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Improved Glucose Label-Free Biosensor with Layer-by-Layer Architecture and Conducting Polymer poly(3,4-ethylenedioxythiophene)

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Research Highlights:

- Layer-by-layer (LbL) self-assembled multilayers as a mild entrapment method for enzyme immobilization
- PEDOT conductive polymer considerably improves biosensor sensitivity
- Monitoring of LbL film growth by Surface Plasmon Resonance Spectroscopy
- Successfully use of the biosensor for glucose detection in grape wines

Abstract:

Layer-by-layer (LbL) self-assembly has been used for the development of a new glucose label-free biosensor. Glucose oxidase (GOx) was incorporated in a multilayer film on a gold electrode, previously modified with a film of the conducting polymer poly(3,4-ethylenedioxythiophene) (PEDOT), by electropolymerization, for better conductivity. Multilayer films, containing the enzyme and nitrogen doped graphene (NG) dispersed in the biocompatible positively-charged polymer chitosan {chit⁺(NG+GOx)}, together with the negatively charged polymer poly(styrene sulfonate), PSS⁻, were assembled. Cyclic voltammetry and electrochemical impedance spectroscopy were used for characterization of the biosensor architectures. The LbL film growth was monitored by Surface Plasmon Resonance Spectroscopy in order to evaluate the interactions involved in the biomolecule immobilization. Atomic force microscopy and scanning electron

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