Volume 30, Issue 2, 2020, Pages 29-39

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-1.44Ndand Mg-1.43Ce (wt.%) alloys in 0.9% NaCl (wt.%) solution were investigated usingelectrochemical tests, X-ray diffraction (XRD) and scanning electron microscopy, combined with energy-dispersive X-ray spectroscopy (SEM-EDS). The as-castmicrostructure of both alloys revealed the presence of second phases. Heat treatmentat 535°C for 6 h led to a more uniform distribution of the second phases in Mg-1.44Ndalloy and their dissolution along the grains boundaries in the Mg-1.43Ce alloy. As aresult, the corrosion resistance was improved in the heat-treated alloys. Accordingly, the corrosion resistance values for the heat-treated alloys were much higher than thoseof the as-cast alloys, indicating that the heat-treated alloys were less susceptible to the Corrosion. Also, the heat-treated Mg-1.43Ce alloy seems to have very good corrosionresistance (26890 ? cm 2) compared to the Mg-1.44Nd alloy (6156 ?·cm 2) bypreventing pitting corrosion along the grains boundaries. The corrosion product wasmade up mainly of magnesium hydroxide Mg(OH) 2 and magnesium oxide MgO andmore uniform corrosion morphology were found in the heat-treated alloys.

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