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## **In situ Grazing-Incidence Small-Angle X-ray Scattering Observation of TiO<sub>x</sub> Sputter Deposition for Perovskite Solar Cells Application**

*Tuesday, 5 December 2023 14:00 (3 hours)*

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<sub>x</sub> layers are deposited onto a SnO<sub>2</sub> layer via sputter deposition at room temperature, forming a bilayer HBL. The structure evolution of TiO<sub>x</sub> during sputter deposition is investigated via in situ grazing-incidence small-angle X-ray scattering. After sputter deposition of TiO<sub>x</sub> with a suitable thickness on the SnO<sub>2</sub> 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 SnO<sub>2</sub>/TiO<sub>x</sub> functional bilayer, the perovskite solar cells exhibit higher power conversion efficiencies than the unmodified SnO<sub>2</sub> monolayer devices.

**Primary author:** JIANG, Xiongzhuo (TUM School of Natural Sciences)

**Co-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); MÜLLER-BUSCHBAUM, Peter (TU München, Physik-Department, LS Funktionelle Materialien); ROTH, Stephan (DESY / KTH); Mr STRUNSKUS, Thomas (Christian Albrechts-Universität zu Kiel); BULUT, Yusuf; XU, Zhuijun (Technische Universität München)

**Presenter:** JIANG, Xiongzhuo (TUM School of Natural Sciences)

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