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Electrical Properties of Ultra-thin TiO_2 Compact Layer on FTO for Perovskite Solar cells

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A TiO_2 compact layer or blocking layer plays a crucial role in a hybrid organic-inorganic lead halide perovskite solar cells because it can prevent the carrier recombination at the interface of fluorine-doped tin oxide (FTO) and perovskite layers. There are many methods to fabricate this layer such as spray pyrolysis or spin-coating which is solution-based synthesis that is difficult to avoid pinholes in the surface of the blocking layer. In this work, TiO_2 blocking layers are fabricated by radio-frequency (RF) magnetron sputtering using Ti metallic target with O_2 partial pressure in Ar atmosphere on FTO coated glasses. The controlled parameters for the deposition of TiO_2 compact layer are RF power, O_2 partial pressure, deposition time and annealing time. The optimization of the TiO_2 compact layers are found from the diode I-V characteristics between the TiO_2/FTO interfaces. The FESEM images as well as optical spectroscopy are used to observe the physical appearance and the optical transmission, respectively.

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