Influence of Zn(II) and Sodium Dodecyl Benzene Sulfonate as Electrolyte Additives on the Electrochemical Performance of Mg-10Li-3Al-3Zn Electrodes in a NaCl solution

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The influence of electrolyte additives on the electrochemical performance of Mg-10Li-3Al-3Zn electrodes was studied. After mixing various concentrations of Zn^{2+} and sodium dodecyl benzene sulfonate (SDBS) in a 0.7 M NaCl electrolyte solution, magnesium alloy electrodes discharged at 25 °C. Potentiodynamic polarization, potentiostatic oxidation, electrochemical impedance spectroscopy (EIS), scanning electron microscopy (SEM) and energy dispersive spectrometry (EDS) were utilized to analyze the electrochemical performance of the electrode. The combination of Zn^{2+} and SDBS improved the corrosion resistance of the electrode. Mg-10Li-3Al-3Zn electrodes retained the highest discharge current density and the smallest polarization resistance in the electrolyte solution including 2.0 mM Zn^{2+} and 1.0 mM SDBS at three various constant potentials: -1.4, -1.2 and -1.0 V. The additives accelerated the breaking and shedding of oxides on the electrode surface to expand the effective discharge area. The combination of 2.0 mM Zn^{2+} and 1.0 mM SDBS had the optimal effect on improving the electrochemical performance of Mg-10Li-3Al-3Zn electrodes.

Keywords: Mg-10Li-3Al-3Zn electrodes; electrochemical performance; electrolyte additives; Zn^{2+} ; sodium dodecyl benzene sulfonate

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