Surface morphology and corrosion investigation of AZ91RC magnesium alloy

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ABSTRACT

Rheocast processing of AZ91 magnesium alloy was evaluated in terms of microstructure and corrosion resistance. Rheocasting leads to a globular microstructure of α-Mg spheres separated by an interconnected β-$Mg_{17}Al_{12}$ (β-phase) network. Findings revealed that early stages of corrosion were located at the center of α-Mg globules and more importantly at α-Mg/β-phase interfaces due to galvanic coupling as predicted from surface potential maps. Electrochemical, hydrogen evolution and weight loss measurements demonstrated the superior corrosion resistance of the rheocast alloy. This was attributed to an improved barrier effect of the β-$Mg_{17}Al_{12}$ phase related to its morphology, quantity and composition. For long immersion times, only small attacked areas were observed which corresponded to randomly corroded α-Mg globules. High resolution 3D measurements of the corroded areas after removal of the corrosion products were obtained in order to further evaluate the corrosion morphology.