Studying organic solar cells with GISANS

Peter Müller-Buschbaum[1,2]

[1] *Technische Universität München, Physik-Department, Lehrstuhl für Funktionelle Materialien, James-Franck-Str. 1, 85748 Garching, Germany*

[2] *Heinz Maier-Leibnitz Zentrum (MLZ), Technische Universität München, Lichtenbergstr. 1, 85748 Garching, Germany*

muellerb@ph.tum.de

Among the next generation solar cells, in particular organic photovoltaics are gaining impact as a promising alternative to conventional silicon-based solar cells. Using nanostructured polymer films as active material for the energy conversion offers several potential advantages, as for instance the material availability and low-cost processing techniques. Due to the potential device flexibility and tunable colors and shapes, organic photovoltaics could be integrated into a wide range of applications, combining functionality with design in fields as diverse as mobility, architecture or clothing. However, efficiencies of organic solar cells still stay far below those of their commercially available inorganic counterparts, which demonstrates the need for strengthened fundamental understanding.

In particular, the morphology of the active layer of the organic solar cells is of highest importance for the device performance, because it needs to facilitate exciton creation, exiton migration and splitting at tailored interfaces and transport of the generated charge carriers to the corresponding electrodes. All these different tasks require an optimized polymer nanostructure, which in turn requires techniques being capable of probing these nanostructures of the active layers of solar cells. Using grazing incidence small angle neutron scattering (GISANS) enables to probe the morphology of the active layers from the molecular to the mesoscopic scale. After an introduction to the topic, different examples of organic solar cell materials studied with GISANS will be presented.