Basic Introduction to GISAS

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The investigation of nanostructures at surfaces, interfaces and in thin films requires dedicated analytical techniques, which provide information from a molecular to a mesoscopic scale. [1] Grazing incidence small angle x-ray and neutron scattering (GISAXS and GISANS) overcomes the limitations of conventional small-angle x-ray and neutron scattering with respect to extremely small sample volumes in the thin film geometry by the use of the reflection geometry [2-4]. GISAXS/GISANS involves a combination of two techniques, GID (grazing incidence diffraction), which uses a reflection geometry to obtain surface and near surface sensitive scattering, and SAS (small angle scattering), which measures structures of 1 - 100 nm length in normal transmission mode. It is a non-destructive structural probe and does not require a special sample preparation. GISAXS/GISANS yields excellent sampling statistics (averages over macroscopic regions to provide information on nanometer scale) and provides information on particle geometry, size distributions and spatial correlations. However, in GISAXS/GISANS experiments the high demand on collimation requests the use of high flux x-ray and neutron sources.
After a basic introduction to the GISAXS/GISANS technique, several different examples of thin nanostructured polymer films are presented to illustrate the possibilities and challenges of GISAXS/GISANS. In addition, the challenges and potentials of in-situ studies during printing and in-operando studies of organic solar cells are presented and discussed in detail. [5,6]

References

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