

A new asymmetric benzothiadiazole based small organic chromophore for bulk heterojunction organic solar cells

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This work illustrates the synthesis of donor- π -acceptor-donor (D1- π -A-D2), containing 2,1,3-benzothiadiazole as the electron-withdrawing core and dimethoxyphenyl as electron-donating terminal groups via Suzuki cross-coupling reaction. The synthesized OMe-BBTz chromophore was used as donor material for the fabrication of bulk heterojunction organic solar cells (BHJ-OSCs). The presence of the ethylene moiety as a polyvalent spacer expanded the π -electron system in OMe-BBTz chromophore and improved the optical and structural properties. The morphology and the optical properties of the chromophore were studied to explain the performance of the fabricated BHJ-OSCs. The synthesized OMe-BBTz exhibited suitable HOMO and LUMO values of -5.8 eV and -3.9 eV, respectively, as calculated from cyclic voltammetry and the optical absorption onset. OMe-BBTz : PC61BM (1:3, w/w) active layer displayed the highest power conversion efficiency (PCE) of 3.53% %, the short circuit current (J_{sc}) of ~ 8.71 mA/cm² with an open-circuit voltage (V_{oc}) of ~ 0.698 V.