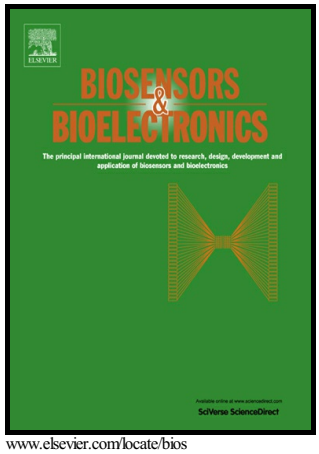

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A flexible and highly sensitive nonenzymatic glucose sensor based on DVD-laser scribed graphene substrate

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ABSTRACT

Flexible and implantable glucose biosensors are emerging technologies for continuous monitoring of blood-glucose of diabetes. Developing a flexible conductive substrates with high active surface area is critical for advancing the technology. Here, we successfully fabricate a flexible and highly sensitive nonenzymatic glucose by using DVD-laser scribed graphene (LSG) as a flexible conductively substrate. Copper nanoparticles (Cu-NPs) are electrodeposited as the catalyst. The LSG/Cu-NPs sensor demonstrates excellent catalytic activity toward glucose oxidation and exhibits a linear glucose detection range from 1 μM to 4.54 mM with high sensitivity (1.518 mA mM^{-1} cm^{-2}) and low limit of detection (0.35 μM). Moreover, the LSG/Cu-NPs sensor shows excellent reproducibility and long-term stability. It is also highly selective toward glucose oxidation under the presence of various interfering species. Excellent flexing stability is also demonstrated by the LSG/Cu-NPs sensor, which is capable of maintaining 83.9% of its initial current after being bent against a 4-mm diameter rod for 180 times. The LSG/Cu-NPs sensor shows great potential for practical application as a nonenzymatic glucose biosensor. Meanwhile, the LSG conductive substrate provides a platform for the developing next-generation flexible and potentially implantable bioelectronics and biosensors.

Keywords:
Laser-scribed graphene; Copper nanoparticles; Electrodeposition; Flexible conductive substrates; Glucose sensor; Flexible biosensors