Oriented nanostructures from single molecules of a conjugated polymer

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Semiconducting polymers are widely used in so-called "plastic opto-electronic" devices and luminescent display technologies. However, a number of issues related to poor control over inter- and intra-chain organization of these materials in conventional thin-films limit many aspects of device performance. This problem is especially critical at smaller length scales where conjugated polymers are envisioned to play an important role in the emerging field of nanoscale optoelectronics. Recent work in our laboratory has explored the effects of 3-dimensional confinement on the self-organization of single chains of conjugated polymers used commonly in polymer LEDs. Isolated in tiny droplets of dilute polymer solution and allowed to dry en route to a glass substrate, these nanoscale species (roughly the size of a biological protein) adopt structural, spectroscopic, and photophysical properties that are markedly different than those of their (well-studied) thin-film counterparts. Applications to nanoscale opto-electronic devices will be discussed.

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