Metal- and metal-oxide modified multiwalled carbon nanotubes based
determination of glucose

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In this comparative study a traditional, paraffin oil and graphite powder based carbon paste electrode (CPE) was surface modified with multiwalled carbon nanotubes (MWCNT) and with composite nanomaterials of MnO2-MWCNT and Pt-MWCNT by simply drop coating method for obtaining easy to prepare and reliable voltammetric sensors for H2O2 determination in different samples. The SEM/EDS characterization of the composite nanomaterials confirmed that the mediators are randomly distributed on the surface of the MWCNTs, and in both cases represent approximately 5% of the nanocomposites. Cyclic voltammetric investigations were performed in acetate (pH 4.50), phosphate (pH 7.50) and borate (pH 9.18) buffers to determine/compare the basic electrochemical behaviors and to select the working potentials suitable for hydrodynamic chronoamperometric determination of H2O2 under different circumstances. The CV responses showed that in slightly alkaline media all four electrodes are applicable, but with different efficiency at different potential values, with favored reduction signal of H2O2 and Pt-MWCNT/CPE and oxidation signal at MnO2-MWCNT/CPE. The reproducibility of the responses is different; in the case of MnO2-MWCNT/CPE it is much lower, which demands additional electrochemical conditioning step. Additional remarkable differences were obtained in the case of two composite nanomaterial modified electrodes at pH 4.50 and 9.18. In the acidic media the MnO2-MWCNT/CPE was not suitable, but in basic supporting electrolyte showed promising behavior, while in the case of the Pt-MWCNT/CPE the signals are much promising in the acidic media with limited possibilities for applications at pH 9.18. The analytical methods were optimized applying, mainly, the Pt-MWCNT/CPE, in term of selection of the appropriate pH, and working potentials for hydrodynamic chronoamperometric determination of H2O2 in milk samples and in photocatalytic samples where the disappearance of the H2O2 was determined. Additionally, the Pt-MWCNT/CPE was modified with glucose oxidase and the glucose content was successfully determined in pollen sample.