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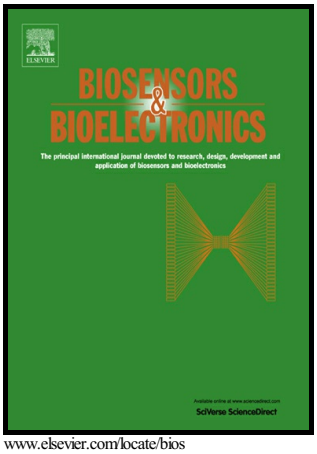

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Stochastic DNA walker for electrochemical biosensing sensitized with gold nanocages@graphene nanoribbons

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Abstract

A target-driven stochastic DNA walking electrochemical biosensor sensitized with gold nanocages@graphene nanoribbons (Au NCs@GNRs) was explored for sensitive detection of target DNA. Benefited from the large surface area and excellent conductivity of Au NCs and GNRs, the proposed sensing platform not only improved the electron transfer kinetics involved in electrochemical reactions, but also enhanced the loading capability for stem-loop structural DNA segment (H). Upon the addition of target DNA, the hairpin structure of H was opened and H:target DNA duplex was formed based on toehold-mediated DNA strand displacement. In the presence of exonuclease III (Exo III), the H:target DNA duplex was digested. As a result, target DNA spontaneously dissociated from H:target DNA duplex and then hybridized with another H strand. Therefore, the continuous locomotion of target DNA unceasingly triggered new digestion process from near to far along the electrode surface, resulting in great signal amplification. The proposed strategy exhibited excellent detection performances for DNA analysis in complex matrix such as human serum, which illuminated the practical application field of the sensing platform.

Keywords: Stochastic DNA walker; Gold nanocages; Graphene nanoribbons; Electrochemical detection; Signal amplification.

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