3D CHEMICAL ANALYSIS OF THE GUJBA CB CHONDRITE: COMBINING µ-XRF, EDS, EBSD, RAMAN, LA-ICP-MS, AND AFM/MFM.

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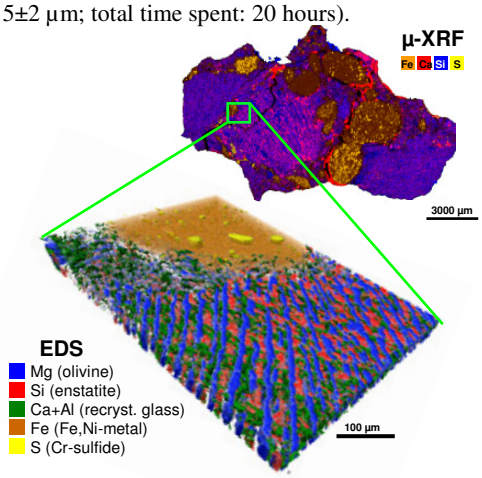
Recent technological developments have significantly improved the possibilities to display the 3D structure of meteorites [e.g., 1]. Here, we present a 3D chemical study of the CB chondrite Gujba combining micro-X-ray fluorescence (µ-XRF) and energy dispersive X-ray spectrometry (EDS)/SEM with serial sectioning (manual grinding/polishing) to display not only the shape of 3D structures in the µm to mm range, but also to reveal their chemical composition. The time needed for data acquisition is minimized by using modern SDD technology with high input count rates. Furthermore, element maps are acquired as hyperspectral images (also called PTS: position-tagged spectroscopy) – a format that allows later offline-evaluation and quantification.

The Figure below shows some of our first results, emphasizing the different kind of information obtained with µ-XRF and EDS/SEM. The µ-XRF map of a complete 2D section of the sample was obtained within 1 hour using an M4 Tornado. The green rectangle indicates the EDS acquisition site shown beneath. For this image, 9 layers were mapped with a Quantax EDS system and reconstructed in 3D with Amira® software (section depth: 5±2 µm; total time spent: 20 hours).



Using the information from µ-XRF and EDS as a basis, selected regions of interest are examined with additional techniques, such as electron backscatter diffraction (EBSD), laser-ablation inductively coupled plasma mass spectrometry (LA-ICP-MS), Raman spectroscopy and atomic/magnetic force microscopy (AFM/MFM). The main goal of this project is to examine physical and chemical interactions between large metal and silicate clasts and impact melt matrix in CB meteorites. We aim to increase the quality of the analytical work by combining the information obtained with different techniques.

References: [1] Ebel D. S. et al. 2008. *Meteoritics & Planetary Science* 43:1725-1740.