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微纳技术与精密机械

纳米颗粒增强铜基摩擦材料的摩擦学性能

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摘要： 基于粉末冶金法分别制备了纳米氮化铝和纳米石墨增强铜基摩擦材料，研究了纳米颗粒对铜基摩擦材料的摩擦磨损和耐热性能的影响规律。采用扫描电子显微镜（SEM）分析了材料的微观结构和磨损形貌，并利用惯性摩擦磨损试验机考核其摩擦学性能。实验结果表明：与未添加纳米颗粒的摩擦材料相比，添加纳米氮化铝和纳米石墨的摩擦材料的摩擦因数高而稳定，且随接合次数增加无明显衰退现象；耐磨性能分别提高了25 %和11 %；耐热性能分别提高了18 % 和25 %。未添加纳米颗粒的摩擦材料的磨损机制主要为犁沟式磨料磨损，纳米氮化铝和纳米石墨能减少摩擦材料的磨料磨损，从而增强了摩擦材料的耐磨性。实验结果显示，纳米氮化铝和纳米石墨可显著提高铜基摩擦材料的摩擦学性能。

关键词： 摩擦材料 铜基摩擦材料 纳米氮化铝 纳米石墨 摩擦磨损

Friction properties of Cu-based friction materials reinforced by nanometer materials

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Abstract: To enhance the friction properties of Cu-based friction materials and study the friction properties of Cu-based friction materials with nanometer particles, the Cu-based friction materials enhanced with nano-AlN (n-AlN) and nano-graphite (n-C) were prepared by powder metallurgy technology, respectively. The effects of nanometer particles on the frictional wear and heat-resistant characteristics of Cu-based friction materials were researched. Then, the microstructures and friction performance were analyzed through a Scanning Electron Microscope (SEM) and a friction tester, respectively. The results indicate that the friction coefficients of friction materials with n-AlN and n-C are higher and stable as comparied with that of the friction materials without any nanometer materials, the wear resistances have been improved by 25 % and 11 %, respectively. The heat resistances of the materials with n-AlN and n-C have been improved by 18 % and 25 %, respectively. The n-AlN and n-C particles can reduce the abrasive wear and enhance the wear resistances of the Cu-based friction materials. The results demonstrate that the n-AlN and n-C particles can enhance the properties of Cu-based friction materials remarkably.

Keywords: Friction materials Cu-based friction material Nano-AlN Nano-graphite Wear behavior

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