Symposium L

Title: Oriented semiconducting polymer nanorods

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We show that uniformly oriented rod-shaped nanostructures can be formed from isolated single chains of a common semiconducting polymer (MEH-PPV) by ink-jet printing techniques. Electrostatic interactions between the charged nanoparticle and the coverglass surface results in highly uniform orientation with the long axis perpendicular to the substrate. A combination of emission pattern imaging/polarization studies and scanning probe microscopies showed that the structural, photophysical, and spectral properties of these materials are dramatically altered with respect to bulk or dilute thin-film preparations. Polarization anisotropy measurements show that an extraordinary degree of intramolecular ordering of conjugated segments within individual nanoparticles. Spectroscopic studies of individual MEH-PPV nanoparticles show narrow (10 - 15 nm fwhm) emission spectra with a discrete distribution of center frequencies whose peaks can be correlated with excitonic traps of integer multiples of monomer conjugation lengths (8, 9, 10, and 11). The observation of discrete emission characteristics in this important class of materials suggests exciting possibilities in photonics and molecular opto-electronics.

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