Effect of Ce on the corrosion resistance of anodized AA2024-T3 FSWed

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Friction stir welding (FSW) is a solid-state joining technique, which has numerous advantages over conventional fusion techniques, such as automation and reproducibility, environmentally friendly, and capability to weld large thicknesses in a single pass.

AA2024 are widely used in the aerospace industry due to their properties as lightweight, high specific strength and durability. However, they are prone to localized corrosion due to its high amount of intermetallics. New anodizing and sealing processes have been studied due to the environmental and health problems related to the sealing treatment containing hexavalent chromium ions. This has encouraged the search for new processes for surface treatment of metals. Recent studies are pointing towards tartaric-sulphuric anodizing, as a viable alternative for the corrosion protection of aluminum alloys, including surface treatments with cerium ions. Other promising method to protect the exposed metal surface is to use eco-friendly alternative corrosion inhibitors in combination with a barrier coating system. Sol–gel coatings have also been extensively studied as potential pre-treatments not associated to toxic residues for aluminum alloys surface preparation prior to paint. It has been demonstrated an efficient alternative for replacement of the chromate technology.

In this study, friction stir welded samples were anodized and then sealed in an aqueous solution with the addition of cerium ions at 70 °C. The effect of Ce on the characteristics of the surface film formed, such as morphology and corrosion resistance, was investigated by SEM and electrochemical impedance

spectroscopy. Samples unsealed or hydrothermally sealed were also tested for comparison. The EIS results showed that the addition of Ce (III) ions improved the corrosion resistance of the AA 2024-T3 TSA anodized and hydrothermal sealed.