

Solution processed bulk-heterojunction organic solar cell fabricated with benzo[c]  
[1,2,5]selenadiazole core substituted D-A-D type small organic molecule

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This work describes the synthesis of D-A-D symmetric small organic molecule named as 4,7-bis(5'-hexyl-[2,2'-bithiophen]-5-yl)benzo[c][1,2,5]selenadiazole (RTh-BSe-ThR) unit as a strong donor unit. The synthesized RTh-BSe-ThR was applied as a donor material with fullerene acceptor (PC61BM) in fabricating the efficient solution processed bulk-heterojunction organic solar cells (BHJ-OSCs). RTh-BSe-ThR displayed broad absorption band between 300-650 nm in both solution and solid thin film with an estimated optical band gap (E<sub>gopt</sub>) of 1.87 eV. RTh-BSe-ThR showed an excellent electrochemical behavior with estimated energy level (HOMO and LUMO) of -5.38 eV and -3.51 eV respectively. The solution processed BHJ-OSCs of configuration ITO/PEDOT:PSS/RTh-BSe-ThR:PC61BM (1:3, w/w)/Au configuration achieved a high power conversion efficiency (PCE) of ~3.46 % with an improved short circuit current-density (J<sub>sc</sub>) of ~11.20 mA/cm<sup>2</sup>, open circuit voltage (V<sub>oc</sub>) of ~0.681 V and fill factor (FF) of 45%.