

Naphthalene Diimide Based Electron Transporting Material for Stable Perovskite Solar Cells with High-Performance

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We develop a new naphthalene diimide (NDI) based electron transporting material for use in high-performance perovskite solar cells. The NDI-ID (N,N'-Bis(1-indanyl)naphthalene-1,4,5,8-tetracarboxylic diimide) consisting of an *N*-substituted indane group having bicyclic side-chain is synthesized by one-step reaction and facile purification method with a low-cost. The inverted-type FAPbI_{3-x}Br_x PSCs with NDI-ID exhibit very high power conversion efficiencies (PCEs) of up to 20.2%, which is higher than that of conventional PCBM (phenyl-C61-butyric acid methyl ester) based PSCs. Moreover, NDI-ID-based PSCs show very high long-term temporal stability, maintaining 90% of the initial PCE after heat treatment (500 h) with 1 sun illumination without encapsulation. Therefore, NDI-ID is a potential ETM for highly efficient, stable PSCs.