



Contribution ID: 98

Type: Poster

In-situ observation of electrode formation in non-fullerene organic solar cells with GISAXS

Tuesday 7 December 2021 10:30 (1h 30m)

Non-fullerene organic solar cells have undergone significant improvements via both, synthesis of novel organic synthesis materials and application of easy fabrication methods. However, device degradation is still a major problem. For example, the peeling-off of the top electrode fabricated by thermal evaporation leads to an intrinsic device degradation, which is one of among the main reasons for the performance losses of organic solar cells. Another disadvantage is the inevitable high temperature during the evaporation process, which can be harmful to the organic materials and is energy extensive thereby prolonging the energy payback times significantly. To overcome these challenges, the magnetron sputtering technique appears very promising for top contact deposition.

For understanding the mechanism of the metal cluster growth on the thin films with various morphologies used in organic solar cells, we use apply in-situ grazing-incidence small-angle X-ray scattering (GISAXS) to observe the morphology changes during the sputter deposition process. In the present study, the active layer of the organic solar cells is composed of the polymer donor PffDT4T-2OD and the small molecule acceptor EH-IDTBR. Both materials were dissolved in 1,2,4-trimethylbenzene and chlorobenzene, respectively to obtain different morphologies of the printed PffDT4T-2OD: EH-IDTBR films. Then 10 nm MoO₃ was deposited on their surface films, which acts as the electron blocking layer for their an inverted solar cell device geometry. A 20 nm Al layer is sputtered on top of MoO₃ acting as top contact. Notably, the formation of the Al electrode on MoO₃ is slower than on the active layer without deposition of MoO₃. In addition, SEM and AFM measurements indicate that the morphology impacts the Al growth significantly.

Authors: JIANG, Xinyu (Technische Universität München Fakultät für Physik); MÜLLER-BUSCHBAUM, Peter (1 Technische Universität München, Fakultät für Physik, Lehrstuhl für Funktionelle Materialien, James-Frank-Str.1, 85748 Garching, Germany 2 Heinz Maier-Leibnitz-Zentrum (MLZ), Technische Universität München, Lichtenbergstr. 1, 85748 Garching, Germany); ROTH, Stephan (DESY / KTH); Mr SCHAPER, Simon (TUM); SCHWARTZKOPF, Matthias (DESY)

Presenter: JIANG, Xinyu (Technische Universität München Fakultät für Physik)

Session Classification: Poster Session

Track Classification: Material Science