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Engineering of Nanoelectrochamical Sensors for Selective Molecular Recognition

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There is indeed a need for fast and simple methods for the evaluation of chemical compounds and biomolecules (e.g. drugs, toxins, food additives, and environmental pollutants) that have wide effects on the functioning of the nervous system, heart, and kidney and also on the oxidative stress related states. Therefore, accurate, rapid, and low-cost monitoring of biomolecules is a critical in numerous fields. Electrochemistry provides a convenient way for biomolecules detection because of its advantages, including high sensitivity, selectivity, and fast response time. Here, we developed accurate nonenzymatic electrochemical sensors for biomolecules such as H_2O_2 (Scheme I) and glucose (Scheme II) using heme- protein modified and metal oxide modified Ni foam electrodes. The proposed electrodes allowed the development of method for sensitive, selective detection over a wide range of H_2O_2 and glucose concentrations in the presence of potentially interfering organic (ascorbic acid, uric acid, dopamine, lactose, maltose, and sucrose) and inorganic (NaCl, Na_2SO_4, KCl, and K_2SO_4) species (Fig. 1). In addition, simple, selective detection and analyzing methods of H_2O_2 form fruit juices and glucose levels in diabetic blood patients was developed. Our results demonstrated the potential for our electrochemical sensors to be used in preventing serious health problems associated with oxidative stress, kidney failure and diabetes mismanagement

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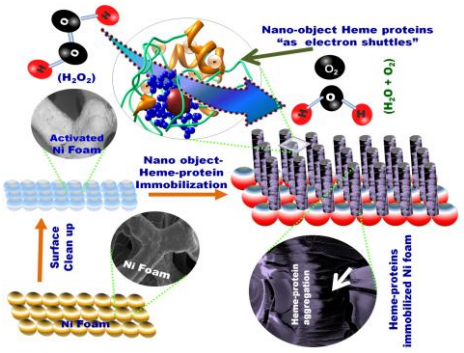
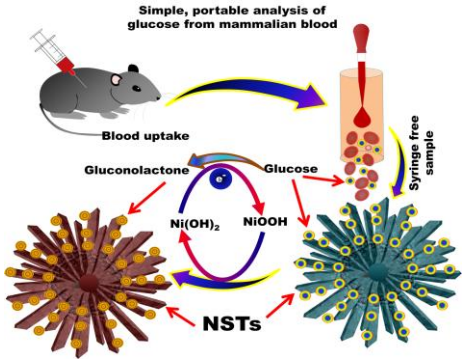


Scheme 1 Schematic illustration of nanoscale hemeproteins as electro n shuttles b-etween the Ni foam a nd electrolytes during the catalytic oxidation of H_2O_2.



Scheme 2 Systematic design and mechanism for simple, portable, analysis of glucose from mammalian blood.

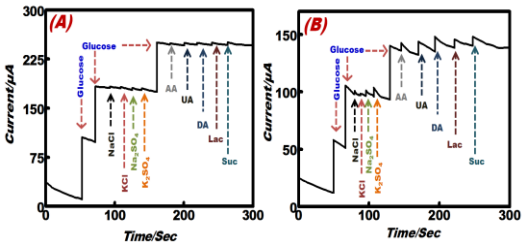


Figure 1 Amperometric selective signal of the (A) NiO nanostrands (B) and NiO nanosheets electrodes.

Reference:

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