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## Hybrid composite material based on graphene and polyhemin for electrochemical detection of hydrogen peroxide

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### Abstract

A simple and reproducible way used to prepare hybrid inorganic-organic composite electrode materials based on polyhemin and graphene oxide (GO), consists in a drop-casting step of GO dispersed in TRIS solution on graphite followed by the simultaneously reduction of GO (rGO) and electropolymerization of hemin (polyHm). The new procedure for graphene–hemin composite preparation, preserving the intrinsic peroxidase-like activity of hemin, results in a performing G/rGO/polyHm electrode architecture.

Cyclic voltammetry investigations put on evidence that the new electrode architecture displays good electrochemical parameters and excellent electrocatalytic properties towards H<sub>2</sub>O<sub>2</sub> reduction. Square-wave voltammetry was used to plot calibration curves having analytical (linear domain between 9.9 - 50 μM of H<sub>2</sub>O<sub>2</sub>, sensibility of 61.94 ± 6.35 mA M<sup>-1</sup>, R = 0.9958, n = 10 points, and the detection limit of 8.86 μM H<sub>2</sub>O<sub>2</sub>) and kinetic parameters (apparent Michaelis Menten constant of 20 ± 1.45 μM H<sub>2</sub>O<sub>2</sub>) in good agreement with other previously reported values. Finally, the optimized sensor was applied to detect H<sub>2</sub>O<sub>2</sub> in a commercial product commonly used as disinfectant. The G/rGO/polyHm electrode is thus recommended for H<sub>2</sub>O<sub>2</sub> detection.

**Keywords:** graphene oxide, hemin, electropolymerisation, hydrogen peroxide

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