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# The effect of a sputter-deposited TiOx interface modification layer on perovskite solar cells

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Efficiently suppressing non-radiative recombination within the hole-blocking layer (HBL) and at the HBL-active layer interface is critical for enhancing solar cell performance. In this study, the $TiO_x$ layer is sputter-deposited onto a $SnO_2$ layer at room temperature as a buried interface modification layer. We investigate the structural evolution of $TiO_x$ during sputter deposition using in situ grazing-incidence small-angle X-ray scattering (GISAXS). The novel HBL, achieved by depositing $TiO_x$ with an appropriate thickness on the $SnO_2$ layer, exhibits favorable characteristics, including suitable transmittance, smoother surface roughness, and reduced surface defects. Consequently, this leads to diminished trap-assisted recombination at the interface between the HBL and the active layer. The incorporation of the $TiO_x$ buried interface modification layer results in perovskite solar cells with enhanced power conversion efficiencies and stability compared to unmodified $SnO_2$ monolayer devices. The large data set of in situ GISAXS data will be used for machine learning applications.

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