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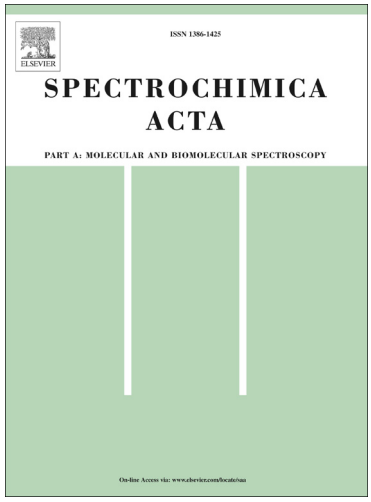

Fluorescence resonance energy transfer between ZnSe-ZnS quantum dots and bovine serum albumin in bioaffinity assays of anticancer drugs

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PII: S1386-1425(14)00583-6
DOI: http://dx.doi.org/10.1016/j.saa.2014.04.029
Reference: SAA 11993

To appear in: *Spectrochimica Acta Part A: Molecular and Biomolecular Spectroscopy*

Received Date: 20 December 2013
Revised Date: 23 March 2014
Accepted Date: 6 April 2014

Please cite this article as: C. Shu, L. Ding, W. Zhong, Fluorescence resonance energy transfer between ZnSe-ZnS quantum dots and bovine serum albumin in bioaffinity assays of anticancer drugs, *Spectrochimica Acta Part A: Molecular and Biomolecular Spectroscopy* (2014), doi: http://dx.doi.org/10.1016/j.saa.2014.04.029

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Fluorescence resonance energy transfer between ZnSe-ZnS quantum dots and bovine serum albumin in bioaffinity assays of anticancer drugs

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ABSTRACT:

In the current work, using ZnSe-ZnS quantum dots (QDs) as representative nanoparticles, the affinities of seven anticancer drugs for bovine serum albumin (BSA) were studied using fluorescence resonance energy transfer (FRET). The FRET efficiency of BSA-QD conjugates can reach as high as 24.87% by electrostatic interaction. The higher binding constant (3.63×10^7 L mol^{-1}) and number of binding sites (1.75) between ZnSe-ZnS QDs and BSA demonstrated that the QDs could easily associate to plasma proteins and enhance the transport efficacy of drugs. The magnitude of binding constants (10^3–10^6 L mol^{-1}), in the presence of QDs, was between drugs–BSA and drugs–QDs in agreement with common affinities of drugs for serum albumins (10^4–10^6 L mol^{-1}) in vivo. ZnSe-ZnS QDs significantly increased the affinities for BSA of Vorinostat（SAHA）, Docetaxel (DOC), Carmustine (BCNU), Doxorubicin (Dox）and 10-Hydroxycamptothecin（HCPT）. However, they slightly reduced the affinities of Vincristine (VCR) and Methotrexate (MTX) for BSA. The recent work will not only provide useful information for appropriately understanding the binding affinity and binding mechanism at the molecular level, but also illustrate the ZnSe-ZnS QDs are perfect candidates for nanoscal drug delivery system (DDS).

Keywords: ZnSe-ZnS quantum dot; Anticancer drug; Bovine serum albumin; Fluorescence resonance energy transfer; Bioaffinity

1. Introduction

Recently nanoscale drug delivery has attracted increasing international attention owing to

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