Al_2O_3 산화 피막의 내식성에 미치는 양극산화 전류밀도의 영향
Effect of Anodizing Current Density on Anti-Corrosion Characteristics for Al_2O_3 Oxide Film

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Abstract : Aluminum alloys have poor corrosion resistance compared to the pure aluminum due to the additive elements. Thus, anodizing technology artificially generating thick oxide films are widely applied nowadays in order to improve corrosion resistance. Anodizing is one of the surface modification techniques, which is commercially applicable to a large surface at a low price. However, most studies up to now have focused on its commercialization with hardly any research on the assessment and improvement of the physical characteristics of the anodized films. Therefore, this study aims to select the optimum temperature of sulfuric electrolyte to perform excellent corrosion resistance in the harsh marine environment through electrochemical experiment in the sea water upon generating porous films by variating the temperatures of sulfuric electrolyte. To fabricate uniform porous film of 5083 aluminum alloy, we conducted electro-polishing under the 25 V at 5 ℃ condition for three minutes using mixed solution of ethanol (95 %) and perchloric (70 %) acid with volume ratio of 4:1. Afterward, the first step surface modification was performed using sulfuric acid as an electrolyte where the electrolyte concentration was maintained at 10 vol.% by using a jacketed beaker. For anode, 5083 aluminum alloy with thickness of 5 mm and size of 2 cm x 2 cm was used, while platinum electrode was used for cathode. The distance between the two was maintained at 3 cm. Afterward, the irregular oxide film that was created in the first step surface modification was removed. For the second step surface modification process (identical to the step 1), etching was performed using mixture of chromic acid (1.8 wt.%) and phosphoric acid (6 wt.%) at 60 ℃ temperature for 30 minutes. Anodic polarization test was performed at scan rate of 2 mV/s up to +3.0 V vs open circuit potential in natural seawater. Surface morphology was compared using 3D analysis microscope to observe the damage behavior. As a result, the case of surface modification presented a significantly lower corrosion current density than that without modification, indicating excellent corrosion resistance.

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