

Electrocatalytic properties of the polypyrrole/magnetite hybrid modified electrode towards the reduction of hydrogen peroxide in the presence of dissolved oxygen

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Abstract

In this study, we report on the electrocatalytic behaviour of a polypyrrole/magnetite hybrid electrode towards the reduction of hydrogen peroxide. The electrocatalytic activity of the composite electrode was demonstrated by cyclic voltammetric and chrono-amperometric measurements in comparison with the identically prepared neat polymer film. The stationary reduction currents, measured at an appropriately chosen potential (here at $E = -0.3$ V), plotted against the peroxide concentration gave a perfect linear correlation in nitrogen atmosphere in the micromolar concentration range. The performance of the composite electrode was not affected by the presence of sulfate, nitrate or chloride anions. In the presence of dissolved oxygen a complex electrocatalytic activity was observed, involving the reduction of both oxygen and H_2O_2 . However, a linear dependence was found also in oxygen containing media, although with much higher currents, but with the same slope (even at different oxygen concentrations). This fact may trigger the development of such hybrid electrodes towards hydrogen peroxide sensors in different aqueous (including natural) samples.

Keywords: *hybrid electrode, magnetite, polypyrrole, H_2O_2 detection, O_2 reduction*