

MM 18: HV Kraft

Time: Tuesday 9:30–10:00

Location: H 0107

Invited Talk

MM 18.1 Tue 9:30 H 0107

Twinning-mediated plasticity in Au Nanowires — ANDREAS SEDLMAYR¹, REINER MÖNIG¹, GUNTHER RICHTER², and •OLIVER KRAFT¹ — ¹Institute for Applied Materials, Karlsruhe Institute of Technology — ²Max-Planck-Institut for Intelligent Systems, Stuttgart

We have developed an experimental method for the mechanical characterization of nanowires with diameters between 30 and a few hundred nanometers. The setup is used inside a dual beam SEM/FIB, and stress-strain curves are measured using piezoelectric actuators and a three-plate capacitor based transducer for applying and measuring force. High resolution strain data is obtained by digital correlation of

the SEM images. In this paper, we report on the deformation behavior of Au nanowires, which were produced by a physical vapor deposition process. The nanowires are single crystal with [110]-orientation, and initially free of defects such as dislocations or growth twins. The stress-strain data show strengths exceeding 1 GPa and plastic strains of the order of 10% without a clear size dependence in the regime investigated. The in situ SEM observations show that the deformation is governed by twinning which occurs in two distinct modes. Moreover, the measured strength values show a large scatter indicating that the deformation process may be influenced by the statistical occurrence of small flaws, most likely at the nanowire surface, triggering the onset of deformation.