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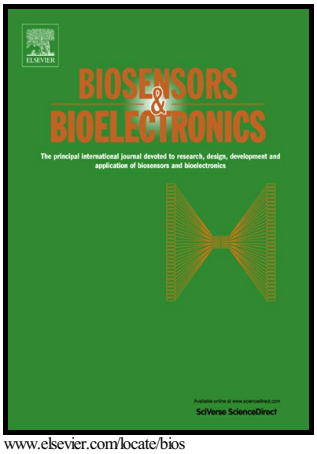

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A novel aptasensor based on 3D-reduced graphene oxide modified gold nanoparticles for determination of arsenite

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Abstract

In this study, a sensitive aptasensor based on three-dimensional reduced graphene oxide-modified gold nanoparticles (3D-rGO/AuNPs) was fabricated for the determination of arsenite (As(III)). The 3D-rGO/AuNPs was fully characterized with various techniques. The 5′-thiolate aptamer was first self-assembled on a glassy carbon electrode (GCE) that it's modified with 3D-rGO/AuNPs via Au-S covalent bonding. In the presence of As(III), the G-quadruplex interaction was formed between a single-stranded DNA and the target, which produced a hindrance for electron transfer. Consequently, the electrochemical impedance spectroscopy signals of a GCE modified with 3D-rGO/AuNPs was increased. In order to improve the response of the designing aptasensor, the effect of the various parameters was optimized. Under the optimal conditions, the aptasensor has an extraordinarily low detection limit of 1.4×10^{-7} ng mL^{-1} toward As(III) with a dynamic range of 3.8×10^{-7} – 3.0×10^{-4} ng mL^{-1}. The 3D-rGO/AuNPs aptasensor displayed superior selectivity and reproducibility with an acceptable recovery for determination of As(III) in real water samples.