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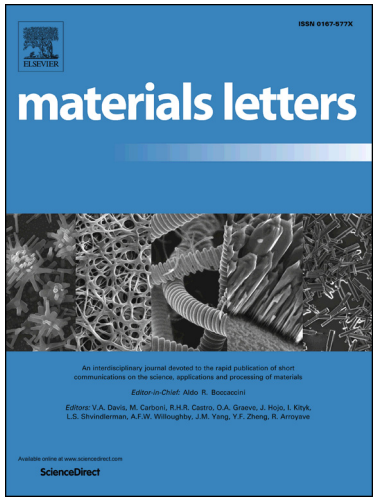

Multifunctional MWCNTs@$CoFe_2O_4$@mSiO_2@$NaYF_4$:Yb^{3+}, Er^{3+} nanocomposites and their application as drug carrier

Huitao Fan, Pengfei Duan, Shaohua Guo, Ling Zhao, Kun Wang, Dongfang Qiu

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Multifunctional MWCNTs@$CoFe_2O_4$@mSiO_2@$NaYF_4$:Yb^{3+}, Er^{3+} nanocomposites and their application as drug carrier

Huitao Fan*, Pengfei Duan, Shaohua Guo, Ling Zhao, Kun Wang, Dongfang Qiu*

College of Chemistry and Pharmaceutical Engineering, Nanyang Normal University, Nanyang 473061, China.

E-mail: fanhuitao0818@163.com; qiudf2008@163.com

Abstract: Multifunctional MWCNTs@$CoFe_2O_4$@mSiO_2@$NaYF_4$:Yb^{3+},Er^{3+} nanoparticles have been synthesized *via* a simple self-assembled process. The composites exhibited good magnetism properties, porous structure, and strong up-conversion fluorescence, which offered by ultraminiature $CoFe_2O_4$ nanoparticles, mesoporous SiO_2 shell, and up-conversion nanoparticles, respectively. Such multifunctional nanocomposites can be utilized as drug delivery carrier. The doxorubicin hydrochloride loaded MWCNTs@$CoFe_2O_4$@mSiO_2@$NaYF_4$:Yb^{3+},Er^{3+} nanoplatforms showed excellent pH-responsive drug release character within 48 h. Additionally, MTT assay confirmed that the nanoparticles possess good biocompatibility.

Keywords: nanocarrier; up-conversion fluorescence; magnetic materials; targeted drug delivery; pH-sensitive, nanocomposites.

1. Introduction

In recent years, a large number of papers have reported the design and synthesis of nanocomposites with core-shell structure, because these kinds of nanocomposites containing multiple nanomaterials with different properties provide the possibility for multifunctional properties or enhanced functionality compared with their relatively single property [1-4]. Among them, the nanomaterials composed of magnetic nanoparticles, mesoporous SiO_2 and rare-earth doped upconversion nanoparticles, have been particular attracted great attention in the field of drug delivery systems (DDSs) due to their potential biological applications, since they can offer up-conversion luminescence imaging, magnetic target drug delivery, large surface area, high pore volume, and so on [5-7].

Cobalt ferrite ($CoFe_2O_4$) nanocrystals, well-known magnetic materials, show excellent properties for application in DDSs and magnetic resonance imaging (MRI) [8-11]. Compared with Fe_3O_4, $CoFe_2O_4$ displays moderate saturation magnetization as well as physical and chemical stability. In addition, multi-walled carbon nanotubes (MWCNTs), possessing multiple layers of graphene and hollow structure, have ideal geometry for drug transport and delivery. Most recently, MWCNTs were used to