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Abstract

Nanomaterials exhibit unique chemical, physical and electronic properties that are different from their bulk counterparts, due to their small size, high surface area and specifically arranged architecture. Nanoscale metal oxides in combination with carbonaceous or other nanomaterials, utilized as modifiers of various types of working electrodes, serve as the basis for the development of electroanalytical procedures for the detection of various compounds. Electrochemical sensors that we are being developed are distinguished by high selectivity, sensitivity, low detection limit and thorough real-world sample analysis. Three types of biosensors: non-enzymatic, enzymatic and immuno-biosensors, were developed. Here we present synthesis nanoplatfoms and their applications in electrochemical sensing of various biomolecules: a) $(\text{Zn,Fe})_3\text{O}_4$ for glucose detections, b) amidase/CeO₂/GNR for paracetamol monitoring, c) dandelion-like MnO₂ for determination of L-dopa and d) citric acid-capped gallium oxyhydroxide for homocysteine impedimetric immunosensing. The design of these materials was analysed by complementary technics (XRPD, SEM, TEM, SQUID, DLS) to determine their (micro)structural properties and correlate them with electroanalytical performance. During the development, sensors' overall output had to be assessed in detail, especially real-world sample performance and the capability of potential commercialization. Unique electrochemical sensors based on nanomaterials, developed in our group, open new avenues for the design and fabrication of high-performance sensors with great sensitivity to different biomolecules.

Keywords: Nanomaterials, biosensors, test strip, disposable sensors.