Advanced EDS and µXRF Analysis using Spectrum Imaging, Computer-Controlled SEM and an Annular SDD.

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Energy dispersive spectrometry (EDS) using scanning electron microscopes (SEM) and micro-X-ray fluorescence spectrometry (µXRF) can be performed rapidly since the introduction of silicon drift detector (SDD) technology. Large samples with sizes up to 20x16 cm can be analysed by µXRF to locate regions of interest. Using SEM-EDS, samples can be classified by automated feature analysis, a combination of morphological classification with chemical analysis. The spatial resolution for element analysis can be enhanced to the sub-µm scale by using low accelerating voltages. Consequently, only low energy X-ray lines can be evaluated (Fig. 1a) which is possible by using extended atomic database.
A new, annular SDD has broadened the range of possible analyses. The large solid angle (1.1 sr) allows sufficient data collection on beam-sensitive samples with substantial surface topography. Even at the lowest beam current (<10 pA), a sample can be investigated without carbon coating under high vacuum (Fig. 1b). Using the annular SDD in transmission mode (TSEM-EDS) provides high spatial resolution and high detection sensitivity (Fig. 1c).
Results of samples related to mining and nano, life, earth and planetary sciences will be presented. They demonstrate that improvements in SDD technology, advanced data processing and the possibility to analyse samples in a close to natural state with little preparation will stimulate new approaches for various fields.

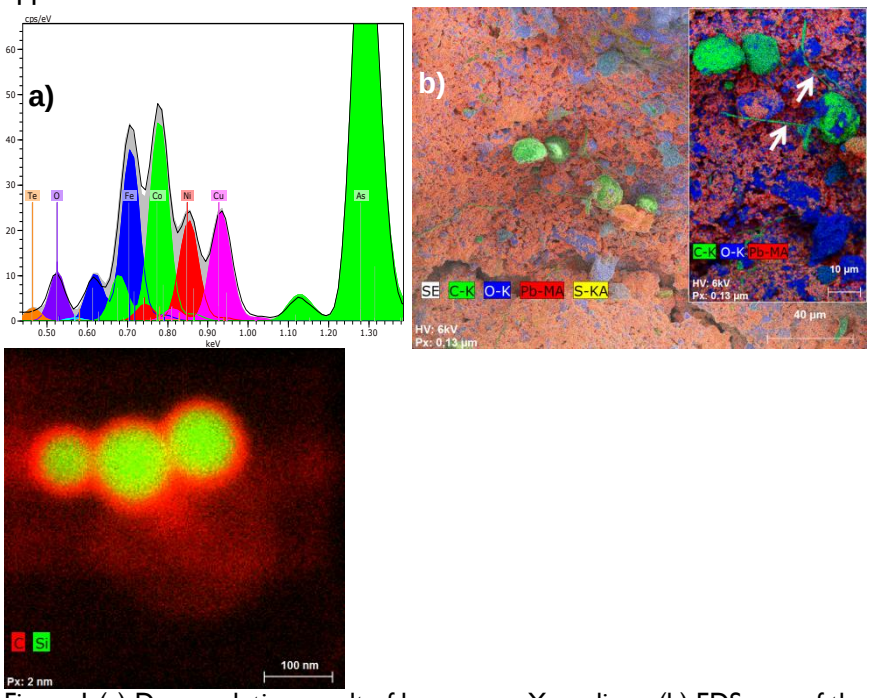

Figure 1 (a) Deconvolution result of low energy X-ray lines. (b) EDS map of the historic meteorite Mocs reveals lead contamination from old polishing. Detail without SE micrograph documents that carbon features <300 nm in size (arrows) can be displayed at high vacuum using low voltage and low currents. (<10 pA, sample courtesy: L. Ferriere, NHM Vienna). (c) Fluorescent core shell nano particles deposited on conductive thin film supports can be analysed by TSEM-EDS (Rades S. et al., 2014, RSC Adv. 4, 49577–49587).