

## CS4

### A Study on Pit Growth of Alloy 600 in $\text{Cl}^-$ -Ion Containing Solution at Elevated Temperatures (298 to 473 K) and Pressures (0.1 to 1.4 MPa) Using Fractal Geometry

고온 고압의 염화이온 함유수용액 조건하에서 프랙탈 기하학을 이용한 합금 600에 형성된 핏트의 성장에 대한 연구

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The present work involves a study on pit growth of alloy 600 in aqueous 0.1M  $\text{Na}_2\text{S}_2\text{O}_3$  + 0.1M NaCl solution as a function of solution temperature 298 to 473 K in terms of fractal geometry using potentiodynamic polarization experiment, ac-impedance spectroscopy, scanning electron microscopy(SEM) and image analysis method. SEM micrographs revealed that morphology of the pits changes from hemispherical shape to highly branched shape with increasing solution temperature. After observation of SEM micrographs of corrosion pits formed on the specimen, the pit morphology was analyzed quantitatively by image analysis method. The fractal dimension of corrosion pits increased with increasing solution temperature. In the present work ac response of oxide film of alloy 600 has been studied at temperature ranging from 298 to 473 K using autoclave specially designed to carry out the electrochemical experiments at elevated solution temperatures and pressures. From the measured impedance spectra, it was observed that the Nyquist plots deviate gradually from a perfect semicircle form with increasing solution temperature. The depression of a semicircle in the impedance plane plot can be mainly attributed to roughening of the electrode due to the acceleration of pit propagation at elevated solution temperature. The degree of depression of impedance spectra was closely related to the fractal dimension in value determined with the quantitative image analysis of the morphology of corrosion pits.

#### References

1. B. B. Mandelbrot, D. E. Passoja and A. J. Paullay, Nature 308 (1984) 721.
2. J.-S. Bae and S.-I. Pyun, J. Alloys and Comp. 217 (1995) 52.