

Polymer and Biopolymer Microstructure Analysis by Scanning SAXS/WAXS

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Scanning SAXS/WAXS using a 2D-detector provides an "images" of a bulk structure with each "pixel" of the image containing information from the unit-cell to morphological scales. Source and instrumental developments at 3rd generation synchrotron radiation sources allow routine use of micron- and submicron-sized X-ray beams extending currently to about 100 nm. The choice of beam size requires, however, usually a compromise on the low-angle resolution. For X-ray microbeams, polymers and biopolymer fibres often show lateral heterogeneities such as skin-core structures. Although such heterogeneities have already been known from electron microscopy/diffraction studies, the interest in scanning SAXS/WAXS is the possibility of performing in-situ studies during deformation of bulk samples. A number of examples from high performance polymer fibres will be reviewed. In-situ experiments are usually performed at room temperature, which poses particular problems due to radiation damage as will be shown for the hydration of starch granules.

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