Contribution ID: **70**                                                                     Type: **Poster**

# Tracking the formation of MAPbI3 by in situ GIWAXS

*Wednesday, 9 December 2020 17:40 (20 minutes)*

Elucidating structure-function relationships in perovskite based materials for photovoltaic and LED application is important to push this material class towards commercialization. Focusing on scaling up methods and working out differences to well established deposition methods, e.g. spin casting, might open up unexpected possibilities for low-cost fabrication.

Slot-die coating is one very promising deposition method for high output production. In this work we investigate the conversion of printed PbI2 on ITO with printed methylammonium iodide (MAI) towards methylammonium lead iodide (MAPbI3) by in situ grazing incidence wide angle X-ray scattering (GIWAXS). Using synchrotron radiation, a time resolution of less than 1 s was achieved and the kinetics of the reaction becomes visible. Time resolved texture evolution during the formation of MAPbI3 shows the connection between preferential orientation of the "precursor"PbI2 thin-film and the final perovskite film, which shows face-on and corner-on orientation (cubic indexing). In contrast, spin-cast MAPbI3 prepared from the same solution and converted with identical parameters shows edge-on orientation. Time resolved deterioration of initially existing solvent-PbI2 complexes is also shown .

The fabrication method and precursor systems have a significant influence on the resulting film morphology, which is highly relevant for optimizing perovskite absorber layers for PV or LED applications.

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**Session Classification:**   Joint poster session of MLZ User Meeting and DN2020

**Track Classification:**   UM: Materials Science