Dislocation Structure in Deformed Fe-35%Ni Invar Alloy Single Crystals(Metallurgy)

SCC of this alloy in acidic chloride solution at room temperature. The crack propagation rate (v) in the tensile crosshead speed region of $\dot{\epsilon}=4\text{–}7.5\times10^{-3}$ mm/minute is described as $v=a\dot{\epsilon}+b$, where a and b are constants. The rate is interpreted as the repetition of selective dissolution and subsequent ductile tearing at the crack tip. Crack propagation is controlled by selective anodic dissolution forming tunnels at the crack tip. In the high tensile crosshead speed region of $1\text{–}4\times10^{-2}$ mm/minute, crack propagation was not greatly accelerated because excess plastic deformation resulted in multiple crack initiation and work-hardening of the specimen.

Effect of Strain Rate on Stress Corrosion Cracking of Austenitic Stainless Steel in $MgCl_2$ Solutions

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Corrosion, **30** (1974), 441.

The effect of strain rate on the stress corrosion cracking (SCC) of an austenitic stainless steel in $MgCl_2$ solutions has been investigated by using a constant strain rate method over the range of strain rates from 4×10^{-3} mm/min to 6 mm/min. Crack propagation mode (intergranular vs transgranular) was a function of strain rate and temperature. At low strain rates, the rate determining step of the SCC corresponded to the formation of slip steps, but at higher strain rates, the rate determining step appeared to be a corrosion process on the slip steps. SCC was most prevalent when the formation rate of the slip steps was equal to the corrosion rate of the steps. The mechanism of SCC in this system has been discussed by considering both the formation rate of slip steps and the corrosion rate of these steps.

Dislocation Structure in Deformed Fe-35%Ni Invar Alloy Single Crystals

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Phys. Status Solidi a, **30** (1975), 521.

Dislocation structures of Fe-35%Ni invar alloy single crystals deformed at room temperature have been observed by transmission electron microscopy. The peculiar characteristics of dislocation structures are as follows: 1) most of the residual dislocations after plastic deformation are cusped screw ones in the early stage of deformation and increase in edge components with increasing strain, 2) dislocation loops exist with high density, distributed homogeneously and form weak obstacles against other dislocation motion, 3) a dislocation accumulation is observed, but does not tangle heavily. It is shown that these experimental results can be explained by the invar properties of these alloys.