

Non-Fullerene Electron Transporting Material for Efficient and Thermally Stable Inverted-Type Perovskite Solar Cells

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For highly efficient and stable inverted-type perovskite solar cells, we report non-fullerene electron transporting material, which consist of naphthalene-diimide(NDI) and *N*-substituted aromatic side chains. The NDI-PM, (*N,N*-Bis(phenylmethyl)naphthalene-1,4,5,8-tetracarboxylic diimide, have comparable electron mobility and solubility compared to the fullerene based-PCBM. Moreover, highly pure NDI-PM is more cheaply synthesized than PCBM by simple condensation reaction. The inverted-type perovskite solar cells with NDI-PM ETM were fabricated, i.e., glass/ITO/PEDOT:PSS/perovskite (MAPbI₃ or FAPbI_{3-x}Br_x)/NDI-PM/Al. As-fabricated perovskite solar cells exhibit up to ~19.1 % power conversion efficiency (η) under forward scan condition and ~19.6 % η under reverse scan condition. Furthermore, NDI-PM based-perovskite solar cell maintains almost an initial efficiency after 100 min heat-treatment at 90 °C