Session III, Tuesday, June 20, morning

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X – RAY OPTICS

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An overview of the used X-ray optics will be presented. The working principles of the wide range of used optics will be discussed. The use of laboratory sources, synchrotron sources and the latest free electron sources require new performance benchmarks for manufacturers. Various obstacles have to be overcome in order not the downgrade the excellent features of new home lab sources and free electron sources. In EUV lithography new challenges for optics performance arises with the use of the 13.6 eV line and the forecast for the 6.x and lower emission lines.

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LOW-TEMPERATURE X-RAY DIFFRACTION: TECHNICAL CHALLENGES AND APPLICATIONS

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Lots of physical quantities are nowadays measured close to absolute zero temperature. Knowledge of structural properties at these temperatures is therefore becoming increasingly important. In my lecture I will review commercially available systems and introduce our low temperature x-ray diffraction system at Charles University.

Using a refurbished Siemens D500 system equipped with a closed cycle He cryostat and a Mythen 1K detector we are able to perform diffraction experiments at temperatures down to 2.5K. The use of a modern linear detectors allows to significantly reduce the acquisition time of diffraction data which is decisive for such in-situ experiments. To avoid loss of resolution using such a detector in Bragg-Brentano geometry we use an adaptive selection of detector channels depending on the diffraction angle [1]. Our diffractometer is, however, not limited to powder diffraction: a sample rotator operating inside the cryostat allows us to also perform measurements on single crystalline samples and epitaxial thin films. Examples of results obtained from powder diffraction, single crystals and thin films will be presented.

1. D. Kriegner, Z. Matej, R. Kuzel and V. Holý; Powder diffraction in Bragg–Brentano geometry with straight linear detectors; J. Appl. Cryst. (2015). 48, 613-618 https://doi.org/10.1107/S1600576715003465