

## Summery

The project aims at the design, synthesis and study of donor-acceptor block copolymers for bulk heterojunction solar cells with stable equilibrium nanoscale morphology, guaranteeing a domain size in the same range as exciton diffusion lengths. During the first year, this joint project has delivered basic findings on synthesis and the morphology of corresponding homopolymers and model block copolymers. Especially the intricacies of crystallization and phase separation will be further studied. Based on this fundamental knowledge, the synthetic strategy will be tuned to obtain the required composition of novel self-assembling block copolymers based on microphase separation and crystallization. The synthesis will be further extended to novel building blocks carrying perylene diester benzimidazole units to improve the light harvesting, to optimize the efficiency of photo induced charge separation and charge transport in systems having well-controlled stable nanostructures. Structure formation processes based both on main chain and side chain crystallization will be studied in detail using temperature- and time-dependent SAXS and WAXS measurements in bulk as well as thin films. This is required to work out methods to control order and orientation of the structures in devices. Additional electro-optical measurements such as SCLC and CELIV will be incorporated with the aim to understand the transport properties in solar cell device structures. Solar cells with improved performance will be obtained with novel materials and the device characteristics and structure-property correlation will be used for the design of more efficient materials.