regard to those already clarified for high carbon steels by the present authors.

The main results obtained are summarized as follows:

(1) There exists χ-carbide in the tempering process of low (0.017%, 0.15%C) and medium (0.48%C) carbon steels.

(2) The habit plane of the χ-carbide in the medium carbon steel is $\{112\}_\alpha$, suggesting that the carbide precipitates preferentially on martensite twin boundaries.

(3) The orientation relationship of the χ-carbide with ferrite matrix of low and medium carbon steel is approximately expressed as $(100)_\chi//(\bar{1}\bar{2}1)_\alpha$, $(010)_\chi//(101)_\alpha$, and $[001]_\chi//[\bar{1}11]_\alpha$.

Constant Stress Creep Tester Using the Servo Divider

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Trans. Japan Inst. Met., **16** (1975), 207.

In order to examine the transient creep, especially its initial stage in detail, a new constant stress creep tester has been developed. The load necessary to maintain the stress constant can be obtained by an automatic control system with a servo divider, which calculates the equation, as $W=W_0l_0(l_0+x)$, where W_0 is the initial load, l_0 is the initial gauge length and x is the elongation of the specimen. The specimen is stretched by the dead weight of water which is controlled in accordance with the calculated value. The system has the advantages of giving the load under a constant loading condition and keeping the stress constant against various disturbances. The maximum load is 100 kg with precision of ± 0.3 kg, and the deviation of the load from the calculated value is within 1 kg. A new precise temperature controller which stabilizes the temperature within ± 0.1°C is also proposed. The tester makes it possible to obtain the load-elongation curves before the creep tests and creep curves up to the strain of 10%. On the basis of the fact that polycrystalline Fe-19Cr alloy exhibits the incubation phenomenon within the strain of 0.1%, it is suggested that the phenomenon will be found below such a small strain in some alloy systems which have not exhibited the phenomenon thus far.

A Study on Stress Corrosion Cracking of Austenitic Stainless Steel in Boiling Magnesium Chloride

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Corrosion, **31** (1975), 398.

The anodic reaction within the transgranular stress corrosion crack of 18–8 stainless steel in boiling $MgCl_2$ was studied under the open circuit condition at constant tensile speeds. The entire crack sides were not passive during the crack propagation. Consequently, stress corrosion cracking (SCC) of 18–8 stainless steel in boiling $MgCl_2$ is thought to propagate under conditions similar to those for

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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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.