

Synthesis of D-A-D type fumaronitrile-based organic π -conjugated chromophores for solution-processed organic solar cells

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The new D-A-D type organic chromophore with fumaronitrile (*trans*-1,2-Dicyanoethylene) moiety as electron-acceptor unit was used to investigate its effect on the photophysical, electrochemical and photovoltaic properties of the organic π -conjugated chromophore, RCNR. The organic chromophore exhibits a broad absorption peak in visible region due to the presence of strong electron-withdrawing nature of two nitrile (-CN) groups of fumaronitrile-acceptor. HOMO energy level of -5.82 eV and LUMO energy level of -3.54 eV are estimated for RCNR with a band gap of 2.28 eV. The fabricated SMOSC with RCNR:PC₆₀BM (1:3, w/w) active layer exhibits the reasonable PCE of ~2.69% with high short-circuit current density (J_{sc}) of ~9.68 mA/cm² and open circuit voltage (V_{oc}) of ~0.79 V. Thus, the D-A-D type organic chromophore showed a promising results and its further architecting would surely enhance the optical, electrochemical and photovoltaic properties of devices based on such organic chromophores.