

MM 53: Invited talk Maier-Kiener

Time: Wednesday 18:30–19:00

Location: BAR 205

Invited Talk

MM 53.1 Wed 18:30 BAR 205

Small scale deformation behavior of high performance materials - Advanced mechanical testing meets high end microstructure characterization — •VERENA MAIER-KIENER, IRMGARD WEISSENSTEINER, BENJAMIN SCHUH, ANTON HOHENWARTER, and HELMUT CLEMENS — Montanuniversität Leoben, Austria

Alloy design for modern high performance materials requires exact knowledge of the microstructure evolution during processing, but also a fundamental in-depth knowledge of the dominating deformation mechanism. Therefore, a direct combination of advanced microstructural characterization techniques with sophisticated micromechanical testing under various conditions is required. In the first part the potential of nanoindentation as a high throughput screening technique for

probing phase decompositions in novel HEAs will be demonstrated. Together with APT studies it is shown that an increase in the Young's Modulus after various heat treatments in highly deformed conditions can be correlated to a phase decomposition of the initially single phase HEA into a multi-phase composite. The second part will focus on a CoCrW alloy used for biomedical application. Under mechanical loading, these alloys tend to a strain-induced martensitic transformation. In our studies, we combined macroscopic mechanical tests using a deformation dilatometer with small scale in-situ high temperature nanoindentation and high resolution EBSD analysis. This approach allowed the quantification of the onset strain for phase transformations, and further scale bridging insights regarding the influence of deformation rate and temperature on the plastic flow behavior.