8. Closing Remarks

Surface- and interface-sensitive x-ray-scattering techniques play an important role in many areas of physics. This book was intended to give a review of their application to problems concerning soft-matter thin films. Many fundamental questions such as the change of the wavenumber spectrum of capillary waves due to a background potential and the altering of the packing density of a fluid near a hard wall have been discussed. Also, problems that arise in materials science, such as the question how strongly roughness is vertically propagated in thin films and the detection of disorder in LB multilayers, have been in the focus of this work. Research will certainly continue in these fields with the "conventional" x-ray reflectivity and diffuse-scattering methods described in Chaps. 2–6.

X-ray scattering using coherent beams, as presented in Chap. 7, is a promising new field for the near future – this is, in particular, true for the investigation of soft-matter thin films. Although we are still far away from the flux of coherent photons that a common laser emits in the range of visible light, the experiments that have already been carried out within the last years are very impressive. At all operating synchrotron facilities worldwide, beamlines are under construction that will be dedicated to experiments with coherent x-rays.

A promising new tool that may be used in the near future to solve interface structures is multiple-energy x-ray holography. This technique, developed recently by *Gog et al.* [143], allows a three-dimensional imaging of structures with atomic resolution. Here many possible applications in soft-matter physics are already under consideration.

Last but not least, the question of industrial applications will be addressed. Reflectivity is already in use to characterize the interfaces of thin films. Complete "reflectivity setups" consisting of an x-ray generator, a diffractometer, detectors, and the analyzing software are available. However, it still needs quite a bit of experience to extract reliable information from reflectivity data that goes beyond the simple determination of a layer thickness. Here data-analyzing techniques such those outlined in Chap. 4 may improve this situation in the future.

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