The Beams and Applications Seminar Series

Abilities of Transmission Electron Microscopy

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Bldg. 401, room B2100
Friday, Feb. 27, 1:30 pm
Host: K.-J Kim, ASD

Transmission electron microscopy (TEM) offers several imaging modes and analytical tools for characterization of materials on a scale down to 0.1nm. Several of these methods have been limited strongly by the aberrations in the magnetic lens system. During the last 10 years several concepts for aberration correction for electron microscopy have been successfully developed. Improving the spatial resolution was the major objective of these projects. The advantages of correction of spherical aberration for transmission electron microscopy (TEM) have been demonstrated e.g. for CoSi2 thin films. From these first results in high-resolution imaging it can be concluded, that aberration correction is very helpful for the investigation of the atomic structure of defects, interfaces and grain boundaries. Therefore, aberration correction is a useful tool for the characterization of thin films in electronic devices where detailed knowledge of the microstructure is required for understanding the electronic properties.

The TEAM project aims on improving the capabilities of transmission electron microscopy using aberration correction in three different areas:

- **Characterization of the 3d-structure of defects in crystals and in amorphous material on an atomic level requires a point resolution down to about 0.05 nm.**
- **In situ experiments require a larger space for the sample than available in modern high-resolution microscopes. Aberration corrected instruments integrate high resolution and in situ capabilities.**
- **Chemical analysis on single atomic columns with an energy resolution of 0.1 eV for electron energy loss spectroscopy**

Further progress in instrumentation is necessary to achieve these goals including the development of a correction system for the chromatic aberration Cc. These new components will allow the development of a microscope with a resolution of better than 0.2 nm for in situ experiments. This enables new experiments with respect to magnetism, vortices in superconductors, grain boundary dynamics and oxidation.

For more information visit
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