Contribution ID: **46** Type: **Short talk**

Spray Deposition of Water-processed Active Layers for Hybrid Solar Cells Investigated with in situ Grazing Incidence X-ray Scattering Techniques

Wednesday 26 June 2019 10:40 (20 minutes)

Hybrid solar cells with an active layer based on low temperature processed titanium dioxide and a water-soluble polymer have been developed [1]. In this all-embracing green technology approach TiO2 nanoparticles are produced with laser ablation in liquid in order to initiate a functionalization of TiO2 with the polymer for the active layer. Combining these TiO2 nanoparticles and water-soluble poly[3-(potassium-6-hexanoate)thiophene-2,5-diyl] (P3P6T) hybrid solar cells are realized. For the fabrication of hybrid photovoltaic devices we applied spray-coating as the deposition method for the active layer which could easily scale-up to industrial cost-effective fabrication. For the deposition of the active layer with laser-ablated particles spray deposition provides a good control of the film thickness. The morphology of the active layer is of major importance for the performance of hybrid solar cells. As we are especially interested in how the morphology changes with ongoing deposition process, we use the in situ GISAXS technique. This allows us to follow the development of the morphology of the active layer with high spatial and temporal resolution [2, 3]. Whereas the mesoscale of the active layer for hybrid solar cells was probed with in situ GISAXS, the crystallinity of the polymer and the inorganic component was investigated with in situ GIWAXS. The changes of the morphology and the influence on photovoltaic performance with the introduction of a compositional gradient are discussed. As the synchrotron-based investigation allowed for a high temporal resolution of 0.1 s, insights into the very first stages of the deposition process were obtained. From the overall situ study improvements for the spray deposition procedure are derived that allow for a better control of the morphology of the devices.

Authors: KÖRSTGENS, Volker (TU München); Mr MAYR, Christoph (Lehrstuhl für Funktionelle Materialien E 13); Mr BUSCHEK, Florian (Lehrstuhl für Funktionelle Materialilen E 13); Dr IGLEV, Hristo; Prof. KIENBERGER, Reinhard; ROTH, Stephan (DESY / KTH); MÜLLER-BUSCHBAUM, Peter (TU München, Physik-Department, LS Funktionelle Materialien)

Presenter: KÖRSTGENS, Volker (TU München)

Session Classification: Science group meetings 1