Dogan Paktunc: ADVANCED CHARACTERIZATION OF IRON MINERALS/COMPOUNDS COMMON IN HYDROMETALLURGICAL PROCESS STREAMS

Advanced characterization techniques and methodologies provide information about the chemical and isotopic compositions, and physical, surface and structural characteristics of the minerals/compounds which can be used to better understand the hydrometallurgical processes.

Examples include electron microprobe for in-situ quantitative determination of major and minor elements, particle induced X-ray emission or proton microprobe (micro-PIXE) for in-situ microanalysis of trace elements, secondary ion mass spectrometer or ion microprobe (SIMS) and laser ablation techniques for in-situ analysis of trace elements and the determination of isotope ratios, high-resolution transmission electron microscopy for identification, synchrotron-based X-ray absorption spectroscopy techniques for speciation and molecular-scale characterization, and synchrotron-based high energy X-ray scattering for the characterization of nanoparticles and amorphous compounds.

Iron, a common element in ores processed by the metallurgical industry, can be released in significant quantities to process solutions. Common iron compounds that form during and after hydrometallurgical processing include ferrihydrite, schwertmannite, jarosite, goethite, akageneite, lepidocrocite and hematite. Fresh precipitates from process solutions and treatment processes occur as nanoparticles. An overview of the long- and short-range characteristics of these nanoparticles will be presented. Their nucleation and growth properties along with phase transformations taking place following their formation will be discussed.