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Morphology investigation of printed active layers of hybrid solar cells with grazing incidence neutron and x-ray scattering techniques

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One aspect for the development of non-conventional solar cells should be the sustainability of the production process of devices. Following this idea, we developed hybrid solar cells, which can be processed out of aqueous solution. The active layer of these devices is based on laser-processed titania nanoparticles dispersed in a water-soluble polythiophene. The active layers were produced with a home-built slot die coater. With this printing technique, the thickness of layers can be easily controlled and the scale-up toward the coating of large areas is done with low effort. We investigated the morphology of the deposited active layers with time of flight - grazing incidence small angle neutron scattering (TOF-GISANS) and x-ray scattering. With GISAXS and GIWAXS we were able to follow the evolution of the morphology for different donor/acceptor ratios *in situ* during the printing process. The expected impact of the observed morphologies and crystallinity on the performance of corresponding devices is discussed.

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