CS06

The Effect of Sulfate Ion on the Pitting Corrosion of Pure Aluminium as Electrode Material for the Electrolytic Capacitor in Aqueous 0.01 M NaCl Solution

전기화학적 축전기 전극재료로 쓰이는 순수한 알루미늄의 핏팅에 미치는 수용액 내 황산이온의 영향에 관한 연구

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The effect of sulfate (SO_4^{2-}) ion on the pitting corrosion of pure aluminium (Al) for the electrolytic capacitor has been investigated in aqueous 0.01 M NaCl solution as a function of SO_4^{2-} ion concentration using potentiodynamic polarization experiment, optical microscopy, potentiostatic current transient technique combined with electrochemical quartz crystal microbalance (EQCM) technique, and ac-impedance spectroscopy. It was observed from the polarization curves that the pitting potential (E_{pit}) was raised in value and at the same time the anodic current density above the E_{pit} increased with increasing SO_4^{2-} ion concentration. This implies that SO_4^{2-} ions depress the formation of the pits on the outer native oxide-covered surface, but enhance the growth of the pits, which is validated by optical microscopy. From the combined results of anodic current transient and electrogravimetric curve, it is suggested that SO_4^{2-} ions adsorb on the Al specimen surface during the anodic polarization and subsequently dissolve it after the transition time t_T. The surface area of pitted specimen increased in the presence of SO_4^{2-} ion was quantitatively estimated from the measured oxide film capacitance value. Based upon the above experimental results, it is deduced that adsorbed SO_4^{2-} ions can partially exchange with chloride ions, leading to the acceleration of the formation of tunnels from the pits.