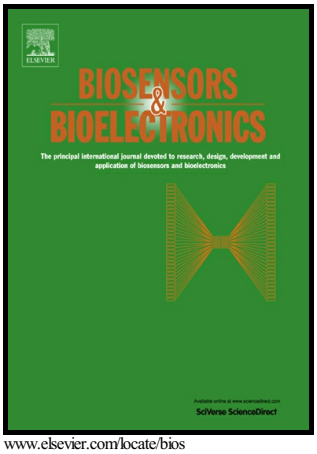

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A novel glucose sensor using lutetium phthalocyanine as redox mediator in reduced graphene oxide conducting polymer multifunctional hydrogel

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Abstract

Herein, we report a scalable synthesis of multifunctional conducting polyacrylic acid (PAA) hydrogel (MFH) integrated with reduced grapheme oxide (rGO), vinyl substituted polyaniline (VS-PANI) and lutetium Phthalocyanine ($LuPc_2$) as three dimensional robust matrix for glucose oxidase (GOx) immobilization (PAA-rGO/VS-PANI/$LuPc_2$/GOx-MFH). We have integrated the multicomponents such as PAA with rGO, and VS-PANI through free radical polymerization using methylene bis-acrylamide, and ammonium persulphate as the cross linker and initiator. The $LuPc_2$ was then doped to form multifunctional hydrogel (PAA-rGO/VS-PANI/$LuPc_2$-MFH). Finally, biosensor was fabricated by immobilizing GOx into PAA-rGO/VS-PANI/$LuPc_2$-MFH and subsequently used for electrochemical detection of glucose. The PAA-rGO/VS-PANI/$LuPc_2$/GOx-MFH biosensor exhibited high sensitivity (15.31 $\mu AmM^{-1}cm^{-2}$) for the detection of glucose over a concentration range of 2–12 mM with a low detection limit of 25 μM. The PAA-rGO/VS-PANI/$LuPc_2$-MFH biosensor showed a fast response time (1s) to the addition of glucose with high storage stability of 3 months. The real sample analysis reveals that PAA-rGO/VS-PANI/$LuPc_2$/GOx-MFH could be effectively used as an electrochemical biosensor in industrial as well clinical diagnosis.

Keywords: Polyacrylic acid, reduced graphene oxide, polyaniline, lutetium Phthalocyanine, glucose biosensor, multifunctional hydrogel