Capabilities of Advanced Mineral Identification and Characterisation System (AMICS)

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Advanced Mineral Identification and Characterisation System (AMICS) is based on energy dispersive X-ray spectroscopy utilised in a scanning electron microscope (SEM-EDS). A specially designed software coordinates the sample positioning inside the microscope chamber, EDS spectra acquisition, database management, phase identification, and results visualisation in the form of maps, graphs and tables ready for reporting. Characterisation can be conducted automatically for up to 28 mounted samples with or without coating. Although, many options exist for an experience researcher to influence the analysis process: (i) extract a spectrum for each acquisition point and determine chemical composition at this point, (ii) visualise mineral maps for each phase or a group of phases to characterise their interactions, (iii) determine the particle geometry-chemistry relationship, (iv) conduct statistical analysis of EDS spectra, define presence of solute elements, and visualise distribution of particles with a particular chemical composition, (v) manually develop the spectra data-base for unknown phases and solid solutions. All these approaches can be used to fully analyse the sample chemistry or facilitate the following study of the sample with other analytical techniques, such as XRF, EPMA, ICPMS, or SIMS. The combination of modern instrumentation with dedicated software allows analysis of large area (tens of mm2) at high resolution (particle sizes down to 1 micron). Characterisation of fine mineral bodies is critical in studies of pre-processed materials such as mine tailings, fine grained waste, or clays. Therefore, application of AMICS is growing in geology, mining, and mineral processing. This presentation will outline the system capabilities and showcase recent results from a number of projects, in particular: (i) identification of commercially valuable metallic elements in mine tailings, clays, and electronic waste; (ii) mineral phase balance in rocks, soils and dust, (iii) characterisation of laboratory produced oxide nano-particles and pyrometallurgical slags.