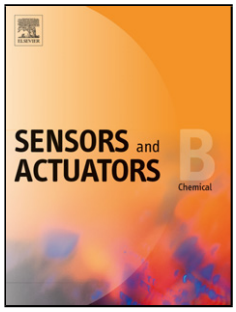

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Miniaturized and Multi-Purpose Electrochemical Sensing Device based on thin Ni Oxides

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Highlights

- Extensive study on Ni oxides electrochemical sensing device (Ni-EC Device) towards several redox active analytes including glucose, aminoacids and amines
- Complete glucose sensing study in real biological matrix of plasma and saliva
- Glucose test on blind samples of human plasma showed results comparable to the commercial POC system ACCU-CHECK Aviva (61.56 mg/dl from Ni-EC device versus 75 mg/dl from ACCU-CHECK Aviva)
- Good results on the detection of phenylalanine (important marker for the phenylketonuria disease) in real urine sample with very reliable results (28.1 µM was found by Ni-EC device, 26 µM confirmed by MS-MS measurement on the same sample).
- Good specificity for Phenylalanine respect to Glycine.
- Sensing ability assessment towards Organic Compound (OCs) ethanol, methanol, acetic acid, thioacetic acids and ethylenediammine.
- Good and comparable sensitivities towards alcohol compounds (of 4.47 µM ppm-1 cm-2 for methanol and 4.23 µM ppm-1 cm-2 for ethanol) and positive sensing response for ethylenediamine with a limit of detection of about 20 µM.

Abstract

An innovative miniaturized electrochemical device based on Nickel sensing material is described. The device contains three integrated microelectrodes with the working electrode made of Ni (7.5nm in thickness). It has been proved to be very versatile in the detection of several redox active analytes such as glucose, aminoacids and amines. In particular, the results in the detection of glucose from human plasma and saliva, of phenylalanine and glycine from urine and of organic compounds (ethanol, methanol, acetic acid, thioacetic acids, ethylenediammine) are presented