

POLYMERS CHARACTERIZED USING IN-SITU LABORATORY SAXS/WAXS COUPLED WITH MECHANICAL TESTS

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The new tensile stage TS600 from Anton Paar GmbH was used for *in-situ* synchrotron and laboratory X-ray scattering and diffraction investigations on polymers and polymer nano-composites. Laboratory SAXS and WAXS experiments were performed using a NANOSTAR from Bruker AXS. When external loads were applied on a polymer-nanocomposites (PNC) the internal strains are distributed in the matrix and the filler. Depending on the distribution of filler and type of polymer various kinds of strain distributions can be addressed. In a semi-crystalline polymer intercalated composite system strains are dissipated in amorphous and crystalline phase and in stacked filler. Within the stacks, strains are dissipated between clay platelets and the polymeric interlayer. We used in-situ simultaneous synchrotron SAXS and WAXD during deformation of polymer and composites for characterization of strain. The in-situ technique allows for simultaneous determination of strains in crystalline and amorphous domains of polymer as well as of clay crystals and interlayer. The assessed dimensions are spanned between 30 nm and 0.4 nm and cover therefore nearly two orders of magnitude. With these experiments, we were able to determine influence of filler on system and primary fracture mechanism in the polypropylene intercalated nano-clay system.