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Precursor engineering of two-step slot-die coated perovskite layers by TBP, MAI and DMSO addition

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The progress of hybrid perovskite materials has amazed the scientific community in the photovoltaic field, demonstrating a rapid progress in the performance within the last 10 years reaching above 25% power conversion efficiency. Now the investigation of ways to move from lab methods (e.g. spin-coating) to large-scaled production is required. Those methods include, e.g. roll-to-roll deposition, spray coating or sputtering. One of such roll-to-roll compatible methods is slot-die coating, which has several advantages: low waste of the used material, higher speed of production and possibility to print on a flexible substrate.

To reach highly homogeneous and defect-free, uniform films, two-step methylammonium lead iodide (MAPI) deposition is implemented. 4-tert-butylpyridine-assisted and methylammonium iodide-seeded solutions of lead iodide in dimethylformamide/dimethyl sulfoxide with different ratios as well as their combination are synthesized by slot-die coating with a home-built printer. Surface morphology is altered by addition of these solvents and those changes are investigated by SEM and XRD. Preferential orientation is studied by GIWAXS. Conversion to MAPI is tested and analyzed by XRD.

Results of this work can improve the quality of depositing PbI_2 -films in two-step perovskite deposition method leading to full conversion of perovskite and better quality of final layer.

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