材料研究学报 >>2012 >>26 >>(1)

材料研究学报 2012, 26(1) 49-54 DOI: ISSN: 1005-3093 CN: 21-1328/TG

研究论文

银铜双金属纳米合金的制备和电催化性质

刘婧, 陈福义, 张吉晔, 樊莉红, 张金生

西北工业大学凝固技术国家重点实验室 西安 710072

摘要: 采用电沉积方法制备银铜双金属纳米合金, 用X射线衍射仪(XRD)及高分辨率透射电子显微镜(HRTEM), 扫描电子显微镜(SEM)和电化学工作站分别对样品的结构、微观形貌和电催化性质进行了表征。结果表明, 银铜双金属纳米合金电极在H_2O_2溶液中表现出较强的还原电流, 可以作为阴极催化剂; 随着银铜双金属纳米合金沉积电位的变负, 阴极催化作用减弱, 形貌由穗状晶向树枝晶转变; 随着铜离子浓度的提高, 阴极催化作用增强, 银铜双金属纳米合金的形貌由树枝晶向棒状晶转变。这意味着, 本文观察到了银铜双金属纳米合金的双金属电催化协同效应。

关键词: 金属材料 电化学沉积 银铜双金属纳米合金 催化性能

Electrodeposition and Electrocatalytic Properties of Silver－Copper Bimetallic Nanoalloy

LIU Jing, CHEN Fuyi, ZHANG Jiye, FAN Lihong, ZHANG Jinsheng

State Key Laboratory of Solidification Processing, Northwestern Polytechnical University, Xi’an 710072

Abstract: Silver－copper (Ag－Cu) bimetallic nanoalloys were prepared by electrodeposition methods and their microstructure, morphology and electrocatalytic properties were characterized by XRD, HRTEM, SEM and electrochemical workstation. The results show that the silver－copper bimetallic nanoalloy electrodes exhibit a large reduction current peak in H2O2 solutions, indicating that silver-copper bimetallic nanoalloy can be used as a cathode catalytic. The morphology of silver-copper bimetallic nanoalloys changes from spiciform crystal to dendritic crystal and the cathode catalytic performance decreases with increasing deposition potential; The morphology of the nanoalloys changes from dendritic crystal to rod-shaped crystal and the cathode catalytic performance increases with the increasing of Cu2+ concentrations. It can be concluded that the synergistic effects are observed in the electrocatalytic performance for silver-copper bimetallic nanoalloys.

Keywords: metallic materials electrodeposition silver－copper bimetallic nanoalloy catalytic performance

收稿日期 2011-06-23 **修回日期** 2011-10-31 **网络版发布日期** 2012-02-10

DOI:

基金项目:

国家自然科学基金(50971100, 50671082), 西北工业大学基础研究基金(NPU--FFR--ZC200931), 凝固技术国家重点实验室自主研究课题(30--TP--2009), 研究生创业种子基金(Z2011002, Z2010011, Z200915)资助项目。

通讯作者: 陈福义

作者简介:

通讯作者E-mail: fuyichen@nwpu.edu.cn

扩展功能

本文信息

Supporting info

PDF(1059KB)

[HTML] 下载

参考文献[PDF]

参考文献

服务与反馈

把本文推荐给朋友

加入我的书架

加入引用管理器

引用本文

Email Alert

文章反馈

浏览反馈信息

本文关键词相关文章

金属材料

电化学沉积

银铜双金属纳米合金

催化性能

本文作者相关文章

刘婧

陈福义

张吉晔

樊莉红

张金生

PubMed

Article by Liu,j

Article by Chen,F.X

Article by Zhang,J.Y

Article by Fan,L.H

Article by Zhang,J.S

参考文献：

[1] M.E.Indig, R.N.Snyder, An interesting anodic fuel (1), J. Electrochem. Soc., 109(11), 1104(1962)

[2] S.C.Amendola, P.Onnerud, M.T.Kelly, P.J.Petillo, S.L.Sharp-Goldman, M.Binder, A novel high power density borohydride-air cell, J. Power Sources, 84(1), 130(1999)

[3] S.M.Lee, J.H.Kim, H.H.Lee, P.S.Lee, J.Y.Lee, The Characterization of an alkaline fuel cell that uses hydrogen storage alloys, J.Electrochem. Soc., 149(5), A603(2002)

[4] WANG Yonggang, XIA Yongyao, A direct borohydride fuel cell using MnO2-catalyzed cathode and hydrogen storage alloy anode, Electrochem. Commun., 8(11), 1775 (2006)

[5] FENG Ruixiang, CAO Yuliang, AI Xinping, YANG Hanxi, AgNi alloy used as anodic catalyst for direct borohydride fuel cells, Acta Phys. Chim. Sin., 23(6), 932(2007)

[6] N.A.Choudhury, R.K.Raman, S.Sampath, A.K.Shukla, An alkaline direct borohydride fuel cell with hydrogen peroxide as oxidant, J. Power Sources, 143(1), 1(2005)

[7] G.H.Miley, N.Luo, J.Mather, R.Burton, G.Hawkins, L.F.Gu, E.Byrd, R.Gimlin, P.J.Shrestha, G.Benavides, J.Laystrom, D.Carroll, Direct NaBH4H2O2 fuel cells, J. Power Sources, 165(2), 509(2007)

[8] R.K.Raman, N.A.Choudhury, A.K.Shukla, A 28-W portable direct borohydride--hydrogen peroxide fuel-cell stack, Electrochem. Solid State Lett., 7(12), A488(2004)

