

MICRO- AND NANO-XRD ON POLYMERS

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I will discuss in my talk advances in the use of μm - and nm-sized synchrotron radiation beams for SAXS/WAXS studies on polymers at the ESRF-ID13 beamline. Beam sizes of about 100 nm size in one dimension from X-ray waveguides have been used to study skin/core structures in high performance fibers such as Kevlar or PBO. The very short distance of sample to optics does, however, not allow using such optics for complex sample environments. The introduction of crossed linear Fresnel optics provides now intense monochromatic synchrotron radiation beams of about 300 nm focus size and up to 30 mm working distance to the last optical element. Smaller beam sizes will become available in the near future in the context of a dedicated nanofocus endstation at the ESRF-ID13 beamline. These developments provide the possibility for high-resolution mesh-scans on extended samples. This together with progress in recursive data analysis of large 2D detector sets allows generating "diffraction images" with "pixels" containing local SAXS/WAXS information. I will show current instrumental and software capabilities for spherulites and polymer fiber composites.