

Moisture proof hole transport layers based on copper–indium–selenium (CISe) quantum dots
for highly stable perovskite solar cells

박민우[†]

숙명여자대학교 화공생명공학부

(mwpark@sm.ac.kr[†])

Extensive studies have been performed to improve the environmental stability of perovskite solar cells (PSCs) with the use of inorganic charge transport layers (CTLs). However, for *n-i-p* structures, it is difficult to deposit *p*-type inorganic nanocrystals onto perovskites to form the CTLs because they are usually prepared in polar solvents. In this regard, hydrophobic nanoparticles dispersed in nonpolar solvents would be beneficial for their deposition onto the perovskites, thus leading to the formation of a hole transport layer (HTL). In this work, we report on the preparation of monodispersed CuIn_{1.5}Se₃ (CISe) quantum dots (QDs) (diameter = 4 nm) for the design of PSCs based on all-inorganic CTLs. By means of efficient hole injection and transfer process through the CISe-HTLs, impressive power conversion efficiencies (PCEs) of 13.72% and 12.19% for active areas of 0.12 cm² and 1.0 cm² are achieved, respectively, and the devices exhibit hysteresis-less behaviors. Furthermore, the devices show excellent PCE retentions of 89.2% and 74.9% after 30 d relative to their initial values at relative humidity of 25% and 50%, respectively.