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Quantitative Analysis of Impedance Spectra for the Pits of Alloy 600 in Cl⁻-Ion Containing Solution at Elevated Solution Temperatures and Pressures
고온 고압의 염화이온 함유수용액 조건하에서 합금 600에 형성된 핏트의 임피던스 스펙트라에 대한 정량적 분석

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Impedance behaviour of the pits of alloy 600 has been quantitatively investigated in aqueous 0.1 M $Na_2S_2O_3$ + 0.1 M NaCl solution as a function of solution temperature in terms of fractal geometry using scanning electron microscopy (SEM), image analysis method and ac-impedance spectroscopy.

SEM micrographs revealed that morphology of the pits changed from hemispherical shape to highly branched shape with increasing solution temperature. After SEM observation of the pits, the fractal dimension of the pits was determined as a function of solution temperature using perimeter-area method. It was found that fractal dimension value of the pits increased with increasing solution temperature. This is caused by the increase in the ratio of perimeter to area at higher solution temperature, indicating the formation of the pits with highly branched shape. From the impedance spectra in Bode plot, constant phase element (CPE) was observed in the frequency range of 10 to 10^2 Hz at the pitted specimen exposed to elevated temperature solutions. This CPE behaviour was discussed in terms of the fractal dimension of the pits. In addition, generalized equation of impedance spectra was formulated in terms of the fractal dimension of the pits as a function of solution temperature. Impedance spectra calculated theoretically from the generalized equation were compared with those measured experimentally.

Reference
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2. J.-J. Park and S.-I. Pyun, submitted to Corrosion Science (2002)