

CS01

Effects of Anion, pH, and Temperature on Dissolution Behavior of Aluminum Oxide Films

음이온, pH, 그리고 온도에 따른 알루미늄 산화막의 용해현상

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The dissolution behavior of Al oxide films has been investigated extensively in acidic solutions where porous oxide film is formed and in alkaline solutions in the development of Al-air battery. The solubility of Al oxides on solution pH is markedly increased in both alkaline and acidic conditions. However, little information is available on the dissolution process in the near neutral solutions. This is due to the difficulty and reliability in measuring the low rate of dissolution in the intermediate pH range. The main objective in this study is to examine the dependence of dissolution behavior of Al oxides on the type of electrolytic anion (borate, chromate, phosphate, and sulfate), solution pH (pH 3~10), and solution temperature (0~50 C). It is hoped that this study will lead to a better understanding of pitting corrosion by aggressive anions, because the initiation of the localized corrosion has been attributed to film thinning or the oxide dissolution. For this purpose, cyclic polarization technique has been employed. We found that the simple cyclic polarization measurement offers a very rapid and reliable method to characterize growth and dissolution behavior of Al oxides. Polarization characteristics of abraded Al in (a) phosphate (0.25 M NaH₂PO₄ / 0.25 M NaHPO₄, pH 6.0), (b) borate (0.42 M H₃BO₃ / 0.08 M Na₂B₄O₇, pH 8.4), and (c) sulfate (0.5 M Na₂SO₄, pH 5.8) solution at 5 mV/s.

