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High-Efficiency Perovskite Solar Cells with EGTA Functionalized SnO2 Electron Transport Layer

Perovskite solar cells are considered as a viable alternative to currently employed silicon-based technology due to their low cost and ease of production. The electron transport layer (ETL) is of great importance for preparing high-efficiency perovskite solar cells (PSCs). Especially, SnO2 colloid solution recommended itself as a reliable material for ETL due to its decent optical transmittance and matched energy level with the perovskite materials. Despite significant development, the efficiency of planar PSCs based on SnO2 still trails far behind mesoporous PSCs based on TiO2. One technique for increasing the efficiency of planar PSCs based on SnO2 is to improve the film quality of SnO2 films. Commercial SnO2 nanocrystals are known to be disseminated in an aqueous solution that is unstable because SnO2 nanoparticles tend to form huge particulate. Triethylene glycol diamine tetraacetic acid (EGTA) can be used to stabilize SnO2 precursor solutions as well as change their surface to eliminate interface imperfections that reduce perovskite device efficiency. In addition to its low temperature and low cost, EGTA modified SnO2 films show significant improvement of the overall efficiency of devices with better coverage and reduction of defects on the surface.