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Time-resolved Structural Analysis of Solvent Vapor Annealing Processes of the Photoactive Material DRCN5T:PC71BM Using GIWAXS

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The control of the micro- and the nanostructure in photoactive layers of organic photovoltaics is one key component for the performance of such devices. In this regard, we will present time-resolved grazing incidence wide angle scattering (GIWAXS) measurements of the photoactive material DRCN5T:PC₇₁BM during solvent vapor annealing (SVA). In the course of this annealing process a phase separation of the donor (DRCN5T) and the acceptor (PC₇₁BM) occurs and therefore the crystallinity of the donor increases greatly, as can be seen by the rise of several sharp Bragg peaks. This structural changes can lead to an increase in power conversion efficiency (PCE) from 3.57% to 6.64% [1]. We will discuss the influence of the solvent choice in respect to the donor- or acceptor-selectivity of the solvent. In addition we will present a crystallographic structure determination, i.e. space group and lattice parameters, and compare it with complementary techniques (e.g. energy-filtered electron diffraction, ex-situ X-ray pole figures). The in-situ GIWAXS measurements were performed at the synchrotron beamline P08 at PETRA III (DESY) using our self-designed, specialized SVA- and doctor-blading cell, which will also be described.

[1]: J. Min et al., 2017, DOI: 10.1039/c7ta04769j

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