Surface passivation of a SnO_2 electron transport layer by poly(4-vinylpyridine) for highly efficient perovskite solar cells

오희윤, 박민우†
숙명여자대학교
(mwpark@sookmyung.ac.kr†)

Perovskite solar cells have attracted significant attention due to their high power conversion efficiency, low cost, and solution process fabrication. Control of the optical and electrical properties of charge transport layers is required to achieve high-performance and stable devices. Here, we report the novel surface passivation of a SnO_2 electron transport layer by employing a negatively charged polymer. Poly (4-vinylpyridine) (P4VP) was used as a passivation layer, which has strong interaction with metal cations. The UVO-treated P4VP layer is insoluble, and it efficiently makes coordination with Sn and Pb cations. This leads to the controlled growth of perovskite grains, and the resulting morphology is significantly improved with respect to the pristine perovskite. Furthermore, the downward shift of energy levels of SnO_2 facilitates charge extraction from the perovskite. An excellent power conversion efficiency of the devices is found to be 21.11 %, and it is almost retained for 1000 h at relative humidity of 20% under dark condition.