

Corrosion Inhibition on Copper rich Al Alloys: Layered Double Hydroxides

M. A. Travassos, C. M. Rangel

*Instituto Nacional de Engenharia, Tecnologia e Inovação - INETI
DMTP- Electrochemistry of Materials - Paço do Lumiar, 22
1649-038 Lisboa Portugal
antonia.travassos@ineti.pt; carmen.rangel@ineti.pt*

Abstract

Layered double hydroxides (LDHs) are a family of layered materials consisting of positively charged layers with charge balancing anions between the layers. The anions can be replaced by other species through an anion exchange process. The formula $[M_2^{2+} M^{3+} (OH)_6]^+ X_{1/n}^{n-} \cdot yH_2O$ represents most of the layered double hydroxides.

Formation of layered double hydroxides (LDHs) on the surface of copper-rich Al alloys promotes corrosion resistance in Li environment, either in Aluminium 2024-T3 or Al-Li 8090.

Pitting corrosion of Aluminium 2024-T3 in chloride containing solutions was observed to initiate around anodic S phase particles, caused by the local galvanic corrosion induced by the coupling of the Cu-rich S phase with the matrix.

Intergranular corrosion of Al-Li 8090 appears as the most important mechanism responsible for the localized attack of the alloy due to the selective dissolution of the T phases, mainly $T_2(Al_6CuLi_3)$, phases with an anodic character that are found at grain boundaries.

Corrosion inhibition was achieved as a result of the formation of a LDH film $Al_2Li(OH)_7 \cdot 2H_2O$, $Al_2Li(OH)_6 \cdot 2CO_3 \cdot xH_2O$, and possibly a Cu-containing LDHs that covered the surface of the alloys mitigating the galvanic action between the matrix and Cu rich phases. The formation of LDHs is thought to be responsible for inhibition which is demonstrated to be under diffusion control.

Layered double hydroxides were characterised using X-ray diffraction, FTIR and SEM.

Keywords: *layered double hydroxides, rich Al Alloys, corrosion resistance*