

材料化学工程与纳米技术

## 表面修饰铁纳米颗粒的制备及其摩擦性能

麦荣顺, 李楠, 陈爽

五邑大学化学与环境工程系;广州大学化学化工学院

收稿日期 2008-10-13 修回日期 2008-11-7 网络版发布日期 2009-6-17 接受日期

摘要

以次亚磷酸钠为还原剂, 双烷基二硫代磷酸铵盐为修饰剂, 在四氢呋喃-饱和食盐水的两相体系中合成了表面修饰的铁纳米颗粒, 采用红外光谱仪、热分析仪等仪器对其进行了结构表征;在透射电子显微镜下观测所制备的铁纳米颗粒的形貌;在四球摩擦试验机上测试了其摩擦性能, 并在扫描电子显微镜和能谱分析仪上对钢球表面进行了形貌观测和表层成分分析。结果表明, 铁纳米颗粒在低极性有机溶剂中具有良好的分散性, 并具有良好的抗磨和承载能力。磨斑的表面分析表明, 铁纳米颗粒添加剂在边界润滑下形成了一层含Fe、S、P和O元素的表面膜是其具有良好摩擦学性能的主要原因。

关键词

[表面修饰](#) [纳米颗粒](#) [添加剂](#) [摩擦学性能](#)

分类号

## Preparation and tribological properties of surface-modified Fe nanoparticles

MAI Rongshun, LI Nan, CHEN Shuang

### Abstract

Dialkyldithiophosphate (DDP) capped Fe nanoparticles were synthesized in a two-phase system of tetrahydrofuran/saturated electrolyte with  $\text{NaH}_2\text{PO}_2$  as reductant and DDP as modification agent. The structure and morphologies of surface modified Fe nanoparticles were characterized by FTIR, TGA and TEM. The tribological properties were investigated by four-ball test machine, and the worn surfaces of the balls were analyzed by scanning electron microscopy and EDS. The results showed that the surface modified Fe nanoparticles exhibited excellent solubility in low polar organic solvents and good anti-wear properties. SEM result of wear scar indicated that the main reason for the tribological properties was the formation of a layer of film composed of Fe, S, P and O element.

### Key words

[modification](#) [nanoparticles](#) [additive](#) [tribological properties](#)

DOI:

通讯作者 麦荣顺 [icebeatfire@163.com](mailto:icebeatfire@163.com)

### 扩展功能

#### 本文信息

▶ [Supporting info](#)

▶ [PDF\(992KB\)](#)

▶ [\[HTML全文\]\(0KB\)](#)

▶ [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](#)

▶ [复制索引](#)

▶ [Email Alert](#)

▶ [文章反馈](#)

▶ [浏览反馈信息](#)

#### 相关信息

▶ [本刊中 包含“](#)

[表面修饰” 的相关文章](#)

▶ [本文作者相关文章](#)

· [麦荣顺](#)

· [李楠](#)

· [陈爽](#)