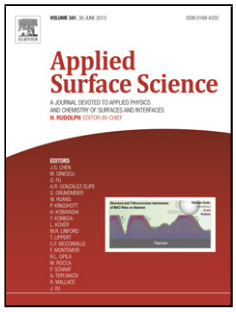

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Targeted Delivery and pH-responsive Release of Stereoisomeric Anti-cancer Drugs Using β-Cyclodextrin Assemblied Fe_3O_4 Nanoparticles

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Abstract: The β-cyclodextrin assemblied 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). ^{1}H-nuclear magnetic resonance (^{1}H 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 assemblied 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 peformance.
The loading properties of β-CD-MNPs were investigated using the Langmuir and Freundlich adsorption equilibrium models.
^{1}H 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