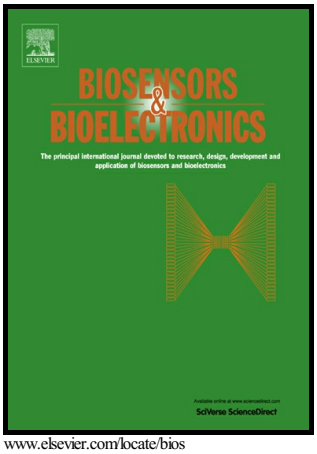

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Abstract

A novel label-free electrochemical strategy was established based on the unique electro-catalytic activity of graphene oxide (GO)-supported terminal deoxynucleotidyl transferase (TdT)-generated C-rich DNA nanotail-templated silver nanoclusters (DNA-AgNCs). TdT can catalyze the deoxycytidine triphosphate (dCTP) to the 3'-OH terminus of single-stranded DNA (ssDNA) with no template; then, in the presence of Ag(I), TdT-generated C-rich DNA sequence was employed for the synthetic template of AgNCs because of the formed complexes of nitrogen atoms of cytosine based with silver atoms. We proved that *in situ* grown DNA nanotail-templated AgNCs can be adsorbed on GO-modified electrode and possess high electro-catalytic activity to H_2O_2 reduction, presenting a good electrochemical indicator for signal readout. Under optimal conditions, the proposed biosensor could be employed for quantitatively monitoring TdT activity and within a dynamic range from 0.4 to 90 U/mL and a low limit of detection is 0.08 U/mL. With high sensitivity