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Article

Tyramine Functionalized Graphene: Metal-Free Electrochemical Non-Enzymatic Biosensing of Hydrogen Peroxide

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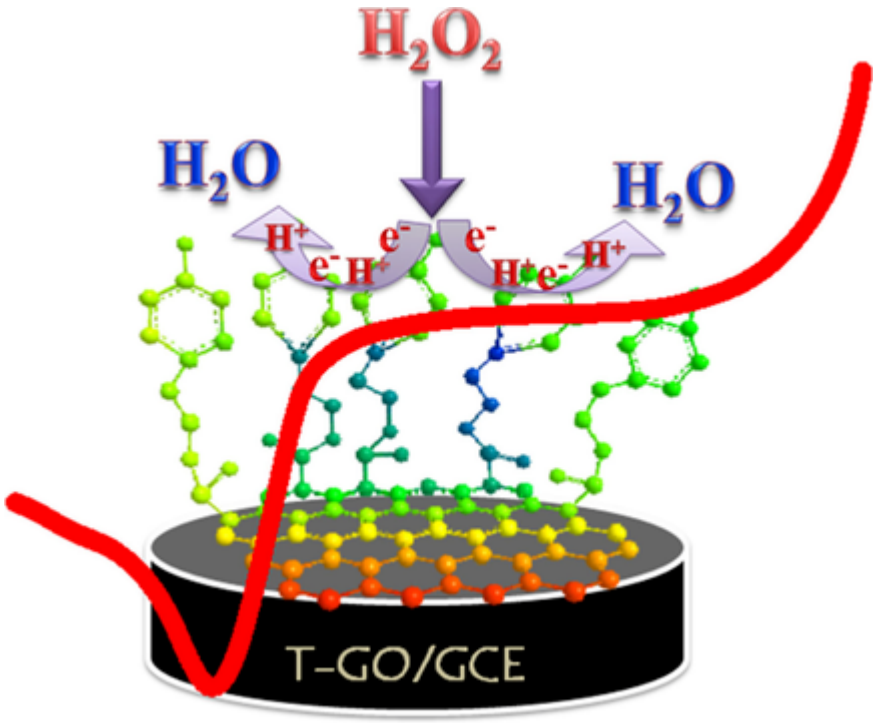
Graphical Abstract

A non-enzymatic electrochemical biosensor for H_2O_2 detection is fabricated using tyramine functionalized graphene (T-GO). As a metal-free electrocatalyst, T-GO shows good activity towards reduction of H_2O_2. A lower onset potential, lower detection limit, wider concentration range with higher electrochemical current and potential stability demonstrates the potential of the T-GO based system towards reduction of hydrogen peroxide.



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We report here non-enzymatic electrochemical biosensing of H_2O_2 using a highly stable, metal-free, tyramine functionalized graphene (T-GO) based electrocatalytic system. The surface functionalization of tyramine on graphene was carried out chemically. The obtained sheets were characterized by scanning electron microscopy (SEM), X-ray diffraction (XRD) as well as X-ray photoelectron (XP), Raman, FT-IR and UV-visible spectroscopy. More significantly, the combined results from morphological and structural studies show the formation of a few layers of graphene with effective large-scale functionalization by tyramine. As a metal-free electrocatalyst, the as-synthesized T-GO shown good electrocatalytic activity towards reduction of H_2O_2 with a sensitivity of 0.105 mM/cm^2 confirmed by combined results from cyclic voltammetric (CV) and linear sweep voltammetric (LSV), and amperometric (i–t) measurements. The lower onset potential (−0.23 mV vs SCE), lower detection limit, wider concentration range (10 mM to 60 mM) with higher electrochemical current and potential stability demonstrated the potential of our non-enzymatic and cost-effective T-GO based electrocatalytic system towards reduction of hydrogen peroxide.

Conflict of interest

The authors declare no conflict of interest.

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