

Accepted Manuscript

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PII: S0169-4332(15)02304-1
DOI: <http://dx.doi.org/doi:10.1016/j.apsusc.2015.09.189>
Reference: APSUSC 31403

To appear in: *APSUSC*

Received date: 2-6-2015
Revised date: 16-9-2015
Accepted date: 22-9-2015

Please cite this article as: C. Wang, L. Huang, S. Song, B. Saif, Y.Z.C. Dong, S.S. Targeted Delivery and pH-responsive Release of Stereoisomeric Anti-cancer Drugs Using *beta*-Cyclodextrin Assembled Fe₃O₄ Nanoparticles, *Applied Surface Science* (2015), <http://dx.doi.org/10.1016/j.apsusc.2015.09.189>

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Targeted Delivery and pH-responsive Release of Stereoisomeric Anti-cancer Drugs Using β -Cyclodextrin Assembled Fe_3O_4 Nanoparticles

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Abstract: The β -cyclodextrin assembled magnetic Fe_3O_4 nanoparticles (β -CD-MNPs) were successfully fabricated via a layer-by-layer method. Possessing an average size 14 nm, good stability and super-paramagnetic response (Ms 64 emu/g), the resultant nanocomposites could be served as a versatile biocompatible platform for selective loading, targeted delivery and pH-responsive release of stereoisomeric doxorubicin (DOX) and epirubicin (EPI). ^1H -nuclear magnetic resonance (^1H NMR) and the computer simulation further give the evidence that partial anthracene ring of drug molecule is included by β -CD. In addition, non-toxic β -CD-MNPs have excellent biocompatibility on MCF-7 cells, and cellular uptake indicate that different amounts of DOX or EPI can be transported to targeting site and released from the internalized carriers. The results demonstrate that as-prepared β -CD-MNPs could be a very promising vehicle for DOX and EPI.

Keywords: β -cyclodextrin; targeted delivery; anti-cancer drug; magnetic nanoparticles

Highlights:

β -cyclodextrin assembled magnetic Fe_3O_4 nanoparticles (β -CD-MNPs) with good good stability were successfully fabricated.

Stereoisomeric doxorubicin (DOX) and epirubicin (EPI) were used to explore the loading and release performance.

The loading properties of β -CD-MNPs were investigated using the Langmuir and Freundlich adsorption equilibrium models.

^1H NMR and the computer simulation were used to demonstrate the inclusion position between drug molecules and β -CD.

1. Introduction

Advances of nanoscience have pushed the development of multifunctional nanomaterials for simultaneous diagnosis and therapy. Among the diverse integrated nanoparticles, magnetic Fe_3O_4 nanoparticles (MNPs) with

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