

CS05

A Study on the Effects of Anion Additives on the Initiation
and Growth of the Pit formed on Pure Aluminium in
Chloride-Containing Solution

염화이온 함유 수용액에서 순수한 알루미늄에 형성된 핏트의
발생 및 성장에 미치는 음이온의 영향에 대한 연구

나경환, 변수일, 이우진, 박진주
한국과학기술원 재료공학과

The effects of the anion additives NO_3^- and SO_4^{2-} on the initiation and growth of the pit formed on pure aluminium (Al) were investigated in chloride-containing solution using potentiodynamic polarization experiment, scanning electron microscopy (SEM) and X-ray photoelectron spectroscopy (XPS). The three kinds of the solutions 0.1M NaCl, 0.1M NaCl + 0.1M NaNO_3 and 0.1M NaCl + 0.1M Na_2SO_4 , were employed in this study. From the potentiodynamic polarization curves obtained from the Al specimen, the pitting potential was observed to be $-0.68 V_{\text{SCE}}$ in 0.1M NaCl solution and it shifted to more positive values of $-0.31 V_{\text{SCE}}$ and $-0.23 V_{\text{SCE}}$ by the addition of NO_3^- and SO_4^{2-} ions to NaCl solution, respectively. The density and morphology of the pits initiated under anodic polarization, were examined using SEM. Furthermore, cross-sectional view of a pit, artificially made by drilling the hole of 3 mm diameter and 4 mm depth into the specimen, revealed that the morphology of the growing pit changes with various immersion time by adding NO_3^- and SO_4^{2-} ions to NaCl solution. The compositions of passive film formed at pit wall or bottom in the three kinds of the solutions were well analyzed from the measured XPS spectra. Based upon the experimental results, the morphological change of the growing pit through pure Al in NO_3^- and SO_4^{2-} ions-containing NaCl solution was discussed in terms of preferential growth in lateral or downward direction due to the competition between the growth and disruption of the pit.