Multi-dimensional analysis of advanced manufacturing metals using diffractometer automation

Scott A Speakman, Fabio Masiello, Detlef Beckers

Diffractometer automation can be used to collect multiple types of scattering measurements from a sample, facilitating a more complete understanding of the sample. This capability fits well with advanced manufacturing process development that can use rapid prototyping to quickly test a large variety of samples made with different compositions and processing conditions.

In this example, diffractometer automation was used to analyze tungsten thin films using coupled Bragg scans, grazing incidence diffraction, texture pole figure analysis, rocking curves, single-pass projected reciprocal space maps, and stress analysis using iso-inclination, side-inclination, and grazing incidence. The automation solution makes it easy to collect these various measurements, even though not all of them might immediate benefit, so that a large statistical picture of the samples may be accumulated. Such high-throughput multi-dimensional analysis has been shown to be capable of discovering hidden defects using “big data” statistical analysis.