

Project Summary 1

Polymeric solar cells: Molecular orientation, structure, and optoelectronic performance

In the second funding period we have provided microscopic insights into the nature, the dynamics, and the impacts of crystallization in P3HT:PCBM composite systems by complementary investigations of the real-time structure evolution during the film drying process. Furthermore, the findings concerning the structure were correlated with the optoelectronic properties. We have shown how the drying kinetics and the crystallization can be altered by the substrate temperature and by the solvent mixtures.

In the next period we aim to extend this promising comprehensive concept to investigate the effect of solvent mixtures and additives to high-efficiency polymers. We will include surface engineering using self-assembled monolayers (SAMs) as an additional route to control the crystallization and the resulting device properties. Thus, we propose in this work to design chemically nanopatterned electrodes to direct the nucleation and phase separation of the BHJ during the liquid-solid transformation.

Our work on interface engineering, drying and structure will be complemented by detailed optical spectroscopic experiments addressing the nature and molecular orientation of the absorbing chromophores. Spectroscopic ellipsometry and electromodulation techniques will be applied for this purpose.