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Stress-induced detwinning in copper

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ABSTRACT

Epitaxial thin films of nanotwinned fcc metals such as Cu possess unprecedented combination of high hardness and high electrical conductivity due to the unique structure of nanometer-spaced coherent twin boundaries. Recent studies using in situ nanoindentation in a TEM and atomistic modeling have provided new insights on the deformation behavior and thermomechanical stability of nanotwins that will be reviewed in this discussion. In particular, two unit processes will be highlighted. First, stress-induced migration of 3{112} incoherent twin boundary that leads to de-twinning of nanotwins. Second, a mechanism for twin 3{111} coherent twin bound dislocation multiplication at boundary.