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Nanostructures of Oligo- and Polythiophenes by Chain-Growth Polymerization.[1] CHUNWA KEI, EVGUENI NESTEROV, Louisiana State Univ - Baton Rouge — Conjugated polymers represent an important platform for designing electronic and optoelectronic devices with tunable characteristics. Typically, processing such materials requires them to be functionalized with alkyl substituents directly attached to conjugated polymer backbone, but such substituents tend to reduce polymer fluorescent quantum yields by introducing low lying vibrational and rotational energy levels. In addition, solubilizing alkyl side chains play a key role in the oxidative degradation of these materials. Thus, conjugated polymers without alkyl substituents should display higher quantum yield and better stability. In this presentation, we will discuss a novel method for preparing unsubstituted polythiophene nanostructures by controlled chain-growth polymerization. In contrast to previously developed methods, nanostructures prepared by this method exhibit diverse shapes, including nanoparticles, nanorods, and nanofibers, and display tunable photophysical properties such as near-infrared fluorescence, related to efficient excitation energy transfer within the particles. X-ray and neutron scattering studies revealed hierarchical organization of the polythiophene nanostructures. A two-stage mechanism for the formation of these nanostructures will also be discussed.

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