SCREEN-PRINTED GRAPHITE ELECTRODES MODIFIED WITH A LANGMUIR-BLODGETT LAYER-BY-LAYER DEPOSITED TAILORED FUNCTIONAL SINGLE NANOBLOCK OF GRAPHENE-PRUSSIAN BLUE

M. Prodromidis*a, A. Michopoulosa, A. Kouloumpisc, D. Gournisc

a Department of Chemistry, b Department of Material Sciences & Engineering, University of Ioannina, Ioannina 45110, Greece,
*E-mail: mprodrom@cc.uoi.gr

The development of nanostructured electrocatalytic surfaces by adopting a true bottom-up approach based on Langmuir-Blodgett layer-by-layer deposition of a low dimensional single block of graphene oxide (GO)-prussian blue (PB) over graphite screen-printed electrodes is described. A water solution of GO was used as subphase in an LB deposition system while octadecylamine (ODA), which binds covalently with the GO, was injected at the air-water interface for the formation of hybridized ODA-GO. ODA-GO hybrid films were deposited on hydrophobic graphite SPEs by horizontal dipping in the LB trough. Then, GO platelets were further modified by bringing the surface of the transferred LB film in contact with ODA, and finally, the ODA-GO-ODA films were brought in contact with PB solution. The as-fabricated ODA-GO-ODA-PB nanostructured sensors were highly reproducible and showed a remarkable electrocatalysis towards reduction of hydrogen peroxide. On this account, the proposed sensors were successfully applied at the amperometric determination of hydrogen peroxide in commercial mouthwash solutions. Inherent limitations as regards the poor working stability of PB-modified sensors were also effectively addressed. Rubidium-modified assemblies showed an increased sensitivity and working stability, while the working stability was further improved at dimethyldioctadecylammonium-protected assemblies. The adopted fabrication approach combines low cost substrates, tailored functional electrocatalysts and fully automated deposition techniques for producing, on a large scale, sensors offered a wide range of applications in chemical and biosensing in combination with suitable enzyme(s).

KEYWORDS: Langmuir-Blodgett hybrid thin films; graphene; Prussian blue; screen-printed electrodes; hydrogen peroxide