

UNIQUE MECHANICAL PROPERTIES OF Cu THIN FILMS CONTAINED ULTRA HIGH DEFECT DENSITY

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Cu films having high mechanical strength and low electrical resistivity were required in various industrial fields. For this requirement, Intensive researches about altering the microstructure of Cu have been performed to improve the mechanical properties of it. Nanotwin Cu is one of the strong candidates for them due to its extraordinary properties. The formation mechanism of nanotwin Cu and the effect of each parameter on the nanotwin formation have been investigated so far.

In this work, we proposed the abnormal mechanical properties of Cu which is prepared with electrodeposition method. By electrodeposition, the tensile strength higher than 700 MPa without the critical elongation decrease and electrical resistivity increase was obtained. Such a strength is very close to that of nickel thin film. Much higher density of defects, including nanotwins were observed in the sample by TEM. The formation of such high density of defect is related to the stress evolution and relaxation during the electrodeposition. In order for in-depth study, diffusion coefficient of Cu²⁺ ions, overpotential, and residual stress of Cu films were investigated.