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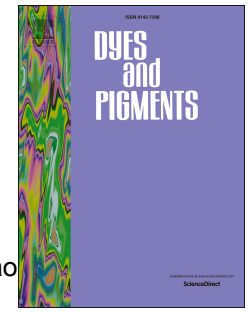

Triphenylamine cored electron-donors for solution-processed organic solar cells: From tri-armed molecules to tetra-armed molecules

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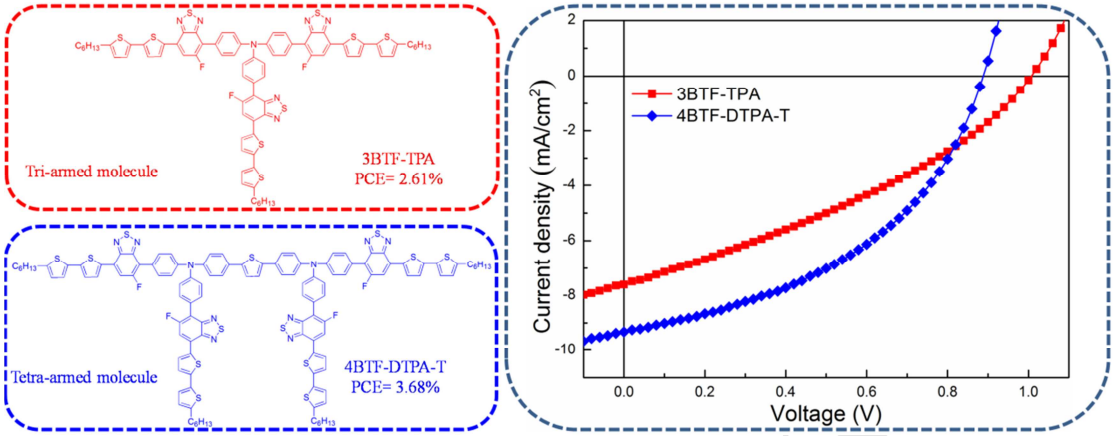
Graphical Abstract



To enrich the toolbox of 3-D molecules for solar cells, novel tetra-armed D-A type small molecule 4BTF-DTPA-T was designed utilizing the thiophene connected ditriphenylamine (DTPA) core and fluorinated benzothiadiazole (BTF) arms. Also the corresponding tri-armed 3BTF-TPA was synthesized to make a better comparison. As observed, although similar absorption spectra covering from 300 nm to 600 nm was obtained for 3BTF-TPA and 4BTF-DTPA-T, much higher extinction coefficients were achieved for the tetra-armed 4BTF-DTPA-T. Furthermore, an interpenetrating network with homogeneous morphology was achieved for 4BTF-DTPA-T based blending films, finally leading to the maximum PCE value up to 3.68% in solar cells, which is much higher than that of star-shaped 3BTF-TPA (PCE= 2.61%). Our results here demonstrated that the tetra-armed D-A small molecules could be the promising electron-donors for solution-processed organic solar cells.