MWCNT–MANGANESE PORPHYRAZINE NANOHYBRID ELECTRODE MATERIAL AS A CATALYST FOR GLUCOSE AND H_2O_2 BIOSENSORS

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Porhyrinoids are very important macrocycle compunds which determine many biochemical processes. In porphyrazines (Pzs), aza-analogues of porphyrins, the conjugated molecular structure consists of four pyrrole rings linked by aza bridges. The presence of metal ion in the core and the plethora of peripheral substituents equips these macrocycles with many exceptional physicochemical properties, including optical and electrochemical. Carbon nanotubes (CNT) have gained considerable attention in research due to their unique electronic properties, chemical stability and affinity to biomolecules. It was found that the CNT can promote effective electron transfer reactions. Moreover, they can be used as a support for immobilization of different electron transfer mediators onto electrode surfaces able to improve their electrochemical properties. [1,2].

Enzymatic electrochemical glucose biosensors are very popular devices for glucose monitoring available on market. The research on the application of enzymes toward glucose sensing have been carried out widely over the past decades. Glucose biosensors monitor the redox current generated when electrons are transferred either indirectly or directly between an enzymatic receptor and a conducting electrode surface [3].

Based on the above considerations, synthethic route leading to the new macrocycle was performed following a two-step procedure. Obtained magnesium porphyrazine derivative was subjected to demetallation reaction with trifluoroacetic acid and subsequent remetallation using manganese (II) salt. The resulting products were carefully purified via flash column chromatography and characterized using various analytical techniques, especially NMR, MALDI and UV-Vis. The newly synthesized Pz was subjected to electrochemical studies and was deposited on MWCNTs. As a result, a promising electrode material revealing high electrocatalytic ability toward hydrogen peroxide oxidation was obtained. Moreover, the proposed hybrid nanomaterial was considered as a platform for immobilization of glucose oxidase. The resultant biosensor material was evaluated for glucose determination. According to the data, the novel PzMn(III) is a compound of choice for the development of electrochemical sensors of hydrogen peroxide or glucose [4].

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References

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Figures

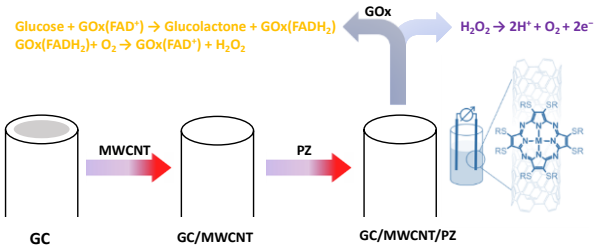

Figure 1. Chemical modification of glassy carbon electrode (GCE).