Characterization and Phase Identification of Metals, Alloys, And Corrosion Materials Using X-ray Diffraction Techniques and the Powder Diffraction File™

T. Blanton, International Centre for Diffraction Data, 12 Campus Blvd., Newtown Square, PA, 19073, USA (tblanton@icdd.com)

High energy diffraction methods including X-ray, synchrotron, electron, and neutron have been the analytical techniques of choice for phase identification of crystalline materials. Advances in radiation sources, optics and detectors, allow scientists to use these techniques to probe beyond phase identification and extend studies to investigate material microstructure as well as nanostructure properties. Whether the material of interest being studied is crystalline or amorphous, randomly or preferentially oriented, inorganic or organic, powder or solid, there are many diffraction methods available that can be used to analyze a sample and provide help in understanding how material processing affects material properties. In addition to improvements in diffraction instrumentation, new developments in the ICDD® Powder Diffraction File (PDF®) databases including: atomic coordinates for Rietveld refinement and reference intensity ratio quantitative analyses, synchrotron, electron and neutron diffraction data, and digital patterns for crystallite size and relative crystallinity studies all help to create a synergy between data collection and data analysis that assists scientists in finding a more complete and correct answer.

Examples of metal based material analyses using diffraction techniques coupled with PDF database tools will be presented, demonstrating the versatility of diffraction methods and the materials that can be analyzed.