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An electrochemiluminescence ratiometric self-calibrated biosensor for carcinoembryonic antigen detection

Jun-Tao Cao[a,*], Yu-Ling Wang[a], Jin-Bei Wang[a], Qing-Mei Zhou[a], Shu-Hui Ma[b], Yan-Ming Liu[a,*]

[a]*College of Chemistry and Chemical Engineering, Xinyang Normal University, Xinyang 464000,China*

[b]*Xinyang Central Hospital, Xinyang 464000, China*

[*]Corresponding author. Email address: liuym9518@sina.com, jtcao11@163.com. Tel and Fax: +86-376-6392889.

Abstract

Owing to the difficulty to find a matched donor/acceptor pair, the development of an accurate and sensitive electrochemiluminescence (ECL) ratiometric sensing strategy based on resonance energy transfer (RET) strategy is still challenging. Herein, RET strategy triggered by the donor/acceptor pair (CdS-C nano-flowers (NFs)/luminol-Au nanoparticles (NPs)) was introduced into the ECL system for the construction of an ECL ratiometric self-calibrated aptasensor. In virtue of the natural absorption cross section and catalytic effect of the Au NPs, the signal quenching of CdS-C NFs and the signal enhancement of luminol could be induced in one potential scan. With this novel ECL-RET strategy, the ratiometric ECL aptasensor self-calibrated by the ratio of anodic ECL signal from luminol-Au NPs to the cathodic ECL signal from CdS-C NFs exhibits excellent analytical performance for carcinoembryonic antigen (CEA) with a range of 0.1 pg/mL – 10 ng/mL and a detection limit of 0.033 pg/mL. In addition, the obtained ratiometric sensing platform was employed to quantify the CEA concent in human serum samples with a satisfied result. The present ECL ratiometric approach provides a promising platform for detecting tumor markers, showing great potential in cancer diagnosis.