Relating Nanostructure to Macroscopic Properties Using A Laboratory Rheo-SAXS Setup

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Rheology deals with the flow and deformation of matter, it relates a material's molecular structure to its mechanical properties. Applying mechanical force, e.g., shear to a material can result in orientation of molecular assemblies or crystallization. Small-angle X-ray scattering (SAXS) determines structural parameters of nanostructured materials: size, shape, inner structure and orientation. Relating the nanostructure of a material to its macroscopic mechanical properties requires *in-situ* characterization techniques such as rheology combined with SAXS. Rheo-SAXS experiments have so far been conducted only at synchrotron beam lines, mainly due to insufficient X-ray flux of laboratory X-ray sources and the lack of a dedicated Rheo-SAXS laboratory set-up.

In this contribution we present new results of experiments on combined Rheo-SAXS studies with the SAXSpoint 2.0 laboratory SAXS system. With a newly designed optical setup of the SAXSpoint 2.0 the overall flux of SAXSpoint 2.0 instrument could be further increased to more than 5 x 10^8 ph/s using a conventional microsource setup. This opens up the way to a variety of new experiments with excellent data quality in minimum time. One experiment that in particular benefits from this development are *in-situ* Rheo-SAXS measurements. The integrated Rheo-SAXS sample stage enables temperature-controlled rheological experiments with *in-situ* determination of shear-induced structural changes of nanostructured materials on a nanoscopic length scale (from approx. 1 nm to 200 nm) by small-angle X-ray scattering. In this contribution we will show some new results obtained with the new setup.

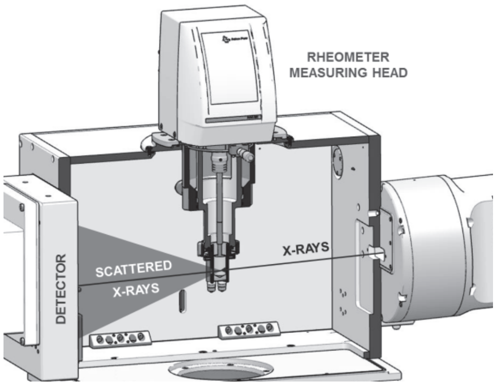

Fig. 1: Rheo-SAXS setup