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Advanced Mineral Identification and Characterisation by µ-XRF

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The study and advanced mineral identification and characterisation of geological samples by scanning electron microscope (SEM) and energy dispersive spectrometry (EDS) has become wide spread in research and mining. Of particular interest in research and exploration are sectioned drill cores or rocks, however, for SEM these require time consuming and costly polishing and must be carbon coated. With micro X-ray fluorescence (µ-XRF) spectrometry, preparation can be kept at a minimum, sensitivity and detection limits are better for ore-relevant elements, and no coating is required. By applying the advanced mineral identification and characterisation technique to µ-XRF, allows comparable results (see Figure 2, Figure 1 and Figure 3) with less or no preparation and lower instrument owning and operating costs.

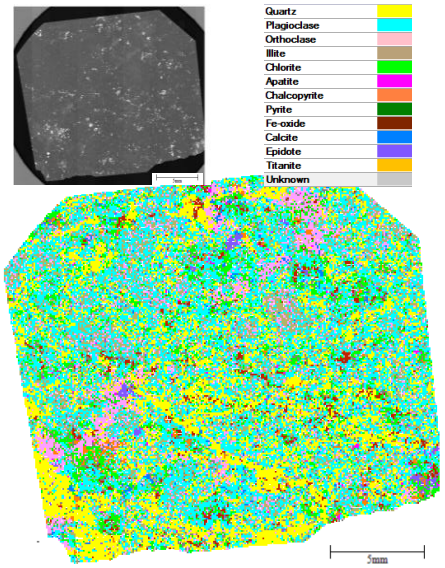

Figure 1 - SEM-EDS mineral characterisation map

In this paper, the authors present comparisons between SEM-EDS studies and µ-XRF studies of geological sample, demonstrating the ability of the µ-XRF to produce comparable measurement and results (see Figure 3). Due to the nature of the µ-XRF technology, spot sizes are larger (~20 µm) than SEM-EDS (~2 µm). However, for many applications, this is more than sufficient to provide detailed insights into the samples.

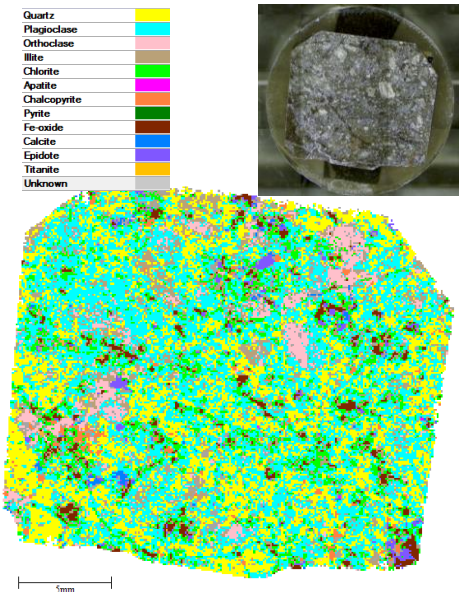

Figure 2 - µ-XRF mineral characterisation map

For example, in a 30 mm epoxy mount, a rock sample was polished and carbon coated and analysed in SEM-EDS and µ-XRF. Using the mapping method, a measurement grid with 100 µm step size was defined, where at each point X-ray spectrum was collected and stored. In case of the SEM, a backscattered electron image is produced, while in the µ-XRF an optical microscope image is acquired. Measurement time for this sample 98 minutes for SEM-EDS and 75 minutes for µ-XRF.

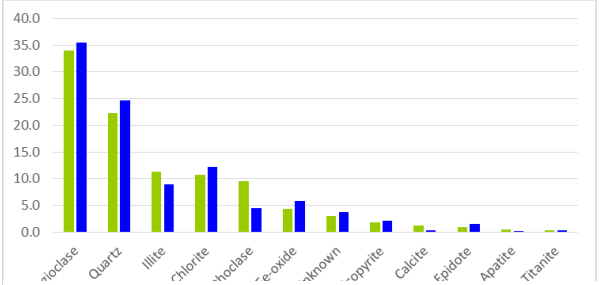

Figure 3 - Comparison chart of mineral characterisation of EDS-SEM and µ-XRF

The data acquisition for both techniques are stored in a HyperMap database, utilising position tagged spectrometry, however, with the µ-XRF system, the acquisition is performed “on-the-fly”, optimising measurement time. The identification and characterisation of the minerals is performed by software on the HyperMap datacube by a user defined mineral database. The algorithm has been optimised for µ-XRF spectrometry to minimise unclassified minerals.