Quantitative analysis at low accelerating voltage with a WDS electron probe microanalyzer equipped with a FE column

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Thanks to its precision, its reproducibility and its stability, Electron Microprobe is a well suited technique for accurately analyzing nearly all chemical elements at concentration levels down to few 10's ppm with a spatial resolution of about 1 μm, which is relevant to microstructures in a wide variety of materials and mineral specimens.

With the development of the Schottky emitter and its implementation as electron source in Electron Microprobe, small features are commonly analyzed down to sub-micrometer scale. Thanks to the high brightness of the Schottky emitter, a fine focussed electron beam can be achieved with both high and stable beam currents even at low accelerating voltages (≤10 keV).

Since X-rays are generated from a much larger diameter than the diameter of the incident electron beam, it is necessary to optimize the two interdependent parameters, accelerating voltage and beam diameter, in order to take full advantage of the FEG electron source for X-ray analysis. The electron beam diameter increases when decreasing the electron beam energy. The interaction volume - within which scattered electrons generate X-rays – decreases with the electron energy. Thus a small beam diameter is not always synonym of a small interaction volume and optimized conditions are obtained when the analytical spatial resolution is primarily limited to the diameter of the X-ray emission volume in a specific material.

The ability to accurately quantify precipitate phases on the micrometer and sub-micrometer scale when working at low beam energy with high spatial resolution will be illustrated in examples such as Dunite, igneous rock locally enriched with Platinum. The analytical resolution determined from X-ray maps will be presented. All samples were analyzed with the CAMECA SXFiveFE.

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