

INVESTIGATION OF CAVITATION DURING DEFORMATION OF POLYMERS BY SAXS STUDIES

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The plastic deformation of polymers is a subject of intensive studies, because the knowledge of deformation mechanisms has both scientific and technological importance.

Recently, we have shown that the significant role in deformation process may play cavities formed during stretching of the polymer specimen. The cavitation is observed in semi-crystalline polymers if the strength of amorphous phase is lower than the strength of crystalline elements. It is possible, by modifying solid-state morphology or deformation condition, to control the behaviours of polymer (*e.g.* polyethylene, polypropylene) and observe cavitation or not cavitation plastic deformation in the same type of material. The typical size of voids in polymers is 2-10000 nm. Nanometer size cavities are usually

detected by the SAXS technique. Application of the synchrotron radiation gives a chance to observe a formation of cavities *in situ* during deformation.

The radiation from synchrotron in Hamburg was used for simultaneous SAXS and WAXS observations of changes in the structure of polypropylene and polyethylene samples. Technical reasons limited our experiments to measurements of specimens after the mechanical test. It was shown that the increase of testing temperature leads to not cavitation behaviour. If the annealing process was applied to not cavitating sample the cavitation was observed again during tensile test.

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