

## High Efficiency Perovskite Solar Cells Fabricated under Ambient Conditions with Mesoporous TiO<sub>2</sub>/In<sub>2</sub>O<sub>3</sub> Scaffold

**Authors :** A. Apostolopoulou, D. Sygkridou, A. N. Kalarakis, E. Stathatos

**Abstract :** Mesoscopic perovskite solar cells (mp-PSCs) with mesoporous bilayer were fabricated under ambient conditions. The bilayer was formed by capping the mesoporous TiO<sub>2</sub> layer with a layer of In<sub>2</sub>O<sub>3</sub>. CH<sub>3</sub>NH<sub>3</sub>I<sub>3-x</sub>Cl<sub>x</sub> mixed halide perovskite was prepared through the one-step method and was used as the light absorber. The mp-PSCs with the composite TiO<sub>2</sub>/In<sub>2</sub>O<sub>3</sub> mesoporous layer exhibited optimized electrical parameters, compared with the PSCs that employed only a TiO<sub>2</sub> mesoporous layer, with a current density of 23.86 mA/cm<sup>2</sup>, open circuit voltage of 0.863 V, fill factor of 0.6 and a power conversion efficiency of 11.2%. These results indicate that the formation of a proper semiconductor capping layer over the basic TiO<sub>2</sub> mesoporous layer can facilitate the electron transfer, suppress the recombination and subsequently lead to higher charge collection efficiency.

**Keywords :** ambient conditions, high efficiency solar cells, mesoscopic perovskite solar cells, TiO<sub>2</sub> / In<sub>2</sub>O<sub>3</sub> bilayer

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