Effect of Surface Roughness on the Deformation of Micron-Sized Specimens of Cu — Matthias Buchenschutz-Göbel and Cynthia A. Volkert — Institut für Materialphysik, Georg-August-Universität Göttingen

A variety of studies on deformed small scale metal specimens (100 nm to 10 μm) have shown that dislocation storage becomes rarer as the crystal size is decreased. This implies that plastic deformation, which is usually controlled by dislocation interactions, changes to a dislocation nucleation limited mechanism in sub-micron samples. In the study presented here, the effect of surface roughness on the mechanical behavior of single crystal Cu pillars is investigated. It is expected that surface roughness at the 10-100 nm length scale will influence the ease of dislocation nucleation and thus the mechanical behavior in sub-micron specimens. One and 4 μm diameter Cu pillars with varying degrees of surface roughness have been fabricated using a focused ion beam and then compressed using a flat punch tip in a nanoindenter. No effect of the ripples on the stress-strain behavior of the columns was observed, suggesting that deformation is not limited by dislocation nucleation at this length scale. Further tests on even smaller pillars are underway.

Deformations of auxetic periodic strut frameworks — Holger Mitscheke, Klaus Mecke, and Gerd E. Schroder-Turk — Institut für Theoretische Physik, Universität Erlangen-Nürnberg, Staudtstr. 7, D-91058 Erlangen

We study the deformation behaviour, in particular Poisson ratios, of planar periodic strut frameworks with rigid struts connected at flexible joints. We systematically search for yet unknown auxetic frameworks (i.e. with negative Poisson ratio) and to understand the relationship between structure morphology (quantified by integral geometric and material properties).