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Optimization of the power conversion efficiency in high bandgap pyridopyridinedithiophene -based conjugated polymers for organic photovoltaics by the random terpolymer approach

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Abstract

We report that the organic photovoltaic (OPV) performance of wide band gap pyridopyridinedithiophene -based conjugated polymers can be significantly improved by employing the random terpolymer approach for the development of new pyridopyridinedithiophene -based conjugated polymers. This is demonstrated by the synthesis of the alternating copolymer (P1) consisting of 3,3'-difluoro-2,2'-bithiophene and pyridopyridinedithiophene and the random terpolymer (P2) containing pyridopyridinedithiophene 3,3'-difluoro-2,2'-bithiophene and thiophene. OPV devices fabricated by P1 and P2 in combination with PC₆₁BM and PC₇₁BM in an inverted device configuration exhibited power conversion efficiencies (PCEs) of 1.5% and 4.0%, respectively. We identified that the main reason for the enhanced performance of the OPV devices based on the P2 random copolymer was the improved morphology (miscibility) between P2 and PCBM as compared to P1. More specifically, atomic force microscopy (AFM) and scanning electron microscopy (SEM) studies revealed that the P1 based films showed rougher surface with clear crystallization/precipitation of the polymer chains even

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