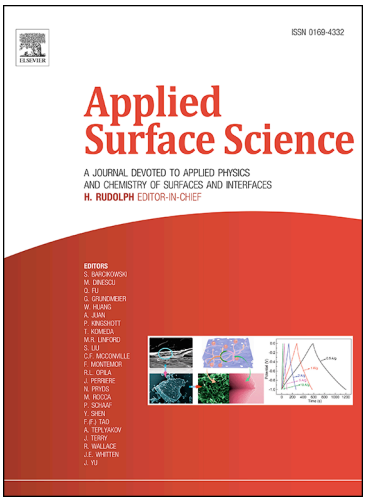

Full Length Article

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Low temperature solution-derived TiO_2-SnO_2 bilayered electron transport layer for high performance perovskite solar cells

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Abstract

Planar lead halide perovskite solar cells have shown a promising application in the field of printable solar cells. However, high-performance planar perovskite solar cells typically need a high-temperature process to achieve crystallized titanium oxide films as the electron transport layers, which hinders their application in flexible plastic substrates. Here, we demonstrate a bilayered TiO_2-SnO_2 film as an excellent substitute for electron transport layer using a low temperature liquid phase method. The bilayered TiO_2-SnO_2 film exhibits efficient electron extraction and hole blocking ability even at a low processing temperature of 150 ^oC. The as-obtained solar cells exhibit a champion power conversion efficiency of 18.85% (V_{oc} = 1.100 V, J_{sc} = 22.52 mA·cm^{-2} and FF = 0.761) under one sun illumination, which is much higher than the devices based on individual SnO_2 or TiO_2 electron transport layers. The higher electron extraction driving force at the SnO_2/perovskite interface and the stronger hole blocking ability due to the defect-free physical contact at the TiO_2/FTO interface are suggested to be the main reasons for the improved device performance.

Keywords: bilayered electron transport layer; TiO_2-SnO_2; low temperature; perovskite solar cell

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