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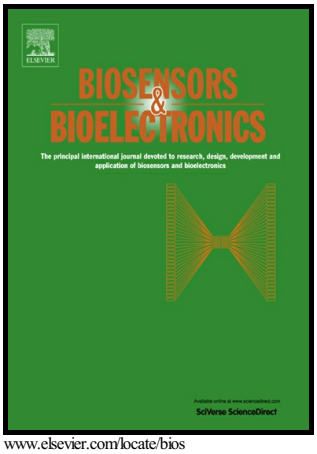

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Silver nanoclusters-assisted ion-exchange reaction with CdTe quantum dots for photoelectrochemical detection of adenosine by target-triggering multiple-cycle amplification strategy

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ABSTRACT

Herein, we successfully devised a novel photoelectrochemical (PEC) platform for ultrasensitive detection of adenosine by target-triggering cascade multiple cycle amplification based on the silver nanoparticles-assisted ion-exchange reaction with CdTe quantum dots (QDs). In the presence of target adenosine, DNA s1 is released from the aptamer and then hybridizes with hairpin DNA (HP1), which could initiate the cycling cleavage process under the reaction of nicking endonuclease. Then the product (DNA b) of cycle I could act as the "DNA trigger" of cycle II to further generate a large number of DNA s1, which again go back to cycle I, thus a cascade multiple DNA cycle amplification was carried out to produce abundant DNA c. These DNA c fragments with the cytosine (C)-rich loop were captured by magnetic beads, and numerous silver nanoclusters (Ag NCs) were synthesized by $AgNO_3$ and sodium borohydride. The dissolved AgNCs released numerous silver ions which could induce ion exchange reaction with the CdTe QDs, thus resulting in greatly amplified change of photocurrent for target detection. The detection linear range for adenosine was 1.0 fM ~10 nM with the detection limit of 0.5 fM. The present PEC strategy combining cascade multiple DNA cycle amplification and AgNCs-induced ion-exchange reaction with QDs provides new insight into rapid, and ultrasensitive PEC detection of different biomolecules, which showed great potential for detecting trace amounts in bioanalysis and clinical biomedicine.

Keywords: ion-exchange reaction CdTe quantum dot multiple cycle amplification silver nanoclusters