Synthesis and Characterization of Graft Polymethacrylates Containing Conducting Diphenyldithiophene for Organic Thin Film Transistors

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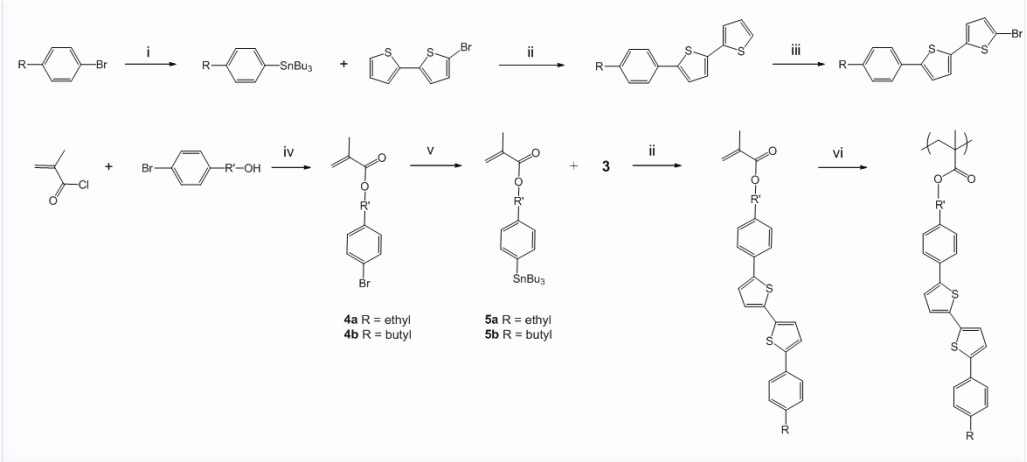

The [5,5']-diphenyl-[2,2']-bithiophene (PTTP) family of co-oligomers affords good electrical performance because of its molecular geometry and energy levels. To date, studies have focused on PTTP small molecules. Given the advantages of polymers versus small molecules, particularly in terms of their ability to form uniform films, mechanical flexibility, and excellent rheological properties, it is of interest to incorporate PTTP semiconducting blocks into polymeric systems. Herein a novel "graft" approach was developed to synthesize PTTP graft polymers. It was found that for the methacrylate system, the pendant PTTP sides chains appeared to be aligned in a face-to-face manner as evidenced by a distinct blue shift in their UV-Vis spectra. The extracted mobilities in the saturated regime were on the order of 10^{-5} $cm^2V^{-1}s^{-1}$. Compared to alternative well-developed organic semiconductor materials, there is still substantial space to improve the FET performance characteristics through optimization of the structure of the PTTP materials investigated here. The introduction of the concept of a graft polymer approach could also contribute to the development of new chemical architectures and/or building blocks for applications related to organic electronics.