

THE MORPHOLOGY AND ELECTROCHEMICAL STUDIES OF AC ANODIZED SS304L UNDER VARIOUS ANODIZING CONDITIONS

Abstract

A novel method of anodizing stainless steel (SS) 304L with alternating current (AC) as the power source is presented in the interest of producing a porous oxide film. Since there is a scarcity of research on AC anodizing, this research work is focused on the electrochemistry and morphology of the oxide film generated on the SS304L. The anodizing is done in an ethylene glycol solution containing different concentrations of ammonium fluoride, NH_4F , varying from 0.5 wt.% to 7 wt.%. The anodizing voltage is fixed to 40 V and the process is carried out at 25°C for 30 minutes. The electrochemical studies using the Tafel polarization method in terms of corrosion rate showed decreased values from 0.2842 mm/year to 0.1026 mm/year of the as-received, and anodized 3.0 wt.% specimens, respectively. For morphological studies, the oxide film formed on the anodized SS304L is characterized using a scanning electron microscopy (SEM) and the thickness of the oxide film formed is recorded using 3D profilometer. The morphology demonstrated the formation of the porous arrangement with localized parts of the surface oxide layer and the thickness of the oxide film rises at 2.65 μm and 4.29 μm , respectively, when the NH_4F concentration increases from 0.5 wt.% to 1.0 wt.%. This indicates that there are significant advantages of using AC anodizing on stainless steel.

Keywords

Anodizing; Corrosion; Oxide Film; Stainless Steel 304L