

新型纳米铜/石蜡/PVP温敏复合材料的制备及其性能

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摘要:

采用高能球磨法制备了纳米铜/石蜡/PVP温敏复合材料。用扫描电镜(SEM)、高分辨透射电镜(TEM)和傅立叶变换红外光谱仪(FTIR)对复合材料的微观形貌和结构进行了表征,并测试了复合材料的膨胀性、温敏性和稳定性。结果表明,石蜡/PVP复合有机物对铜粒的包覆效果良好,球磨100h的复合颗粒近似球形,粒径约为100nm。PVP与石蜡、纳米铜粒之间存在一定的相互作用。PVP的加入量对复合材料的膨胀性影响明显,少量PVP可提高复合材料的膨胀性,随着PVP含量的增加,复合材料的膨胀性受到抑制。PVP的添加可以有效改善复合材料的稳定性,但对复合材料的温敏性影响不明显。

关键词: 纳米铜/石蜡/PVP, 膨胀性, 温敏性, 稳定性, 高能球磨

Synthesis and properties of Novel nano-copper/paraffin/PVP thermo-sensitive composites

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Abstract:

Nano-copper/paraffin/PVP thermo-sensitive composites were prepared by high energy ball milling. The samples were characterized by Scanning electron microscope(SEM), Transmission electron microscopy (TEM) and Fourier transform infrared spectrometer (FTIR). The thermal expansion, thermal sensitivity and thermal stability were investigated. The experimental results reveal that copper particles are well coated by the paraffin/PVP organic complexes. Those nano-copper/paraffin/PVP composite particles milled for 100h are near-spherical in shape and the size of particles are about 100nm. There are interactions among PVP, paraffin and nano-copper. The thermal expansion of composite is affected obviously by the additive amount of PVP. Little amount of PVP increases the thermal expansion of composites, while the thermal expansion is inhibited when the PVP content exceeds the specific value. With the addition of PVP, the thermal stability is improved effectively, however the thermal sensitivity is not affected obviously.

Keywords: nano-copper/paraffin/ PVP, thermal expansion, thermal sensitivity, thermal stability, high energy ball milling

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