

Formation of oxide coatings on 2021 Al alloys prepared by plasma electrolytic oxidation with nitrogen inducing

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As a novel electrochemical and physical surface treatment processing, electrolytic plasma processing (EPP) is widely applied for producing oxide coatings on such light metals as Al, Mg, Ti and their alloys. Earlier researches showed that the EPP oxide coatings could offer attractive combination performances of wear resistance, corrosion resistance, mechanical strength, heat resistance and so on. In this work, 2021 series Al alloy was chosen as the matrix to carry out the EPP treatment, for its wide applications in engineering industries. The experimental electrolytes were divided to four groups, which contained 10g/l Na_3PO_4 (film former agent), 0.1~1g/l $\text{NaNO}_3/\text{NaNO}_2/\text{NH}_4\text{NO}_3$, (additive agent), and 2g/l NaOH (adjust pH value). The EPP treatments were carried out under a hybrid voltage of AC 200V (50Hz) combined with DC 260V power supply for 15 min. A combined composition and structure analysis of surfaces and cross-section layers was carried out by X-ray diffractometer (XRD), scanning electron microscopy (SEM), and energy dispersed spectrometer (EDS). The wear and electrochemical tests of EPP oxide coatings were studied accordingly. The results showed that nitrogen which was induced from the electrolytes participated the EPP reaction to generate AlON compound in the coatings, as significantly increase the coating properties.

Keywords: Electrolytic Plasma Processing; 2021 Al Alloy; AlON- Al_2O_3 ; Oxide Coating