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Sputter-Deposited TiO_x Thin Film as a Buried Interface Modification Layer for Efficient and Stable Perovskite Solar Cells

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It is crucial to suppress the non-radiation recombination in the hole-blocking layer (HBL) and at the interface between the HBL and active layer for performance improvement. Herein, TiO_x layers are deposited onto a SnO₂ layer via sputter deposition at room temperature, forming a bilayer HBL. The structure evolution of TiO_x during sputter deposition is investigated via in situ grazing-incidence small-angle X-ray scattering. After sputter deposition of TiO_x with a suitable thickness on the SnO₂ layer, the bilayer HBL shows a suitable transmittance, smoother surface roughness, and fewer surface defects, thus resulting in lower trap-assisted recombination at the interface between the HBL and the active layer. With this SnO₂/TiO_x functional bilayer, the perovskite solar cells exhibit higher power conversion efficiencies than the unmodified SnO₂ monolayer devices.

Primary authors: Prof. FAUPEL, Franz (Christian Albrechts-Universität zu Kiel); PAN, Guangjiu (Technische Universität München, Fakultät für Physik, Lehrstuhl für Funktionelle Materialien); Mr RECK, Kristian (Christian Albrechts-Universität zu Kiel); SUN, Kun; MÜLLER-BUSCHBAUM, Peter (TU München, Physik-Department, LS Funktionelle Materialien); ROTH, Stephan (DESY / KTH); Dr STRUNSKUS, Thomas (Christian Albrechts-Universität zu Kiel); JIANG, Xiongzhuo (Physics Department, TU Munich); BULUT, Yusuf; XU, Zhuijun (Technische Universität München)

Presenter: JIANG, Xiongzhuo (Physics Department, TU Munich)

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