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Formation and characteristic corrosion behavior of alternately lamellar arranged α and β in as-cast AZ91 Mg alloy

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Abstract: Formation and characteristic corrosion resistance of alternately lamellar arranged α and β in as-cast AZ91 Mg alloy were investigated as an independent micro-constituent identity. As-cast AZ91 presented three microstructural entities, i.e. α-Mg grain, (α+β) lamellae and coarse β particle, and each had its own Al content and microstructural morphology. The lamellae occurrence was due to the precipitation of β particle from the divorced eutectic Al-rich-α phase during solidification, because the Al composition can not exceed its maximum solubility. The evidences that were obtained from electrochemical tests, micro-corrosion morphology and hydrogen evolution rate certified that the (α+β) lamellae was beneficial to corrosion resistance, which was different from the reported deleterious influence for its original eutectic Al-rich-α phase. This different corrosion behavior was explained to be ascribed to the changes in fine structure and local composition that resulted in combined electrochemical effects of the changes in α and β phases on the corrosion.

Keywords: AZ91 Mg alloy; micro-constituent identity; formation; corrosion; eutectic phase.