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Hybrid Graphene Based Nanomaterial as Highly Efficient Catalyst for the Electrochemical Determination of Ciprofloxacin

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Abstract : The detection of drug molecules by voltammetry has attracted great interest over the past years. However, many drug molecules exhibit poor electrochemical signals at common electrodes which result in low sensitivity in detection. An efficient way to overcome this problem is to modify electrodes with functional materials. Since discovered in 2004, graphene (or reduced graphene oxide) has emerged as one of the most studied two-dimensional carbon materials in condensed matter physics, electrochemistry, and so on due to its exceptional physicochemical properties. Additionally, the continuous development of technology has opened the new window for the successful fabrications of many novel graphene-based nanomaterials to serve in electrochemical analysis. This research aims to synthesize and characterize gold nanoparticle coated beta-cyclodextrin functionalized reduced graphene oxide (Au NP–β-CD–RGO) nanocomposites with highly conductive and strongly electro-catalytic properties as well as excellent supramolecular recognition abilities for the modification of electrodes. The electrochemical responses of ciprofloxacin at the as-prepared nanocomposite modified electrode was effectively amplified was much higher in comparison with that at the bare electrode. The linear concentration range was from 0.01 to 120 µM, with a detection limit of 2.7 nM using differential pulse voltammetry. Thus, Au NP–β-CD–RGO nanocomposite has great potential as an ideal material to construct sensitive sensors for the electrochemical determination of ciprofloxacin or similar antibacterial drugs in the future based on its excellent stability, selectivity, and reproducibility.

Keywords : Au nanoparticles, β-CD, ciprofloxacin, electrochemical determination, graphene based nanomaterials
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