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Er对铸态AZ91镁合金显微组织和耐腐蚀性能的影响

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摘 要: 利用金相显微镜(OM)、扫描电镜(SEM)、能谱分析(EDS)、X射线衍射分析、集气法及动电位极化曲线研究了微量Er对铸态AZ91镁合金显微组织和腐蚀性能的影响。结果表明: 微量Er可细化AZ91镁合金的铸态组织, 当AZ91镁合金中加入Er的含量不高于0.7%(质量分数)时, 随着Er含量的增加, 镁合金中的 γ -Mg₁₇Al₁₂相由粗大、连续块状分布逐渐转变为细小、岛状均匀分布, 并且有Al₃Er相生成; 同时, 微量Er也可显著提高铸态AZ91的耐腐蚀性能, 当Er含量为0.7%时, 合金耐蚀性能大幅度提高, 在3.5%(质量分数)NaCl水溶液中浸泡的腐蚀速率为0.546 06 mg/(cm²·d), 仅为常规AZ91镁合金的1/15; 微量Er使得AZ91镁合金在3.5% NaCl溶液中的自腐蚀电位升高, 自腐蚀电流降低, 从而提高AZ91镁合金的耐腐蚀性能。

关键字: AZ91镁合金; Er; 显微组织; 腐蚀性能**Effect of Er on microstructure and corrosion resistance of AZ91 magnesium alloy**LIU Chu-ming^{1,2}, GE Wei-wei¹, LI Hui-zhong^{1,2}, CHEN Zhi-yong^{1,2}, WANG Rong³, GAO Yan-rui¹

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Abstract: The microstructure and corrosion behavior of AZ91 magnesium alloys with trace addition of Er were investigated by optical microscopy (OM), scanning electronic microscopy (SEM), energy-dispersive spectroscopy (EDS), X-ray diffractometry (XRD), collecting gas, immersion test and potentiation dynamic polarization. The results show that with Er addition in the range of 0%–0.7% (mass fraction), the γ -Mg₁₇Al₁₂ phase is refined with increasing Er addition and disperses well in the matrix, and Al₃Er phase forms. The corrosion resistance of alloy is significantly improved. The alloy with 0.7% Er has the best corrosion resistance, and the corrosion rate is 0.546 06 mg/(cm²·d), only 1/15 of that of common AZ91 alloy. Trace addition of Er enhances the electrode voltage and lowers the corrosion current of AZ91 alloy in 3.5% NaCl solution, thus improves the corrosion characters of magnesium alloy.

Key words: AZ91 magnesium alloy; Er; microstructure; corrosion resistance

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