Effect of Shot Peening and Pre-Oxidation Duplex Treatment on Electrochemical Corrosion Behavior of Al Alloy in Alkaline Soil

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The aim of this article was to develop a surface modification process to enhance the corrosion resistance of Al alloy in soil. Shot peening combined with pre-oxidation was conducted to Al alloy and its effects on corrosion behavior of Al alloy in soil were investigated by optical microscopy, scanning electronic microscopy, electrochemical testing and accelerating corrosion test. The results showed that the duplex treatment can refine the grain and second phase (θ -Al₂Cu) in the surface region of Al alloy. Compact and homogenous corrosion products (CuAlO₂ and Al₂O₃·3H₂O) without pitting corrosion were formed on the surface of treated samples. Compared to the as-received sample, surface treatment can reduce the corrosion current density and increase the impedance value, indicating an excellent corrosion resistance. The running experiment of 60 days showed that Al alloy with surface treatment can be used as a grounding material with excellent anti-corrosion in soil.

Keywords: Al alloy grounding material; pitting corrosion; shot peening; pre-oxidation; soil corrosion

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