

Preparation of perovskite solar cells by applying heterostructures based on TiO<sub>2</sub> nanorod

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TiO<sub>2</sub> nanorod (TNR) thin film has been considered as an excellent electron transport layer (ETL) which can replace the conventional nanoparticle layer in perovskite solar cells (PSCs). In this work, to enhance the efficiency of PSCs based on TNRs, TiO<sub>2</sub> heterostructure thin films including rutile TNRs and anatase TiO<sub>2</sub> nanoparticles on FTO glass are fabricated by the hydrothermal method and are applied as ETLs in MAPbI<sub>3</sub>-based PSCs. A device based on TNRs and commercial TiO<sub>2</sub> nanoparticles (P25) is also prepared and is analyzed for comparison. The efficiency of MAPbI<sub>3</sub>-based PSCs based on TiO<sub>2</sub> heterostructures ETL is much higher than that of cells with pure TNRs as ETL. The enhanced performance is attributed to the larger surface area, the excellent capability of carrier extraction, the support of light scattering, and the defect passivation.