

# Micro-compression test using non-tapered micro-pillar of electrodeposited Cu

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## Abstract

We propose a novel method of mechanical test for measuring strength of electrodeposited Cu films using non-tapered micro-pillar. The grain size of each electrodeposited Cu films were changed by controlling current density and investigated by electron back scatter diffraction analysis. The pillars were fabricated by focused ion beam milling. The micro-compression test was carried out twice for each electrodeposition condition using a test machine designed for micro-sized specimen developed in our laboratory. The yield strength increased with increase of current density. The study showed that the influence of orientations on mechanical properties of the micro-sized specimens was magnified with reduction of the number of grains inside a sample.

## Additional Information

Non-tapered micro-pillar compression (see article [here in Advances in Engineering](#) for fabrication method) was applied for evaluation of mechanical properties of nanocrystalline nickel fabricated by electroplating using supercritical carbon dioxide. Maximum compression stress of 3.5 GPa was obtained in the nickel with grain size of 8 nm. Strength of the nanocrystalline nickel which correspond to one-fiftieth of shear modulus for maximum shear stress while assuming 45 degree shear is the highest strength for nickel at present. Carbon impurity observed in the nickel film effectively enhances the grain boundary cohesion. Thus, Hall-Petch breakdown, which arises by the deformation mechanism change to grain boundary mediated one, was suppressed

to finer grain size and strength was increased.

