

Characterization and Electrocatalytic Activity of Nanocomposites Consisting of Nanosized Cobalt Tetraaminophenoxy Phthalocyanine, Multi-walled Carbon Nanotubes and Gold Nanoparticles

Abstract

Glassy carbon electrodes were modified with composites containing cobalt tetraaminophenoxy phthalocyanine nanoparticles (CoTAPhPcNP), multi-walled carbon nanotubes (MWCNT) and gold nanorods (AuNRs). The modified electrodes were studied for their electrocatalytic behavior towards the reduction of hydrogen peroxide. Phthalocyanine nanoparticles significantly improved electron transfer kinetics as compared to phthalocyanines which are not in the nanoparticle form when alone or in the presence of multiwalled carbon nanotubes (MWCNTs). CoTAPhPcNP-MWCNT-GCE proved to be suitable for hydrogen peroxide detection with a catalytic rate constant of $3.45 \times 10^3 \text{ M}^{-1} \text{ s}^{-1}$ and a detection limit of $1.61 \times 10^{-7} \text{ M}$. Adsorption Gibbs free energy ΔG_{ad} was found to be $-19.22 \text{ kJ mol}^{-1}$ for CoTAPhPcNP-MWCNT-GCE.