Thickness and Orientation Dependence of Plastic Behaviors of Iron Whiskers*

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Abstract

Stress-strain curves of iron whiskers, of which thickness ranges from 5 to 80 μ, have been measured using an Instron-type tensile machine at room temperature. All of the ⟨111⟩ whiskers show "work-softening", of which softening rate decreases with increasing thickness. "The lower yield stress" decrease with increasing thickness in ⟨100⟩ and ⟨111⟩ whiskers thinner than about 35 μ. Marked thickness and orientation dependence of the stress-strain curve have been found. The ⟨100⟩ whiskers thinner than about 8 μ show no appreciable plastic deformation after the sharp yielding, as already known in very thin whiskers. Those, 8~17 μ in thickness, show nearly flat regions in their stress-strain curves after yielding and those thicker than about 17 μ reveal "work-hardening" after about 5% strain.