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研究报告

离子液体 AlCl_3 -[bmim]Cl中电沉积铝的研究

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摘要: 在摩尔比为2:1的 AlCl_3 -[bmim]Cl离子液体中, 加入一定量的甲苯, 控制阴极电流密度, 在基体铁片上获得银白色和平整致密的铝镀层。循环伏安实验表明离子液体中沉积铝源于 Al_2Cl_7^- 的还原, 还原峰电位为-0.34 V; 当电流密度为20 mA/cm²时, 最大电流效率达97%; 所得铝镀层的厚度与电镀时间呈抛物线关系; 在电流密度小于35 mA/cm²时, 镀层厚度随电流密度增大呈逐渐递增趋势; 扫描电镜、X射线能谱对铝镀层分析结果表明(45±2)℃温度得到平整致密纯度高的铝镀层; 当电流密度为20 mA/cm²时, 铝镀层呈薄片状生长, 随电流密度的增大, 镀铝层形貌由片状向粒状过渡, 并伴随着晶粒的细化。

关键词: 电沉积 离子液体 铝 镀层厚度 电流密度ELECTRODEPOSITION OF ALUMINUM FROM AlCl_3 -[bmim]Cl IONIC LIQUIDS

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Abstract: Dense, well adherent and silvery bright aluminum coating was obtained on iron substrates from 2 AlCl_3 /[bmim]Cl ionic liquids contained of a small amount of toluene at various cathode current densities. Cyclic voltammogram show that the deposition is obtained owing to the reduction of Al_2Cl_7^- which has a peak value of -0.34 V; The maximal current efficiency of 97% is obtained when current density is 20 mA/cm². The thickness of aluminum coating increases with prolongation of plating time and the increase of cathode current density when it is less than 35 mA/cm². The results investigated by SEM and DES show that the aluminum electrodeposits obtained on Fe electrodes were dense, continuous and higher purity at 45±2℃ temperature. When the current density is 20 mA/cm², the aluminum is deposited in a flaky form, with the increasing of the current density, the form of the aluminum layer changes from flake to graininess, and at the same time, the size of the grains decreases.

Keywords: electrodeposition ionic liquid aluminum thickness current density

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参考文献:

- [1] Deng Y Q. Ionic liquid-property preparations and application. [M]. Beijing: China Petrochemical Press, 2006
- [2] (邓友全. 离子液体-性质、制备与应用 [M]. 北京: 中国石化出版社, 2006)
- [3] Zhao Y G, Vander N T J. Electrodeposition of aluminum from room temperature AlCl_3 -TMPAC molten salts [J]. Electrochem. Acta, 1997,42(11): 1639-1643 
- [4] Liao Q, Pitner W R, Gemma S, et al. Electrodeposition of aluminum from the aluminum chloride-1-methyl-3-



- [5] Reddy R G. Emerging technologies in extraction and processing metals [J]. Metall. Mater. Trans. 2003, 34B(2): 137-152
- [6] Yue G, Lu X, Zhu Y, et al. Surface morphology, crystal structure and orientation of aluminum coatings electrodeposited on mild steel in ionic liquid [J]. Chem. Eng. J., 2009, 147(1): 79-86 
- [7] Yue G, Zhang S, Zhu Y, et al. A promising method for electrodeposition of aluminum on stainless steel in ionic liquid [J]. AIChE J., 2009, 55(3): 783-796 
- [8] Gao. L, Wang L, Qi T, et al. Electrodeposition of aluminum from $AlCl_3/Et_3NHCl$ ionic liquids [J]. Acta Phys. - Chim. Sin., 2008, 24(6): 939-944 
- [9] Jiang T, Chollier B M J, Dube G. Electrodeposition of aluminum from ionic liquids: Part I -electrodeposition and surface morphology of aluminum from aluminum chloride ([EMIM]Cl) ionic liquid [J]. Surf. Coat. Technol., 2006, 201: 1-9
- [10] Tetsuya T, Toshiyuki N, Yasuhiko I. Nucleation and surface morphology of aluminum-lanthanum alloy electrodeposited in a $LaCl_3$ -saturated $AlCl_3$ -EtMeImCl room temperature molten salt [J]. Electrochem. Acta, 2002, 47(17): 2817-2822 
- [11] Feng Q Y, Ding Z M, Jia L S, et al. Low temperature electroplating aluminum in molten salt [J]. Mater. Prot., 2004, 37(4): 1-3
- 冯秋元, 丁志敏, 贾利山等. 低温熔融盐电镀铝的研究 [J]. 材料保护, 2004, 37(4): 1-3 

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2. 刘辉, 孙明先, 马力, 闫永贵. 杂质 Fe 对 Al-Zn-In 牺牲阳极性能的影响 [J]. 中国腐蚀与防护学报, 2011, 23(6): 514-517
3. 董立峰. ZQMn12-8-3-2 高锰铝青铜在 2.4% NaCl 溶液中的空蚀行为 [J]. 中国腐蚀与防护学报, 2011, 23(6): 485-489
4. 吝大亮, 刘瑛, 尹晓爽, 唐永明, 杨文忠. 3A21 铝合金表面 1,4-双(3-三乙氧基丙基尿基苯)涂层的耐蚀性研究 [J]. 中国腐蚀与防护学报, 2011, 23(6): 471-474
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