Organic spacer-based quasi-two-dimensional perovskites with improved moisture stability for high-performance planar solar cells

김은비, AMEEN SADIA, 신형식†, 압둘라, 알람샤바즈
전북대학교
(hsshin@jbnu.ac.kr†)

Quasi-two-dimensional (Q-2D) perovskites have shown great potential for application in solar cells due to their intrinsic stability, where the organic spacer dominantly determines the Q-2D perovskite ambient stability and device performance. In this work, a novel Q-2D perovskite photosensitizer was prepared by 2-(4-Methoxyphenyl)ethylamine hydroiodide (MPAI) as organic spacer and methylammonium iodide (MAI) for the fabrication of perovskite solar cells (PSCs). The synthesized $MPA_{0.2}MA_{0.8}PbI_3$ film exhibited the absorption bands at ~760 nm and optical bandgap was estimated as ~1.63 eV. The morphological, optical and photovoltaic properties of Q-2D perovskites were enhanced by adding different amine derivatives i.e. NH_4Cl, NH_4F, NH_4SCN as light-harvesting layer. The fabricated device of configuration FTO/TiO_2/$MPA_{0.2}MA_{0.8}PbI_3$/NH_4SCN/Spiro-OMeTAD/Au achieved power conversion efficiency (PCE) of ~15.1% with short circuit current density (J_{sc}) of ~22.9 mA/cm^2, open-circuit voltage (V_{oc}) of 1.11 eV and fill factor (FF) value of 0.59.