

Influence of Surface Preparation Effects on the Electrochemical Behavior of 2098-T351 Al-Cu-Li Alloy

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Abstract : The Al-Cu-Li alloys are advanced materials for aerospace application because of their interesting mechanical properties and low density when compared with conventional Al-alloys. However, Al-Cu-Li alloys are susceptible to localized corrosion. The near-surface deformed layer (NSDL) induced by the rolling process during the production of the alloy and its removal by polishing can influence on the corrosion susceptibility of these alloys. In this work, the influence of surface preparation effects on the electrochemical activity of AA2098-T351 (Al-Cu-Li alloy) was investigated using a correlation between surface chemistry, microstructure, and electrochemical activity. Two conditions were investigated, polished and as-received surfaces of the alloy. The morphology of the two types of surfaces was investigated using confocal laser scanning microscopy (CLSM) and optical microscopy. The surface chemistry was analyzed by X-ray Photoelectron Spectroscopy (XPS) and energy dispersive X-ray spectroscopy (EDS). Global electrochemical techniques (potentiodynamic polarization and EIS technique) and a local electrochemical technique (Localized Electrochemical Impedance Spectroscopy-LEIS) were used to examine the electrochemical activity of the surfaces. The results obtained in this study showed that in the as-received surface, the near-surface deformed layer (NSDL), which is composed of Mg-rich bands, influenced the electrochemical behavior of the alloy. The results showed higher electrochemical activity to the polished surface condition compared to the as-received one.

Keywords : Al-Cu-Li alloys, surface preparation effects, electrochemical techniques, localized corrosion

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