F-doped TiO₂ Compact Film for High-Efficient Perovskite Solar Cells

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The high quality compact layer plays a crucial role in electron transport and hole blocking in perovskite solar cells (PSCs). In this study, F-doped TiO₂ dense layer was utilized to enhance the electron mobility and conductivity of the compact layer. Upon optimization of F doping content, the device with 3% F-doped TiO₂ compact layer achieves outstanding power conversion efficiency (PCE) of 14.12%, increased by about 13% compared with the one using pure TiO₂ compact layer. Scanning electron microscopy (SEM) showed that the dense and homogeneous TiO₂ layer had a thickness of about 30 nm. Direct current conductivity measurement revealed the enhanced electron conductivity of F-doped TiO₂ layer. Moreover, the photoluminescence (PL) spectra were employed to demonstrate the improved electron transfer process at F-doped TiO₂/perovskite interface.

Keywords: F-doped TiO₂, compact layer, perovskite solar cell

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