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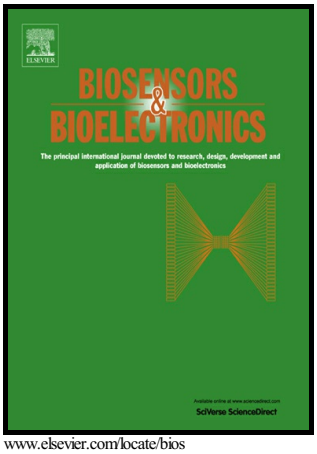

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Highly Selective Aptamer based Organic Electrochemical Biosensor with Pico-Level Detection☆

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Abstract

An organic aptamer functionalized electrochemical transistor has been developed to detect the presence of epinephrine molecule which acts as an excitatory neurotransmitter. The abnormalities in the level of epinephrine are the direct symptoms of some diseases such as Takotsubo cardiomyopathy, myocardial infarction, arrhythmias and other heart related diseases. The present approach is based on immobilization of aptamers on the gate electrode which selectively binds to epinephrine with high affinity. The introduction of epinephrine in the system causes screening of negative charge of aptamers as well as the production of Faradaic current due to oxidation of epinephrine. The synergistic effect of these two events decreases the overall channel current which was seen in both transfer characteristics and current-time curve. Additional experiments against common interfering agents (dopamine, ascorbic acid, DOPAC etc) showed no decrease in the current which indicates high specificity of the sensor. Overall, the incorporation of aptamers in the transistor has allowed us to obtain a sensor exhibiting the lowest limit of detection for epinephrine (90 pM) till date which is comparable to normal physiological level. This approach provides a real-time detection of a large range of biomolecules and viral proteins in a time and cost-effective manner and has applications in point-of-care testing tool for several diagnostic applications.

Keywords: OECT, Aptamers, Epinephrine, PEDOT:PSS, point-of-care, Biosensor;

☆ Electronic supplementary information available
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