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Publication date:
2014

Document Version
Peer reviewed version

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Aluminium and its alloys are widely used in aerospace industry owing to their high strength to weight ratio. The surface of aluminium under normal conditions has a thin oxide film (2.5-10 nm) responsible for its inherent corrosion resistance. This oxide film can further be converted or transformed into functional conversion coatings in order to enhance corrosion resistance and adhesion to paint systems. Chromium based conversion coatings have been extensively used on aluminium alloys to improve adhesion of subsequent paint layers and corrosion resistance. However, the use of hexavalent chromium is strictly regulated due to its toxic nature and suspected carcinogenicity. So, it is highly imperative to develop other alternatives for chrome conversion coatings. Treatment of aluminium with natural water at elevated temperatures results in the formation of different forms of aluminium oxide (γ-AlO(OH) , $Al(OH)_3$) depending on the preparation parameters/conditions. Moreover, with the knowledge of factors controlling film growth, composition and morphology, such oxide layers carry huge potential for practical applications.

Pure aluminium (AA1090, 99.94 wt. %) and other aluminium alloy surfaces were exposed to high pressure steam produced by an autoclave at a temperature of 107 – 121 °C and pressure of 15 -17 psi for 10 minutes to produce a thin coating of aluminium oxide. The aim of this study is to understand the effect of high pressure steam with and without different chemical additives on surface morphology and growth of oxide film on different intermetallic particles and corrosion behaviour of such alloys.Surface morphology was observed by using FEG-SEM, EDX and FIB-SEM. Metal oxide surface characterization and compositional depth profiling were investigated by using XPS and GD-OES respectively. Potentiodynamic polarization measurements and acid salt spray testing were used to study corrosion behavior of the produced coatings.