

On the corrosion behaviour of as-cast and heat-treated Mg-RE alloys in 0.9% NaCl solution

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Abstract: The microstructure and corrosion behaviour of as-cast and heat-treated Mg-1.44Nd and Mg-1.43Ce (wt.%) alloys in 0.9% NaCl (wt.%) solution were investigated using electrochemical tests, X-ray diffraction (XRD) and scanning electron microscopy, combined with energy-dispersive X-ray spectroscopy (SEM-EDS). The as-cast microstructure of both alloys revealed the presence of second phases. Heat treatment at 535°C for 6 h led to a more uniform distribution of the second phases in Mg-1.44Nd alloy and their dissolution along the grain boundaries in the Mg-1.43Ce alloy. As a result, the corrosion resistance was improved in the heat-treated alloys. Accordingly, the corrosion resistance values for the heat-treated alloys were much higher than those of the as-cast alloys, indicating that the heat-treated alloys were less susceptible to corrosion. Also, the heat-treated Mg-1.43Ce alloy seems to have very good corrosion resistance (26890 cm^2) compared to the Mg-1.44Nd alloy (6156 cm^2) by preventing pitting corrosion along the grain boundaries. The corrosion product was made up mainly of magnesium hydroxide $\text{Mg}(\text{OH})_2$ and magnesium oxide MgO and more uniform corrosion morphology was found in the heat-treated alloys.

Keywords : Corrosion resistance Heat treatment Magnesium alloy NaCl solution Rare earth