

## **Oligothiophenes with a Diketopyrrolopyrrole Chromophoric Core for Solution Processed Organic Field Effect transistors and Photovoltaic Cells**

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Conjugated small molecules that self assemble to novel nanostructures as a consequence of strong inter- and intramolecular interactions are useful as semiconductors in the emerging technologies of organic electronic devices such as field effect transistors (FETs) and photovoltaic cells (PVs). Indeed, very good device performances including high charge carrier mobilities and power conversion efficiencies have been realized and reported in literature. Proper functionalization of conjugated aromatic systems influences not only the solubility and processability of these materials, but more importantly, the degree of self organization which can lead to the creation of one or two dimensional materials that have interesting electronic properties. This degree of self organization that takes place can in fact be controlled via materials design, synthesis, and processing. In this paper, we report the synthesis and characterization of oligothiophene derivatives having a diketopyrrolopyrrole as a chromophoric core. Solution processed FETs made from chloroform solutions of these systems exhibited hole mobilities as high as  $0.02 \text{ cm}^2/\text{V}\cdot\text{s}$ . Photovoltaic devices based on solution processed blends of these systems as donors and fullerene derivative as the acceptor gave power conversion efficiencies of  $>3 \%$  which make them the highest performing solution-processed small molecule based photovoltaic cells to date.