Efficient Planar Perovskite Solar Cells by Using Oblique Electrostatic Inkjet-Deposited TiO_2 Electron Transport Layer

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In the design of electron transport layers (ETLs) to improve the performance of perovskite solar cells (PSCs), efficient electron extraction and transport are important aspects. Herein, we set up a simple and novel oblique electrostatic inkjet (OEI) technique, for the first time, to pattern titanium oxide (TiO_2) compact layer (CL) on fluorine-doped tin oxide (FTO)-substrate, without the required of vacuum environment and used as the ETL in PSCs[1]. This bottom-up OEI technique solely enables for controlling the surface morphology and thickness of TiO_2 CL by simply manipulating the coating times. We test and compare with TiO_2 CL produced using the spin-coating and spray pyrolysis, OEI-deposited TiO_2 CL exhibit satisfactory surface coverage, and smooth morphology as ETLs in PSCs. The power-conversion efficiencies of PSCs with OEI-deposited TiO_2 CL as the ETL were as high as 13.19%. Thus, the present study provides an important advance in the aspects to the simple, low-cost and easy scale-up technique and can be a new TiO_2 CL ETL deposition candidate for highly efficient planar PSCs, which may contribute to the future mass production.

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Reference:

1. M. Shahiduzzaman et al., Oblique Electrostatic Inkjet-Deposited TiO_2 Electron Transport Layers for Efficient Planar Perovskite Solar Cells, *Sci. Rep.*, 2019, **9**, 19494.