

Fabrication of TiO_2 nanostructures by hydrothermal method and its application in perovskite solar cells

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This research aims to fabricate TiO_2 nanotubes (TNTs) from commercial TiO_2 nanoparticles (P25) by hydrothermal method, apply TNTs as the electron transport layer in $\text{CH}_3\text{NH}_3\text{PbI}_3$ perovskite solar cell (PSC), and to investigate the effect of TNTs layer thickness on the efficiency of this PSC. TNTs were fabricated by hydrothermal method using P25 and NaOH with a 1:40 mole ratio for 24h. The NaOH concentration was fixed at 10M and the hydrothermal temperature varied at 100°C, 150°C, and 180°C. Fabricated TNTs are spin-coated on the substrate with different rotational speeds (1000 - 3000 rpm) for 40s. Carbon paste is laminated on top of PSC and serves as a hole collector. The morphology, structure, composition and photoelectric properties of TNTs as well as PSC were characterized by transmission electron microscopy, scanning electron microscopy, X-ray diffraction, BET surface area and pore analysis, ultraviolet-visible spectrophotometry and solar cell I-V test system.