

Advanced Characterization of Materials at Micro-, Nano- and Atomic Scale

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Analytical SEM: Energy Dispersive X-Ray Spectroscopy (EDX) and Electron Backscatter Diffraction (EBSD)

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Abstract

Energy Dispersive X-Ray (EDX) spectroscopy is the most widely applied method for microanalysis in the electron microscope. The excitation of characteristic X-rays enables a qualitative or semi-quantitative analysis of elemental composition at the local scale. After an introduction into basic principles, the talk will cover some of the current trends:

- High throughput by silicon drift detectors (SDD) covering large solid angle through large detector area and/or multi-detector setups,
- From elements to phases by hyperspectral mapping,
- pushing spatial resolution by reducing the interaction volume.

Electron Backscatter Diffraction (EBSD) is the most widespread method for crystallographic characterization at the microscale in the scanning electron microscope (SEM). The EBSD pattern contains information about the crystallographic phase and orientation as well as on the defect content of the material. Automated acquisition and analysis of EBSD patterns allows to map crystal orientations (texture), crystal phases, intergranular and intra-granular microstructures, grain boundary misorientations at a spatial resolution of some ten nanometers. Recent developments include:

- Integrated analysis of crystal orientations and phases by EBSD combined with EDX,
- pushing spatial resolution by analysis of Transmission Kikuchi Diffraction (TKD) patterns obtained from thin specimens using conventional EBSD hardware,
- Analysis of the five parameter grain boundary misorientation characteristics in 3D,
- Estimation of local strain distribution and defect content by high resolution EBSD.

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