中国腐蚀与防护学报 >>2011 >>31 >>(5)

中国腐蚀与防护学报 2011, **31**(5) 362-366 **DOI**: **ISSN**: 1005-4537 **CN**: 31-1421/TG

研究报告

添加剂对四羟丙基乙二胺（THPED）化学镀厚铜的影响

申晓妮[1,2],赵冬梅[1],任凤章[1],田保红[1]

1. 河南科技大学材料科学与工程学院 洛阳 471003
2. 河南省有色金属材料科学与加工技术重点实验室 洛阳 471003

摘要： 为开发THPED-EDTA•2Na化学镀厚铜工艺，研究了添加剂L-精氨酸，聚乙二醇（PEG）和亚铁氰化钾（$K_4Fe(CN)_6$）对化学镀速、镀层质量及镀液稳定性的影响。结果表明，适量L-精氨酸能显著提高化学镀速，其适宜的添加量为0.15 mg•L^{-1}； PEG和$K_4Fe(CN)_6$使铜还原速率有所降低，但均能改善镀层外观质量，其适宜的添加剂用量分别为150 mg•L^{-1} 和20 mg•L^{-1}。三种添加剂均能提高镀液稳定性，混合添加剂稳定性最高，80℃下稳定时间近5 h。在适宜条件下镀速为7.10 μm•h^{-1}，施镀15 min后获得的镀层表面平整、晶粒细致和外观红亮。沉积层为立方晶系铜，且在(111)晶面择优沉积，背光级数达到10级。

关键词： 添加剂 化学镀厚铜 四羟丙基乙二胺 L-精氨酸 $K_4Fe(CN)_6$ 聚乙二醇

INFLUENCES OF ADDITIVES ON ELECTROLESS THICK COPPER PLATING BASED ON THPED SYSTEM

SHEN Xiaoni[1,2], ZHAO Dongmei[1], REN Fengzhang[1], TIAN Baohong[1]

1. School of Materials Science and Engineering, Henan University of Science and Technology, Luoyang 471003
2. Henan Key Laboratory of Advanced Nonferrous Metal Materials,Luoyang 471003

Abstract: The influences of additives on plating rate, coating quality and bath stability were investigated to develop THPED-EDTA•2Na thick copper plating process. The plating rate is obviously increased by proper amount of L-arginine, and its proper dosage is 0.15 mg•L^{-1}; the coating quality is greatly improved by proper amount of PEG and ferrous potassium cyanide in spite of slight decrease of plating rate, and the proper amount are 150 mg•L^{-1} and 20 mg•L^{-1}, respectively. The stability of bath is enhanced by all these additives and the stability time of bath in which mixed additives is added reaches the highest of 5 h at 80℃. The plating rate is 7.10 μm•h^{-1} and the backlight level achieves 10th grade under appropriate conditions after plating for 15 min. The coating is red, bright and uniform, the sedimentary layer is cubic copper and the crystal of copper coating is mainly assigned to the (111) face.

Keywords: additive electroless thick Cu plating THPED L-arginine ferrous potassium cyanide PEG

收稿日期 2010-07-21 **修回日期** 2010-09-23 **网络版发布日期** 2011-10-25

DOI:

基金项目:

国家自然科学基金项目（50771042）和河南省基础与前沿技术研究计划项目（092300410064）资助

通讯作者: 任凤章

作者简介: 申晓妮，女，1982年生，硕士生，研究方向为电沉积、腐蚀与防护

通讯作者E-mail: lyrenfz@163.com

参考文献：

[1] Fang J L. Theory and Application of Electroplating Additives [M]. Beijing: National Defence Industry Press, 2007

[2] (方景礼. 电镀添加剂理论与应用 [M]. 北京: 国防工业出版社, 2007)

[3] Li D P, Yang C L. Acidic electroless copper deposition on aluminum-seeded ABS plastics [J].Surf. Coat. Technol., 2009, 203: 3559-3568

[4] Wang G J, Wang D Z. Preparation and characterization of molybdenum powders with copper coating by the electroless plating technique [J]. Rare Met.,2008, 27(4): 434-438

[5] Lee C Y, Won C M, Jung S B. Surface finishes of rolled copper foil for flexible printed circuit board [J]. Mater. Sci. Eng., A, 2008,483/484(15): 723-726

[6] Sridhar A, Van Dijk D J, Akkerman R. Ink jet printing and adhesion characterization of conductive tracks on a commercial printed circuit board material [J]. Thin Solid Films, 2009, 517(16): 4633-4637

[7] Noh B I, Lee J B, Jung S B. Effect of surface finish material on printed circuit board for electrochemical migration [J]. Microelectron.Reliab., 2008, 48(4): 652-656

[8] Yang F Z, Yang B, Lu B B, et al. Electrochemical study on electroless copper plating using sodium hypophosphite as reductant [J]. Acta Physico-Chim.Sin., 2006, 22(11): 1317-1321

