

目录

镁合金表面制备硅掺杂类金刚石膜的性能研究

李庆刚¹, 罗庆丽², 王修春¹, 罗庆刚³

1.山东省科学院新材料研究所, 山东 济南 250014; 2.山东省劳动职业技术学院基础部, 山东 济南 250022; 3.济南安塞自动化技术有限公司, 山东 济南 250022

摘要:

将无铬化学转化新工艺与射频等离子化学气相沉积(PECVD)技术相结合,先在镁合金表面生成一层多孔结构、附着力高的化学转化膜作为过渡层,再采用PECVD技术低温沉积一层硅掺杂类金刚石(Si-DLC)薄膜复合涂层。扫描电子显微镜和拉曼光谱图分析证实,获得的薄膜由sp²和sp³键杂化的碳硅氢化合物呈层状堆积而成,薄膜均匀、平整致密;制备的薄膜为典型的类金刚石结构。原子力显微镜直观地观察到,掺杂硅的类金刚石薄膜比未掺杂的平整致密。当硅含量达到20%时,得到的DLC薄膜最为平整致密,无铬化学转化膜层均被含硅的DLC薄膜覆盖。性能测试实验表明,将化学转化膜作为中间过渡层并采用PECVD沉积含硅的DLC薄膜明显提高了镁合金基体与结合强度,同时也大幅度提高了镁合金的耐磨、耐高温和耐腐蚀性。

关键词: 化学转化膜 射频等离子化学气相沉积 硅掺杂类金刚石 镁合金

Research on the properties of diamond like carbon films prepared on magnesium alloy substrate

LI Qing-Gang¹, LUO Qing-Li², WANG Xiu-Chun¹, LUO Qing-Gang³

1.New Material Institute, Shandong Academy of Sciences, Jinan 250014, China; 2.Department of Basic Courses, Shandong Labor Vocation and Technical College, Jinan 250022, China; 3.Jinan ASI Automation Co.Ltd., Jinan 250022, China

Abstract:

We employed the new technology of chromium free chemical conversion surface treatment and plasma enhanced chemical vapor deposition (PECVD) to prepare diamond like carbon (DLC) films by two steps. We initially formed a porous structure on Mg alloy substrate and took a high adhesion film as the transitional layer. We further employed PECVD technology to prepare DLC films with Si-DLC. Scanning electron microscope and Raman spectroscopy demonstrate that the films are uniform, smooth and compact, and composed of layered compounds of C, Si and H. The films also have the same characteristics as DLC. Observation through an atomic force microscope (AFM) shows that Si-DLC films are more compact than un-doping Si-DLC films. Si-DLC films are the most compact and completely cover the chemical conversion coating. Performance test shows that the intermediate layer between chemical conversion coating and Si-DLC film significantly improves the bond strength between Mg alloy substrate and DLC film. The intermediate layer also dramatically improves wear resistance, high temperature resistance and corrosion resistance capabilities of Mg alloy.

Keywords: chemical conversion coating plasma enhanced chemical vapor deposition diamond like carbon film magnesium alloy

收稿日期 2011-11-15 修回日期 网络版发布日期

DOI: 10.3976/j.issn.1002-4026.2012.02.014

基金项目:

通讯作者:

作者简介: 李庆刚(1976-), 硕士, 助理研究员, 研究方向为表面处理、金属防护与润滑等。Email:

lqg1128@126.com

作者Email:

参考文献:

本刊中的类似文章

扩展功能

本文信息

- ▶ Supporting info
- ▶ PDF(1861KB)
- ▶ [HTML全文]
- ▶ 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

- ▶ 化学转化膜
- ▶ 射频等离子化学气相沉积
- ▶ 硅掺杂类金刚石
- ▶ 镁合金

本文作者相关文章

- ▶ ?????o????
- ▶ ?????o????
- ▶ ??????????¥
- ▶ ?????o????

PubMed

- ▶ Article by Li, Q. G.
- ▶ Article by Luo, Q. L.
- ▶ Article by Wang, X. C.
- ▶ Article by Luo, Q. G.

1. 李卫红, 杨院生, 田长文, 唐守秋, 刘运腾. 镁合金短流程合金化熔炼工艺研究进展[J]. 山东科学, 2010,23(5): 15-21
 2. 唐守秋, 周吉学, 田长文, 李卫红, 杨院生. 镁合金定向凝固技术研究的意义与进展[J]. 山东科学, 2011,24(4): 18-22
 3. 赵德刚, 田长文, 刘运腾, 姜利坤, 詹成伟. 复合添加Nd与B对AZ91镁合金组织和力学性能的影响[J]. 山东科学, 2011,24(4): 23-27
-

Copyright by 山东科学