[9] R.R.Bessette, J.M.Cichon, Dischert., E.G.Dow, A study of cathode catalysis for the aluminium/hydrogen peroxide semi-fuel cell, J. Power Sources, 80(1), 248(1999)

[10] Russell R. Bessette, Maria G. Medeiros, Charles J. Patrissi, Craig M. Deschenes Christopher N. LaFratta, Development and characterization of a novel carbon fiber based cathode for semi-fuel cell applications, J. Power Sources, 96(1), 240(2001)

[11] YANG Weiqian, YANG Shaohua, SUN Wei, SUN Gongquan, XIN Qin, Nanostructured palladium-silver coated nickel foam cathode for magnesium--hydrogen peroxide fuel cells, Electrochim. Acta, 52, 9(2006) crossref

[12] WEI Jianliang, WANG Xianyou, WANG Hong, YANG Shunyi, DAI Chunling, PEI Fu, Performance of nanosized Au particle as a cathode catalyst for direct borohydride-hydrogen peroxide fuel cell, Acta Chim. Sin., 66(24), 2675(2009)

[13] YANG Weiqian, YANG Shaohua, SUN Wei, SUN Gongquan, XIN Qin, Nanostructured silver catalyzed nickel foam cathode for an aluminum--hydrogen peroxide fuel cell, J. Power Sources, 160, 1420(2006) crossref

[14] KE Xi, CUI Guofeng, SHENG Peikang, Stability of Pd--Fe alloy catalysts, Acta Phys. Chim. Sin., 25(2), 213(2009)

[15] WU Gang, Karren L. More, Christina M. Johnston, Piotr Zelenay, High-performance electrocatalysts for oxygen reduction derived from polyaniline,iron, and cobalt, Science, 332, 443(2011) crossref

[16] J.H.Sinfelt, Bimetallic Catalysts: Discovery, Concepts, and Applications (New York, Wiley, 1983) p.130 crossref

[17] G.Schmid, A.Lehnert, J.O.Malm, J.O.Bovin, Ligand-stabilized bimetallic colloids identified by HRTEM and EDX, Angewandte Chemie International Edition in English, 30(7), 874 (1991)

[18] I.Sunagawa, Morphology of Crystals (Kluwer Acaddemic, Dordrecht, 1987) p.509

[19] LI Zhongchun, CHEN Xuhong, ZHAO Xinghong, ZHAO Zhenyi, Preparation and electroca talytic properties of silver-copper bimetallic nanoalloy, Journal of Jiangsu Teachers University of Technology, 16(9), 49(2010)

[20] WANG Guiling, LAN Jian, CAO Dianxue, SUN Kening, Recent advance in research on direct NaBH$_{4$/H$_{2$O$_{2$ fuel cells, Journal of Chemical Industry and Engineering (China), 59(4), 805(2008)

[21] WU Huihuang, Application of Electrochemical Basis (Xiamen, Xiamen University Press, 2006) p.160

[22] CHANG Gang, JIANG Zucheng, PENG Tianyou, HU Bin, Preparation of high-specific-surface-area nanometer-sized alumina by sol-gel method and study on adsorption behaviors of transition metal ions on the alumina powder with icp-aes, Acta Chim. Sin., 60(1), 100(2003)

[23] FAN Youjun, ZHEN Chunhua, CHEN Shengpei, SUN Shigang, Effect of specific adsorption of anions and surface structure of Pt(111) electrode on kinetics of dissociative adsorption of ethylene glycol, Acta Phys. -Chim. Sin., 25(5), 999(2009)

本刊中的类似文章

1．张小强 张 健** 楼琅洪
.应变速率对一种无铼第二代单晶高温合金950℃低周疲劳性能的影响
[J]. 材料研究学报, 2015,(8): 0-0

2．江荣 陈波 郝宪朝 李硕 马颖澈 刘奎.熔体过热处理对690合金显微组织的影响[J]. 材料研究学报, 2012,26(1): 78-84

3．曹晓晖 陈威宏 刘宇 孙杰 曹晓晖 王文举 于名讯.二次化学共沉淀法制备片状钡铁氧体的形成历程及磁性能研究[J]. 材料研究学报, 2012,26(1): 107-112

4．豆喜华 赵韦人 宋恩海 周国雄 易春雨 周民康.紫外激发蓝色荧光粉$Sr_{2-x-y}B_5O_9Cl:xEu^{2+}$, yTb^{3+}的合成和发光性能[J]. 材料研究学报, 2012,26(1): 96-100

5．樊俊铃 郭杏林 吴承伟 邓德伟.热处理对FV520B钢疲劳性能的影响[J]. 材料研究学报, 2012,26(1): 61-67

6．叶诚 杜晓东 杨皓宇.钢表面颗粒增强熔覆层的组织和性能[J]. 材料研究学报, 2012,26(1): 55-60

7．杨武涛 杨卫华 付芳.PEG/CPB复配改性二氧化铅电极的制备和性能[J]. 材料研究学报, 2012,26(1): 8-12

8．刘义 李海金 张清 刘厚通.钙钛矿型热电氧化物$Y_{0.95}R_{0.05}CoO_3$ (R=Ca, Sr, Ba)的制备和热电性能[J]. 材料研究学报, 2012,26(1): 31-36

9．侯自勇 许云波 吴迪.超快速退火对Nb+Ti--IF钢组织和织构的影响[J]. 材料研究学报, 2012,26(1): 13-20

10．薛文斌 金乾 杜建成 华铭 吴晓玲.不锈钢表面阴极微弧电沉积氧化铝膜层的性能[J]. 材料研究学报, 2012,26(1): 21-25

Copyright by 材料研究学报