Contribution ID: **107** Type: **Poster**

In Situ GIWAXS of Slot-Die Coated Perovskite Quantum Dot Thin-Films

Tuesday, 9 April 2024 18:30 (20 minutes)

Perovskite Quantum Dot Solar Cells (PQDSC) hold great promise for future renewable energy solutions. Utilizing Perovskite Quantum Dot Layers as the active layer in solar cells exploits quantum confinement, if the crystal size is below the Bohr radius [1], resulting in high power conversion efficiencies, a high photoluminescence quantum yield (PLQY)a narrow photoluminescence (PL) peak, and enhanced stability compared to bulk perovskite.[1] The versatility of X halides (I-, Br-, Cl-) and A cations (FA+, MA+, Cs+) allows precise bandgap control across the visible spectrum of the ABX3 perovskite structure.[2]
This study focuses on Cesium Lead Iodide (CsPbI) and Formamidinium Lead Iodide (FAPbI) perovskite quantum dot layers, exploring various washing processes in between varying PQD ratios in a mixed precursor solution. In-situ grazing incidence wide-angle scattering (GIWAXS) is used to reveal crystal structure and texture during thin-film formation. The potential integration of machine learning offers insights for optimizing PQD thin film fabrication in the future.

[1] L. Liu et al., Adv. Sci. 9.7, 2104577 (2022)
[2] L. Protesescu et al. Phys. Nano. Lett. 15.6, 3692–3696 (2015)

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Session Classification: Posters

Track Classification: MLC