long-range order in rod-coil block copolymer morphologies.

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