



The Physics of Soft and Biological Matter

Exploring soft matter with X-ray scanning micro- and nano-diffraction techniques

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Detailed characterisation of hierarchical structures in soft matter and biological systems can be achieved by X-ray imaging methods using synchrotron radiation. Among the different approaches, X-ray scanning methods using micro- and nano-beams offer a powerful tool to locally map heterogeneous materials and obtain quantitative information with nanometre resolution. In the last years, strong effort has been put to improve the time and spatial resolution of the technique, to develop fast data acquisition systems, new strategies for sample manipulation, and radiation damage control. Therefore, scanning X-ray techniques are now routinely in use at synchrotron sources.

This contribution will demonstrate the unique opportunities offered by scanning small- and wide-angle X-ray techniques using micro- and nano-metric beams at beamline ID13 of the European Synchrotron Radiation Facility (ESRF). After a short overview of recent technical developments (sample positioning, new refractive focusing optics, increase in X-ray flux), the presentation will mainly focus on scientific examples from the field of biological hierarchical materials (such as wood and tissue) as well as of polymer composites. The quantitative interpretation of two-dimensional scattering and diffraction mappings of the samples will be demonstrated also in combination with complementary spectroscopic techniques. Adapted sample environments which allow in-situ mechanical deformation and thermal studies will be presented.

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