Novel Magnetic Nanocomposites Comprising Reduced Graphene Oxide/Fe₃O₄/Gelatin Utilized in Ultrasensitive Non-Enzymatic Biosensing

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Measuring the concentration of glucose is important to prevent the growth of cancer cells. Electrochemical enzyme based biosensors offer highly selective and sensitive detection of glucose at the expense of limited stability. Therefore, development of simple, sensitive, fast and reliable devices has a great importance for the determination of glucose level. In this paper, reduced graphene oxide (rGO)-Fe₃O₄-gelatin amended glassy carbon electrode (GCE) was used as an advanced magnetic nanobiosensor for non-enzymatic determination of glucose concentration. The nanocomposite, rGO-Fe₃O₄-gelatin, has been firmly coated on GCE, developed by a relatively simple technique. The resulting cyclic voltammograms exhibited a pair of well defined, irreversible and stable peak for redox systems, acquired in buffer solution. The developed biosensor demonstrated an excellent catalytic activity towards the oxidation of glucose at a positive potential in buffer solution, which is relatively unusual. This novel nanosensor also exhibited high sensitivity, enhanced shelf-life (> 2 month), wide linear range (0.1-10 mM) and low detection limit (0.024 μM). To the best of our knowledge, the aforementioned electroanalytical characteristics of this nonenzymatic biosensor are superior to previously reported modifications of nonenzymatic glucose biosensors.

Keywords: Nonenzyme electrode, Glucose sensing, Cyclic voltametry, Gelatin, Stability, Selectivity.

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