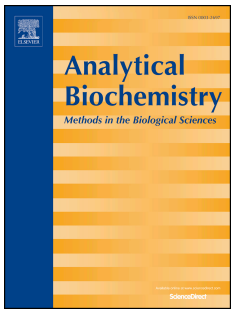
Accepted Manuscript



Fluorescence alteration of MPA capped CdSe quantum dots by spontaneous biomarker protein adsorption

Amber Rowley, Tegan Parks, Kaden Parks, Kyle Medley, Alex Cordner, Ming Yu

PII: S0003-2697(18)30357-9

DOI: 10.1016/j.ab.2018.05.019

Reference: YABIO 13025

To appear in: *Analytical Biochemistry*

Received Date: 4 April 2018

Revised Date: 20 May 2018

Accepted Date: 20 May 2018

Please cite this article as: A. Rowley, T. Parks, K. Parks, K. Medley, A. Cordner, M. Yu, Fluorescence alteration of MPA capped CdSe quantum dots by spontaneous biomarker protein adsorption, *Analytical Biochemistry* (2018), doi: 10.1016/j.ab.2018.05.019.

Can non-selective spontaneous protein adsorption on quantum dots be utilized for disease diagnosis?

Amber Rowley[a], Tegan Parks[a], Kaden Parks[a], Kyle Medley[b], Alex Cordner[a] and Ming Yu*[a]

[a]*Department of Chemistry, Utah Valley University, Orem, UT 84058 USA*

[b]*Department of Biology, Utah Valley University, Orem, UT 84058 USA*

*Corresponding author, Email: mingy@uvu.edu; Tel: +1 (801) 863-6840;

Fax: +1 (801) 863-8064.

Abstract

Quantum dots (QDs) biosensors detect biomarker proteins with high selectivity and low detection limit for disease diagnosis, however, often involve complex designs for specific targets and prolonged pre-sensing preparation. For biosensors that need a straightforward, fast, and universal protein recognition component, alternative methods are needed. Spontaneous adsorption of proteins on solid surfaces is a common phenomenon in nature. It occurs to most proteins. In this study, non-selective spontaneous adsorption of biomarker proteins on CdSe QDs was investigated to explore the possibility of applications in disease diagnosis. By monitoring the fluorescence emission of QDs, the biomarker proteins adsorbed on the QDs surface were recognized and quantified. When alpha fetoprotein (AFP) and heat shock protein 90 alpha (HSP90α) were present, the QDs became brighter. In contrast, the presence of cytochrome C (CytoC) and lysozyme (Lyz) made the QDs dimmer. Within five minutes response time all four biomarker proteins were detected individually with the estimated detection limit in the range of 1-10 ng/mL and good linear dynamic ranges. The results suggested that non-selective spontaneous adsorption of proteins on QDs can be utilized in biosensing platforms as a simple, fast, and universal sensing component for disease diagnosis.

Keywords

Quantum dots, Biomarker protein, Fluorescence, Spontaneous protein adsorption, Biosensing