

A planar indandione based small organic molecule for effective donor materials in organic solar cells

알람 샤바즈, 김은비, 이은희, 모하마드임란, 압둘라, 아민사디아, 신형식[†]
전북대학교
(hsshin@jbnu.ac.kr[†])

A new and effective donor material of indandione based D- π -A planar molecule, 2-(5''-hexyl-[2,2':5'2'' terthiophen]-5-yl) methylene)-1H-indene-1,3(2H) dione, HBT-ID) was synthesized to fabricate the bulk-heterojunction organic solar cells (BHJ-OSCs). A promising absorption behavior with the optical band gap of ~ 1.98 eV was recorded for HBT-ID molecule. The HBT-ID molecule with π -spacer and hexyl side chain showed in improving the thin film morphology, molecular packing and charge transport. HBT-ID organic molecule presented the deep HOMO of ~ -5.37 eV and higher LUMO of ~ -3.38 eV, these were well-matched with energy levels of PC₆₁BM acceptor. Fabricated BHJ-OSC using HBT-ID as donor and PC₆₁BM as acceptor attained the maximum PCE of ~ 4.05 % with good $J_{SC} = \sim 10.43$ mAcm⁻², $V_{OC} = \sim 0.77$ V and FF= 0.51. Importantly, the fabricated BHJ-OSCs expressed showed good reproducibility and stability by retaining over $\sim 80\%$ of its initial PCE for 15 days without encapsulation.