Short Communication

Effect of T4 and T6 Treatment on Electrochemical Corrosion Behavior of GW103K Magnesium Alloy

Tao Jin¹, Shuang Yu², Shengzhi Liao¹, Ruiling Jia^{2,*}, Wen Ma², Feng Guo²

¹ China Special Vehicle Research Institute, Aviation Key Laboratory of Science and Technology on Structural Corrosion Prevention and Control, Jingmen 448035, Hubei, P. R. China

² School of Materials Science and Engineering, Inner Mongolia University of Technology, Inner Mongolia Key Laboratory of Thin Film and Coatings Technology, Hohhot, 010051 PR China

*E-mail: jrl014014@163.com, jintao52020372@126.com

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GW103K (Mg-10Gd-3Y-0.4Zr) alloy can achieve better strength and elongation through precipitation hardening method. The precipitation sequence of the alloy has been identified as SSSS (cph)→β" (D019)→β' (cbco)→β1 (fcc)→β (bcc). In present work, the corrosion behavior was evaluated for the GW103K alloy under as-cast, solution treatment (T4) and aged treatment (T6) conditions, and the corrosion mechanism of the alloy after over-aging treatment (193h and 500h) was discussed. Electrochemistry impedance test results showed that the corrosion resistance of the alloy after T6-treated for 193h was the highest. The dissolution of Mg₂₄(Gd,Y)₅ phase led to severe localized corrosion on the as-cast alloy. The localized corrosion of the T4-treated alloy was inhabited because the micro-galvanic coupling between the Mg₂₄(Gd,Y)₅ phases and the matrix was reduced, which was attributed to the volume fraction of Mg₂₄(Gd,Y)₅ greatly decreased. Improved corrosion resistance of aged alloys could be attributed to the corrosion pits produced by the dissolution of the nano-scale β' phase were tiny and uniform, which led to the corrosion products on the surface more compact. However, slightly lower of corrosion resistance for the T6-500 h alloy was attributed to the spacing of the reticular structure of β' phase became wider and some of them transformed for β phase (Mg₂₄ (Gd,Y)₅), the local corrosion was enhanced again.

Keywords: Mg alloy; over-aging treatment; corrosion; electrochemistry

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