Manganate Conversion Coating for Magnesium Alloys

方國男、李春穎

E-mail: 9314767@mail.dyu.edu.tw

ABSTRACT

Phosphate-peramnganate conversion coating treatment has been made on the AZ31magnesium alloy, with emphasis on the formation mechanism and microstructure of the coating. Furthermore, the growth kinetic of the coating was investigated via the measurement of the weight differerce of the specimens before and after conversion coating treatment. The operation parameters studied included the solution temoperature and immersion time. Experimental results indicate that as the immersion proceeded, the surface of the AZ31 alloy changed from grey to dark brown. Meanwhile, as the thickness and weight of the coating increased with increasing immersion time, the corrosion resistance of the AZ31 alloy was improved as evident from the polarization curve and the salt spray test. Accompanying with the increase in coating thickness, SEM revealed that numerous microcracks formed with their crack opening increased with the coating thickness. Finally, corss-sectional TEM resolved the coating was porous and consisted of nano-sized crystallities dispersed within the amorphous matrix. The coating mainly contained phosphorus, oxygen, magnesium, manganese and aluminum.

Keywords : magnesium alloy, phosphate-peramnganate conversion coating, polarization curve, salt spray test.

Table of Contents

REFERENCES

1. 楊智超，輕量化新鎂合金材料之發展，工業材料，198 (2003)，pp.81-85 2. 邱六合，林信安，鎂合金腐蝕與表面處理，工業材料，186(2002) pp.118-124 3. 王燕華，唐曉，王佳，鎂合金微弧氧化處理及其性能研究，第三屆海峽兩岸材 料腐蝕與防護研討會論文集，pp.529-532 4. 楊智超，鎂合金材料之新發展方向，工業材料，186 (2001)，pp.75-79 5. 莊錦川，具備輕量化潛力的擠型鎂合金，工業材料，180(2000)，pp.134-138 6. 王建義，鎂合金之環保化工業材料，186 (2001) ，pp.125-130 7. 王建義，若原幸藏，劉坤山，鎂合金之非鉻酸鹽，工業材料，197(2003)，pp.155-159 8. 賴文啟，鎂鋁合金錫酸鹽皮膜化成處理之研究，逢甲大學碩士論文，2002 9. 張志坤，黃庭彬，陳復國，鎂合金AZ31板材之沖壓製程，工業材料，186 (2002)，pp.99-105 10. J. E. Gray, B. Luan，“ Protective Coatings on Magnesium and Its -Alloy－A Critial Review ” , Journal of Alloys and Compounds， -336 (2002)，pp.88-113 11. H. Umehara, M. Takaya and Y. Kojima，“ An Investigation of the -Structure and Corrosion Resistance of Permanganate Conversion -Coatings on AZ91D Magnesium Alloy ” , Materials Transactions -， 42(2001)，pp.1691-1699 12. M. A. Gonzalez-Nunez, P. Skeldon, G. E. Thompson, and H. -Karimzadeh，“ Kinetics of the Development of a Nonchromate -Conversion Coating for Magnesium Alloys and Magnesium Based -Metal Matrix Composites ” , Corrosion，55 (1999)，pp.1136-1143 13. A.L.Rudd,C.B.Breslin and F.Mansfeld ,“ The Corrosion Protection -Afforded by Rare Earth Conversion Coatings Applied to -Magnesium ” , Corrsion Science，42(2000)，pp.275-288 14. S. Ono, K. Asami, T. Osaka and N.Masuko，“ Structure of Anodic -Films Formed on Magnesium ” , J. Electroclem. Soc.，Vol.143， -(1996)， pp.L62-L63. 15. Y.Xiang, W. Hu, X. Liu, C. Zhao and W. Ding ,“ A Study on -Surface State during the Pretreatment of Electroless Nickel plating -on Magnesium Alloy ” , Trans IMF ， Vol.79，(2001)，pp.27-29. 16. A.Yamamoto, A.Watanabe, K. Sugahara, S. Fukumoto and -H.Tsubakino，“ Deposition Coating of Magnesium Alloys with Pure -Magnesium ” , Materials Transactions，Vol.42，(2001)，pp.1237-1242. 17. Dr. Quan-Sheng Song ,“ Electrochemical Measurement -Techniques ” , National Taiwan University Metal Hydride Lab，pp.1-10 18. 賴耿陽，金屬的化成處理，富漢出版社，(1999)，pp.102-109