CORROSION OF ELECTRODEPOSITED Ni/Zn ALLOY: ELECTROCHEMICAL AND MORPHOLOGY STUDIES

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1. Introduction

The excellent corrosion resistance of Ni/Zn alloy in the composition range 10-15% Ni is well known[1]. However, the reasons for this behavior are not yet clearly defined. In order that alloy coatings may be optimally developed for particular uses, an understanding of corrosion mechanisms is desirable. Toward this goal, electrochemical tests and microscopic observations were performed for a range of alloy compositions.

2. Procedure

Ni/Zn alloy coatings of 6,11,14,and 25% Ni were prepared in the laboratory. All samples had a coating weight of 20g/m^2, and all were tested in the unpainted condition. Electrochemical tests performed included potential scanning[2], polarization, and potential monitoring, all in NaCl solutions. SEM and optical microscope observations were also made.

3. Results

Polarization and potential monitoring tests in stagnant,air saturated 5% NaCl solutions indicated significant changes in the corrosion behavior with time. These results are attributed to surface composition changes, corrosion product build-up, and local corrosion. In O_2-free solution, polarization curves(Fig.1) indicate a rapid increase in corrosion rate at more noble potentials for all of the Ni-containing specimens except the 14% specimen. Microscopic observations indicate that localized corrosion in the form of pits and cracks initiates on all of the specimens, but that the 14% specimen shows only a pattern of fine cracks, in contrast to the pits, large cracks, and coating loss observed on the other specimens(Fig.2).

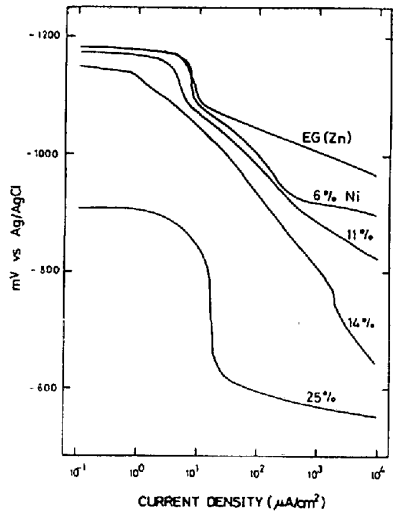

Fig. 1. Anodic Polarization Curves in O_2-free 5% NaCl.

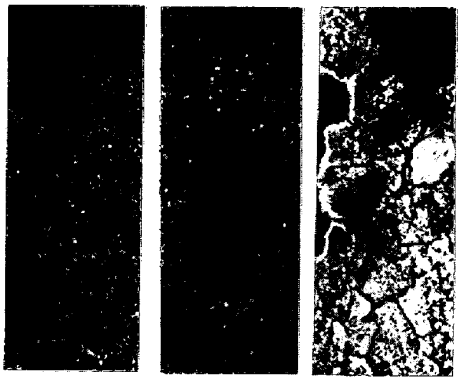

Fig. 2. SEM Photos After 1 hr Immersion in 5% NaCl.

4. Conclusions

In the unpainted condition, crack and pit formation is an important aspect of the corrosion behavior of Ni/Zn alloy. Good corrosion performance is observed on the specimens that develop a relatively fine crack structure.

5. References

1) Shibuya, A., et al, Tetsu-to-Hagane,66(7), p.771 (1980)
2) Isaacs, H. and Kissel, G., J. Electrochem. Soc.,119,1628 (1972)