

研究论文

干摩擦磨损过程中表面粗糙度的定量描述

刘洪涛, 靳晶, 曹守范, 葛世荣

中国矿业大学材料科学与工程学院 徐州 221116

摘要: 基于金属磨损试验以及得出的摩擦系数和磨损形貌的变化规律, 用轮廓算术平均偏差Ra、均方差 σ 、统计分布参数、偏态系数Rsk和峰态系数Rku等可用于分析摩擦副磨损表面特性的典型表面粗糙度表征参数, 定量分析了磨损过程中表面粗糙度的变化规律。结果表明, 磨损稳定后, Ra和 σ 逐渐降低, 磨损表面凸峰是钝峰, 轮廓高度分布越来越符合正态分布且数据分布越来越集中。

关键词: 材料表面与界面 磨损 表面粗糙度 表征参数 分布 机理

The Quantitative Analysis of Surface Roughness in the Dry Friction

LIU Hongtao, JIN Jing, CAO Shoufan, GE Shirong

School of Materials Science and Engineering, China University of Mining and Technology, Xuzhou 221116

Abstract: Based on the wear test of metal materials and the variation law of friction coefficients and the surface topographies of wear, the variation of surface roughness during the process of wear was quantitatively studied by using the typical characterizing parameters such as arithmetical mean deviation of the profile (Ra), mean square error (σ), statistical distribution parameters, coefficient of skewness (Rsk) and coefficient of kurtosis (Rku). The results indicated that after the wear was stable, Ra and σ were both decreased gradually and the profile peaks on the wear surface were blunt. In addition, the distribution of profile's height was more and more near normal distribution and the data were more and more concentrated.

Keywords: surface and interface in the materials wear surface roughness characterizing parameters distribution mechanism

收稿日期 2011-07-21 修回日期 2011-08-11 网络版发布日期 2011-10-25

DOI:

基金项目:

国家自然科学基金51075387资助项目。

通讯作者: 刘洪涛

作者简介:

通讯作者E-mail: tribocumt@126.com

扩展功能

本文信息

- Supporting info
- PDF(1090KB)
- [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

- 材料表面与界面
- 磨损
- 表面粗糙度
- 表征参数
- 分布
- 机理



本文作者相关文章

- 刘洪涛
- 靳晶
- 曹守范
- 葛世荣

PubMed

- Article by Liu,H.S
- Article by Jin,j
- Article by Cao,S.F
- Article by Ge,S.R

参考文献:

- [1] A.I.Dmitriev, M.Schaggott, V.L.Popov, Direct modelling of surface topography development in a micro-contact with the movable cellular automata method, *Wear*, 268, 877(2010) 
- [2] E.Y.A.Worniyoh, V.K.Jasti, C.F.Higgs, A review of dry particulate lubrication: powder and granular materials, *Journal of Tribology*, 129, 438(2007) 
- [3] S.Mezlini, M.B.Tkaya, M.E.Mansori, H.Zahouani, P.Kapsa, Correlation between tribological parameters and wear mechanisms of homogeneous and heterogeneous material, *Tribology Letter*, 33, 153(2009) 
- [4] WEN Shizhu, Centurial review and prospect—The development tendency of tribology, *China Journal of Mechanical Engineering*, 36(6), 1(2000)
- [5] YUAN Chenqing, LI Jian, YAN Xinping, Tribological testing technology and its development, *Tribology*, 22(4s), 447(2002)
- [6] G.Straffelini, G.Bizzotto, V.Zanon, Improving the wear resistance of tools for stamping, *Wear*, 269, 693(2010) 
- [7] Z.K.Zhang, Y.Y.Zhang, Y.S.Zhu, A new approach to analysis of surface topography, *Precision Engineering*, 34, 807(2010) 
- [8] LI Fenlan, TANG Wenyan, DUAN Haifeng, HAO Jianguo, New development in research of non-contact surface roughness measurement, *Laser & Infrared*, 37(6), 498(2007) 
- [9] CHAO Caixia, YANG Shengmiao, XIU Shichao, Characteristics of the point grinding surface texture and its effects on evaluation parameters of the surface roughness, *Journal of Northeastern University(Natural Science)*, 32(6), 846(2011)
- [10] JI Shengya, SUN Leming, Influence of surface roughness on electric-current friction and wear properties of copper-base PM/QCr0.5 couples, *Lubrication Engineering*, 36(3), 69(2011)
- [11] GE Shirong, ZHU Hua, *Fractal in Tribology* (Beijing, China Machine Press, 2005) p.85, p.227
- [12] WEN Jianping, ZHEN Minghui, CHENG Wenkong, YU Na, Structural design and tribological properties for aluminium-plastics self-lubricating composites, *China Mechanical Engineering*, 17(21), 2292(2006)
- [13] P.S.Agarwal, V.Rao, A probabilistic approach to predict surface roughness in ceramic grinding, *International Journal of Machine Tools & Manufacture*, 45, 609(2005) 
- [14] CHEN Yu, CAO Ping, PU Chengzhi, LIU Yeke, LI Na, Experimental study of effect of water-rock interaction on micro-topography of rock surface, *Rock and Soil Mechanics*, 31(11), 3452(2011)
- [15] B.Bhushan, *Introduction to Tribology* (New York, John Wiley & Sons, 2002) p.29 

本刊中的类似文章

1. 邓春明, 刘敏, 曾翠丽, 邓畅光, 邝子奇, 毛杰.耐锌液腐蚀热喷涂涂层的研发现状[J]. 材料研究学报, 2011,23(6): 453-456
2. 季慧玲 蒋南 王继刚.糠醇树脂的开环热裂解机理研究[J]. 材料研究学报, 2011,25(6): 585-590
3. 魏永强 田修波 巩春志 杨士勤.脉冲偏压幅值对TiN/TiAlN多层薄膜微观结构和性能的影响[J]. 材料研究学报, 2011,25(6): 630-636
4. 石文艳,夏媛,雷武,夏明珠,王风云,张其平, 张跃华.5种氨基酸对铁缓蚀机理的分子动力学模拟[J]. 材料研究学报, 2011,31(6): 478-482

5. 王树森, 梁成浩, 黄乃宝, 金光明. 铝基牺牲阳极研究进展[J]. 材料研究学报, 2011,23(5): 369-375
 6. 肖婷, 刘波, 王新练, 王春芬, 任丁. 含IPA的TMAH溶液对湿法腐蚀硅倒金字塔阵列微观形貌演化的研究[J]. 材料研究学报, 2011,25(5): 495-499
 7. 王常川, 王日初, 彭超群, 冯艳, 韦小凤. hBN表面镀Ni对Ni--20Cr/hBN自润滑材料性能的影响[J]. 材料研究学报, 2011,25(5): 509-516
 8. 邝刘伟, 范希梅, 郝军, 张会广. 化学镀Ni-B合金镀层性能[J]. 材料研究学报, 2011,31(4): 315-318
 9. 于春杭, 邵红红, 许晓静, 翟瑞. 纳米晶体钛基掺钽TiO₂薄膜的摩擦磨损性能[J]. 材料研究学报, 2011,25(4): 433-438
 10. 钟曼英. 氢对2(1/4)Cr-1Mo钢力学性能的影响[J]. 材料研究学报, 2011,31(3): 236-239
-