We offer the Bachelor thesis topic

Advanced camera characterization for low energy electron detection

A part of the SALVE project at Universität Ulm

Modern condensed matter physics, solid state chemistry, and materials science greatly benefit from the characterization power electron microscopes offer. Especially, nowadays aberration corrected transmission electron microscopy (TEM) provides atomic scale structural and chemical information on *e. g.* functional interfaces or nanomaterials. Nevertheless, there are still big challenges to tackle in every aspect of the technique; one of them is the damage the imaging electron beam causes in the sample to be characterized *via* several different damaging mechanisms. One way to reduce sample damage is to image with electrons that bear significantly lower energy than normally used.

In a joint project with manufacturers we developed a prototype transmission electron microscope for imaging with very low electron energies. One part of this project was to extend the energy range of the cameras. Detectors as cameras play an important role in the imaging process because they introduce a discrete sampling to the micrograph, dampen its contrast, add noise, *etc.* For the quantitative assessment of the camera several individual characteristics can be measured, like the modulation transfer function, the noise transfer function, and the electron conversion rate. All these characteristics are highly dependent on the imaging electron energy.

The candidate will characterize several different modern camera types and layouts available on various high end microscopes, with different characterization methods, and at various primary electron energies. The different methods themselves will be compared by the student. Finally, the cameras will be evaluated in terms of their suitability for different primary electron energies as well as imaging modes.

Candidate requirements

Bachelor course in physics, basic programming skills.

Contact

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