INVESTIGATION AND USE OF THERMALLY REDUCED GRAPHENE OXIDE FRACTIONS IN THE DEVELOPMENT OF THIRD GENERATION BIOSENSORS

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The increasing demand for inexpensive and portable analytical devices, which require low-sample consumption and real-time response, has greatly raised the novelty in the design of biosensors [1]. Researchers have especially focused on new materials, which could improve portability and miniaturization of mentioned devices [2]. This can be achieved by integrating carbon materials, which are characterized by unique properties, into analytical systems. One of the most promising carbon materials is graphene, which after special modification could help to create third-generation biosensors that use direct electron transfer (DET) between the enzyme and the electrode and therefore do not require any intermediate mediating materials [3].

This study aims to synthesize and investigate fractions of thermally reduced graphene oxide (TRGO) and to use them in construction of third-generation biosensors based on pyrroloquinoline quinone-dependent glucose dehydrogenase (PQQ-GDH) from *Acinetobacter calcoaceticus* sp. and urease from *Canavalia ensiformis.* While PQQ-GDH enzyme could be very promising for creation of new technologies for investigation of diseases related to release of carbohydrates, urea sensitive analytical devices can be significant in medicine, agriculture and chemical industries too.

TRGO fractions were synthesized from graphite oxide (GO), which was initially prepared using modified Hummers' method and pre-washed 13 days from excess of sulphate ions. Afterwards GO was reduced using thermal reduction and fractionation equipment. Properties of obtained TRGO fractions were characterised by x–ray diffraction, thermogravimetric and Brunauer–Emmett–Teller analysis. The amperometric biosensors were constructed using membranes made from PQQ-GDH/urease immobilised into layer of TRGO. Characteristics of proposed biosensors, such as sensitivity, substrate selectivity, optimal working electrode potential, pH and concentration of buffer solution were determined. On a base of these data, an influence of TRGO properties to the efficacy of biosensors were concluded. Obtained results will be presented in more detail during the poster session.

This research was partly supported by Research Council of Lithuania (Project No. 09.3.3-LMT-K-712-16-0125).

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