MI 1: Electron Probe Microanalysis

Chair: Enrico Langer (TU Dresden)

Time: Tuesday 9:30–11:00 Location: H5

Invited Talk MI 1.1 Tue 9:30 H5

Extending the frontiers of high-resolved measurements with a Field Emission Microprobe — Silvia Richter and •Philippe Pinard — RWTH Aachen, Germany

Field emission (FE) electron microprobes have pushed the boundaries of electron probe microanalysis (EPMA) by offering new ways to characterize smaller features. As with conventional microprobes, analytical conditions should be properly selected for an accurate and precise quantification. The challenge is to optimize these parameters to obtain the best spatial resolution. Furthermore, instrumental parameters such as the focusing capability, beam stability and stage reproducibility, influence high resolution acquisitions. Carbon contamination has to be considered as well. Higher spatial resolution can be achieved by lowering the beam energy. But this can result in quantification problems of soft x-ray lines, i.e. Lα lines of the transition elements, where the electronic structure of the atoms and chemical bonding play a significant role in the generation and absorption of x-rays. Alternative solutions would be the use of Ll lines or using a small overvoltage ratio. Using the same overvoltage ratio for all measured x-ray lines requires a good reproducibility of the beam focus and -position, if the beam energy is changed. Defocus or shift effects can be corrected by a probe tracking function. However, changing the beam energy influences brightness and contrast of the images used for probe tracking which provides new challenges. Another possibility for achieving high spatial-resolved chemical information is the use of model-based reconstruction. The concept and first results will be presented.

MI 1.2 Tue 10:15 H5

EDS; Analysis of Nanoparticles — •Meiken Falke — Bruker Nano GmbH, Berlin, Germany

Fast chemical analysis from the mm to the atomic scale can be carried out using energy dispersive X-ray spectroscopy (EDS) in the electron microscope. A wide analysis region is the condition for chemically characterizing not only nanoparticles but also their surroundings and distribution. Examples of analysis approaches for different types of nanoparticles, including core-shell and bio-generated nanoparticles will be shown and used to explain the available technology for the analysis of bulk and electron transparent specimens.

Single EDS detectors in combination with aberration corrected STEM allow the routine characterization of nm-sized core-shell nanoparticles. Even single light atoms in a carbonatious substrate were identified (R. Stroud et al., M&M 2015).

Multiple detectors and annular detector arrangements ensure large collection angles and minimize shadowing and absorption effects. In STEM a high collection angle enables speed allowing the investigation of beam sensitive samples or 3D analysis. In SEM high topography bulk specimens can be investigated fast and sometimes in a close to natural state, e.g. nano-clay particles, embedded in a porous polymer matrix.

TEM-specimens were investigated in an SEM as well. Different nanoparticle types and their distribution over large areas were statistically evaluated using the T-SEM approach (D-V. Hodoraba et al., IOP Conf. Ser. MSE, EMAS 2015, in press).

Topical Talk MI 1.3 Tue 10:30 H5

Quantitative Röntgenmikroanalyse von alten indischen Goldmünzen — •Peter-Michael Wilde — Zentralinstitut für anorganische Chemie, Berlin

Zu Zeiten der Herrschaft der Mogule in Indien des 17. Jahrhunderts wurde eine größere Anzahl von Goldmünzen geprägt. Ein besonders wertvoller Schatz ist eine Serie von zwölf Münzen mit den Motiven der bekannten Tierkreiszeichen. Die persische Schrift auf der Rückseite nennt den Namen des Moguls Jahangir, der vor 400 Jahren herrschte. Für die Bestimmung der chemischen Zusammensetzung wurden oberflächennahe Bereiche dieser Münzen mit EDX quantitativ analysiert. Es zeigte sich, dass die Goldgehalte der einzelnen Münzen unterschiedlich sind. Sie betragen zwischen 96 und 99 Masseprozent. Als zusätzliches Element wurde Silber nachgewiesen.