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Lecture: X-RAY PHOTOEMISSION ELECTRON MICROSCOPY

C.M. Schneider, Peter Grünberg Institut PGI-6, Research Centre Jülich

Abstract.

The lecture reviews the principle of immersion lens electron microscopes and its applications in x-ray photoemission electron microscopy (XPEEM). We first discuss the electron-optical aspects of an immersion lens system, the technical realization of a PEEM, as well as the advantages and limitations of this imaging approach. In a second step we will consider the various contrast mechanisms with unpolarized and polarized radiation and the information on the sample topography, chemical composition, and electrical and magnetic properties, which can be obtained by XPEEM in the absorption mode. For specific examples, we demonstrate, how the chemical selectivity can be exploited to study complex layered systems, and how magnetic structures in ferro- and antiferromagnets can be discerned by choosing the polarization state of the x-rays. This includes a time-resolved imaging approach based on XPEEM exploiting the intrinsic time structure of the synchrotron radiation. Finally, we may discuss some new developments such as energy filtering of the photoelectrons, which enables studies with hard x-ray excitation and novel approaches such as momentum microscopy and explicit photoelectron spin polarization analysis.