The inhibitory effect of caffeic acid on localized corrosion of duplex Mg-Li alloy

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Abstract Magnesium-lithium (Mg-Li) alloy is a lightweight structural material, but the localized corrosion restricts its widespread application. Corrosion inhibitor is an effective strategy for corrosion control, but there is very little research on Mg-Li alloys. In this work, the effect of caffeic acid (CA) on the corrosion behavior of LAZ931 alloy in NaCl electrolyte was systematically studied. The main conclusions are as follows:

(1) CA with an appropriate concentration can significantly reduce the corrosion rate of LAZ931 alloy, and its maximum corrosion inhibition efficiency can reach more than 80%.

(2) CA can significantly inhibit the localized corrosion behavior of LAZ931 alloy, so that the mechanical bearing capacity of the alloy can be retained to the greatest extent after corrosion.

(3) At the initial stage of immersion, CA preferentially adsorbs on the Li-rich β phase in LAZ931 alloy, and the reactivity of the α-Mg/β-Li and β-Li/AlLi galvanic couples is simultaneously inhibited. CA also participates in the formation of corrosion products and increases the density of the product layer. The above two are the main inhibition mechanisms of CA on corrosion of LAZ931 alloy.

The obtain findings are of great significance for improving the service reliability of Mg-Li alloys in complex environments.