[9] Ando S, Endoh M, Nakamura T. Electrolytic copper-plated R-T-B magnet and plating method thereof [P]. U.S. Pat., 6866765, 2005

[10] Donahue F M, Sajkowski D J, Bosio A C. Kinetics of electroless copper plating inhibition by adsorption of ligand [J]. J. Electrochem. Soc., 1982,129(4): 717-719

[11] Zheng Y J, Zhou W H, Yi D Q, et al. Electroless copper plating in the presence of THPED and EDTA•2Na as the dual-chelating agent [J]. Mater.Prot., 2006, 39(2): 20-24

郑雅杰, 邹伟红, 易丹青等. 四羟丙基乙二胺和EDTA•2Na盐化学镀铜体系研究 [J]. 材料保护, 2006, 39(2): 20-24)

[12] Zhou W H. Fast copper plating process and mechanism [D]. Changsha: Central South University, 2006

[13] (邹伟红. 快速化学镀铜工艺及机理研究 [D]. 长沙: 中南大学, 2006)

[14] Li C H. Study on electroless copper plating technology of high plating rate in triethanolamine and EDTA$\cdot $ 2nd [D]. Changsha: Central South University, 2007

[15] (李春华. 三乙醇胺和EDTA$\cdot$2Na双配合体快速化学镀铜研究 [D]. 长沙: 中南大学, 2007)

[16] Hu G H, Yang F Z, Wu H H. The effect of additives on electroless copper plating on ceramic surface [J]. Electroplat. Finish., 2002, 21(3): 26

胡光辉, 杨防祖, 吴辉煌. 添加剂对化学镀铜的影响 [J]. 电镀与涂饰, 2002, 21(3): 26)

[17] Geng X, Bai Y Q, Ren G N, et al. Physical chemistry of the electroless copper [J]. J.Shenyang Univ. Technol., 2006,28(2): 225-229

耕新, 白艳秋, 任公年等. 化学镀铜的物理化学 [J]. 沈阳工业大学学报, 2006, 28(2): 225-229)

[18] Xu X C, Huang S K. The control degree of cathodic and anodic reactions in electroless copper plating system of Cu(II)-EDTA-HCHO [J]. Plat.Finish., 1987, 9(6): 12-14

徐喜初, 黄树坤. Cu(II)-EDTA-HCHO化学镀铜中阴、阳极反应的控制程度 [J].电镀与精饰, 1987, 9(6): 12-14)

[19] Wang C L, Wang Y E, Qu P, et al. Multilayer flexible PCB electroless copper plating technology research [J]. Print. Circuit Board Inf., 2009, 5: 84-86

本刊中的类似文章

1．姚国光 刘鹏 马红 田秀劳.Mg4Nb2O9/SrTiO3复合陶瓷的烧结特性和微波介电性能[J]. 中国腐蚀与防护学报, 2010,24(4): 444-448

2．刘林林 李曙 刘阳 .几种合成高铼酸盐的减摩行为[J]. 中国腐蚀与防护学报, 2010,46(02): 233-238

3．王典 刘建国 殷跃军 韩长智 严川伟.钛添加剂对无铬达克罗防护性能的影响[J]. 中国腐蚀与防护学报, 2009,21(4): 426-428

4．吴成剑 周婉秋 许淳淳 张召恩.有机胺类添加剂对热浸镀锌板钼酸盐钝化膜耐蚀性能的影响[J]. 中国腐蚀与防护学报, 2009,21(4): 377-379

5．崔作兴 邵忠财 刘志远 赵立新 田彦文.添加剂对镁合金微弧氧化膜性能的影响[J]. 中国腐蚀与防护学报, 2009,23(2): 193-198

6．张锡凤; 殷恒波; 程晓农; 赵歆; 蒋忠桂; 王爱丽 .修饰剂对液相还原法制备的纳米镍粒子形貌与尺寸的影响[J]. 中国腐蚀与防护学报, 2006,42(4): 383-388

7．邓丽琴; 许茜; 马涛; 李兵; 翟玉春 .电脱氧法制备铌用Nb2O5阴极活性的改进[J]. 中国腐蚀与防护学报, 2005,41(5): 551-555

8．王志; 毕诗文; 杨毅宏 .添加剂对铝酸钠溶液碳酸化分解产物粒度和强度的影响[J]. 中国腐蚀与防护学报, 2004,40(9): 1005-1008

9．叶萍萍; 李曙; 姜晓霞; 李诗卓 .纳米硫代钼酸镍润滑添加剂的制备及性能[J]. 中国腐蚀与防护学报, 2001,15(6): 630-634

10．安百刚; 赵国鹏 .添加剂在电沉积非晶态Cr-C合金工艺中的作用[J]. 中国腐蚀与防护学报, 2001,13(3): 180-181
