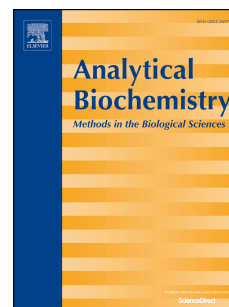


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Fluorescence alteration of MPA capped CdSe quantum dots by spontaneous biomarker protein adsorption

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

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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

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