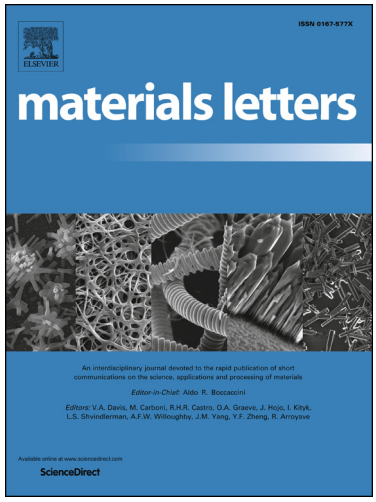

Hydrothermal synthesis of highly stable copper sulfide nanorods for efficient photo-thermal conversion

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Hydrothermal synthesis of highly stable copper sulfide nanorods for efficient photo-thermal conversion

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Abstract: Copper sulfide (CuS) nanostructures have an important application prospect in the field of solar photo-thermal conversion because of their excellent photo-thermal stability. In this paper, nanostructured CuS nanorods were successfully prepared via hydrothermal reaction method. The crystal structure and surface morphology of the as-prepared CuS nanorods were characterized. The optical absorption and photo-thermal conversion performance of the CuS emulsions based on water were studied. The ultraviolet/visible/near infrared (UV/Vis/NIR) absorption spectra tests show that the prepared CuS emulsions have strong optical absorption in both visible light and near infrared light bands. And the photo-thermal conversion results indicate that the CuS emulsions possess good photo-thermal conversion performance, and the maximum temperature of the emulsion reaches about 74.44□ with the mass fraction of 0.10%. Moreover, in a certain concentration range, the photo-thermal conversion performance will be effectively enhanced with increasing the mass fractions of the emulsions.

Keywords: CuS nanorods, Hydrothermal, Nanofluids, Optical absorption, Photo-thermal conversion

1. Introduction

As is known to all, solar energy is an inexhaustible clean energy that has no harm to the environment and does not cause secondary pollution. Thus, how to efficiently absorb and utilize solar energy has become a focus for many researchers [1,2]. In 1970s, Abdelrahman et al. [3] proposed a black liquid solar collector, and different from the traditional surface-type absorption, the collector absorbs solar radiation directly by means of the working fluid, which avoids the heat transfer from the absorbing surface to the heat working medium. As for nanofluid formed by the stable dispersion of nanoparticles in base liquid, the capture and absorption ability on the incident light will be enhanced due to the enhancement of light scattering from the nanoparticles and the increment of light path of the photon [4,5]. Moreover, the direct

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