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Investigating the organometal halide perovskite crystallization in mesoscopic hole-conductor-free perovskite solar cells

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Organometal halide perovskite based solar cells have emerged as the fastest-advancing photovoltaic technology to date, reaching certified solar cell efficiencies of up to 22.1%. Recently, the focus of research broadened beyond high efficiencies to key values like prolonged device lifetime and stability that are required for industrial implementation. A novel perovskite cell architecture utilizing a mesoporous scaffold with embedded perovskite addresses these challenges and is furthermore adaptable for industrial scale production. However, little is known about the perovskite crystal formation in mesoscopic scaffolds.

In this project, we fabricate a mesoscopic scaffold comprised of a mesoporous triple-layer of titania, zirconia and carbon by screenprinting. We further investigate the influence of the processing additive 5- ammonium valeric acid iodide (5-AVAI) on the perovskite solution infiltration and perovskite crystallization. Hereby, our results grant us a better understanding of the perovskite crystallization processes in a mesoscopic scaffold and are of key importance for further developments.

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