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Corrosion Characteristics of Amorphous Alloy Ribbon ($Fe_{70}Cr_5Si_{10}B_{15}$ and $Co_{70}Cr_5Si_{10}B_{15}$) in Hydrochloric Acid Aqueous Solution

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ABSTRACT

In this study, experiments were carried out to measure the variations in the corrosion potential and current density of polarization curves with amorphous $Fe_{70}Cr_5Si_{10}B_{15}$ and $Co_{70}Cr_5Si_{10}B_{15}$ alloy ribbon. The results were particularly examined to identify the influences of corrosion potential including various conditions such as hydrochloric acid, temperature, salt, pH, and oxygen. The optimum conditions were established with variations including temperature, salt, pH, oxygen, corrosion rate, and resistance of corrosion potential. The mass tranfer coefficient(α) value was determined with the Tafel's slope for the anodic dissolution based on the polarization effect with optimum conditions. The second anodic current density peak and maximum passive current density were designated as the critical corrosion sensitivity(I_r/I_f).

1. Introduction

Recently several techniques have been developed for producing amorphous metal matrix composite meterials. Some amorphous alloys exhibit extremely high corrosion resistance in various solutions. In particular, the addition of Ti, Zr, V, Nb, Ta, Cr, Mo, or W to Fe and Co metalloid alloys is effective in improving the corrosion resistance. These elements are more active than the main metallic component of the alloys. Masaaki Naka and co-workers in reporting electrochemical and X-ray photoelectrospectroscopic studies were stated that an increase in Cr content of Fe metalloid alloys leads to a decrease in the corrosion rate due to a Cr enrichment in the surface film. Effects of composition exert on crystallization characteristics of amorphous(Fe, Ni, Co) Si · B alloys were reported by Inoue. The magnetostriction constant and saturation magnetization reported by shigeyasu Ito at room temperature had been measured for Fe based amorphous alloy containg various metalloid and metal atoms.

3. Results and Discussion

3.1 Polarization Characteristic for Corrosion Tests

Fig. 1 and Fig. 2 shows the electrochemical polarization curves of amorphous alloy in an aqueous solution. It shows the effect of temperature on cathodic and polarization of amophous alloy on 0.16% HCl. The cathodic and anodic polarization curves of amophous alloy obtained with two step potentials and current density.

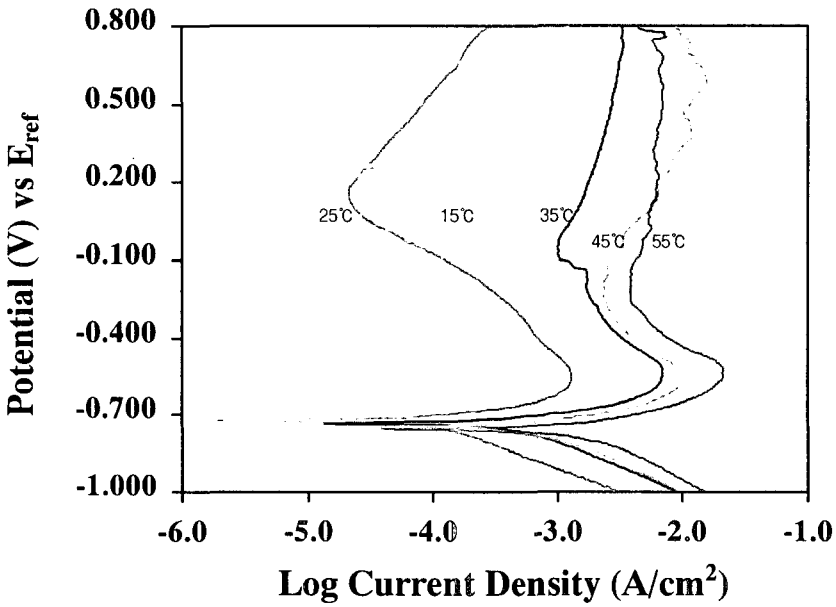

Fig. 1 polarization curves of amorphous $Fe_{70}Cr_5Si_{10}B_{15}$ alloy in aqueous solution (scan rate : 3 mV/sec).

4. Conclusions

The corrosion polariation curves of amophous alloy in an aqueous solution showed two redox waves. The mass transfer coefficient(α) was obtained lesser than 0.5. From these values, it can be clearly recongnized that the electrode reaction is a reversible process.

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