

Wide Linear Dynamic Range New Polymer Photodiode by Controlling Crystalline Orientation

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We report a new polymeric semiconductor that can extend linear dynamic range(LDR), one of the most significant shortcomings of organic photodiodes (OPDs). Two kinds of alkylthio-substituted benzo[1,2-b:4,5-b']dithiophene (BDT) copolymers are synthesized in conjunction with fluorinated terthiophene (BDT-Th-3T) or fluorinated alkylterthiophene (BDT-Th-3AT). We introduce BDT-Th units such as 2D-like to induce vertical-oriented pi-pi stacking, and introduce 3T units to further enhance pi-pi interactions of polymer backbone. Consequently, the optimized OPD structured as $\text{ITO/PEIE/BHI/MoO}_3/\text{Ag}$ could exhibit the high specific detectivity over 10^{13} Jones as well as unprecedentedly high LDR.