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Following the interface formation during sputter deposition on perovskite films

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Perovskite solar cells (PSCs) are promising for future and sustainable power production because they can be processed via up-scalable industrial deposition techniques such as printing or spray casting. Sputtering is a common technique for large scale metal electrode deposition. Understanding and controlling the interface formation during the sputtering process on perovskite is therefore important towards large-scale production of PSCs. In the present study, we sputtered gold on methylammonium-lead-iodide perovskite thin films. During the sputter deposition, we performed in-situ grazing-incidence small-angle X-ray scattering (GISAXS) to gain insight into the detailed steps of aggregation and growth of the sputtered metal layer. Thereby, GISAXS offers a way to gain information about the time evolution during the crucial steps of interface formation. Interestingly, the layer formation kinetics during sputtering are found to be very different for two samples of different surface roughnesses, the perovskite surface morphology seems to influence gold aggregation. On the smooth surface aggregates form of a certain size and spacing at first, which grow and merge until a closed layer is formed eventually. In contrast, the rougher surface seems to cause a broader size distribution of the gold seeds.

Primary authors: REB, Lennart (TUM E13); ROTH, Stephan (DESY / KTH); MÜLLER-BUSCHBAUM, Peter (TU München, Physik-Department, LS Funktionelle Materialien)

Presenter: REB, Lennart (TUM E13)

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