Electrochemical Corrosion Behavior of as-cast Zn-rich Zn-Mg Alloys in a 0.06M NaCl Solution

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The electrochemical corrosion behavior of as-cast samples of Zn- 1.2 wt.% and Zn- 2.0 wt.% Mg alloys, solidified under similar cooling rates, is investigated in the present study. A stagnant and naturally aerated 0.06 M NaCl solution at 25 °C was used in the corrosion tests. In order to evaluate the corrosion resistance, electrochemical impedance spectroscopy (EIS) plots, potentiodynamic polarization curves and an equivalent circuit are used. It is found that the increase in the alloy Mg content (from 1.2wt.% to 2.0wt.%) refines both the Zn-rich dendritic matrix and the eutectic mixture and decreases the volume fraction of the Zn-rich phase. Consequently, this is shown to affect the cathode-to-anode area ratio, which decreases affecting the corrosion behavior. The experimental corrosion parameters demonstrated that the Mg content is associated with susceptibility to pitting corrosion.

Keywords: Zn-Mg alloys; solidification; microstructure; impedance; polarization.

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