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Biosensor based on magnetite/lignin/polydopamine hybrid material combined with glucose oxidase for amperometric glucose biosensor

A Jędrzak, T Rębiś, M Kuznowicz and **T Jesionowski**
Poznan University of Technology, Poland

The development of technology has contributed to the intensification of research into the creation of more advanced materials. Such demands can be fulfilled by various inorganic-organic hybrid materials that were previously widely used in many fields in science also for enzyme immobilization or biosensors constructions. Rapid development of biosensor systems started after the first biosensor containing glucose oxidase was developed by Clark and Lyons in 1962. To this day, many scientists are working on new methods of creation to better detection, as evidenced by amounts of published papers. Novel innovative materials for glucose biosensor have gained enormous attention due to the need for a cheap and effective blood glucose monitoring. Monitoring of glucose level is important aspect in various media, like blood, fluids or juices. Despite the presence in the market of biochemical specialists for the qualitative and quantitative detection of glucose, the commercial available glucose monitoring device have become a crucial part of diabetes care or monosaccharide but has some limitations in accuracy and errors that can be limited due to manufacturing variances, storage, aging etc. Great efforts have been focused on the preparation of magnetite/lignin/polydopamine (Fe_3O_4/Lig/PDA) hybrid material combined with glucose oxidase for amperometric glucose biosensors. In this work a synthesis and physicochemical characterization of a novel magnetite/lignin/polydopamine (Fe_3O_4/Lig/PDA) material is presented as a novel and effective platform for enzyme immobilization and biosensing application. The platform has interesting features like improved thermal and mechanical stability, excellent adhesion for inorganic and organic materials, transferability of electrons and photo thermal properties. Greater material stability and durability and the extension of its attractiveness, compared to the current commercial products can be used in determining the level of glucose in different media like body fluids, juices, fruits.

Recent Publications

1. Wu C, Sun H, Li Y, Liu X, Du X, Wang X and Xu P (2015) Biosensor based on glucose oxidase-nanoporous gold co-catalysis for glucose detection. Biosens. Bioelectron. 66:350-355.
2. Rafighi P, Tavahodi M and Haghighi B (2016) Fabrication of a third-generation glucose biosensor using graphene-polyethyleneimine-gold nanoparticles hybrid. Sensors and Actuators B Chemical 232:454-461.
3. Jędrzak A, Rębiś T, Klapiszewski Ł, Zdarta J, Milczarek G and Jesionowski T (2018) Carbon paste electrode based on functional GOx/silica-lignin system to prepare an amperometric glucose biosensor. Sensors and Actuators B Chemical 256:176-185.
4. Ghasemi E, Shams E and Nejd N (2015) Covalent modification of ordered mesoporous carbon with glucose oxidase for fabrication of glucose biosensor. Journal of Electroanalytical Chemistry 752:60-67.
5. Wang J, Chen L and Ho K (2013) Synthesis of redox polymer nanobeads and nanocomposites for glucose biosensors. ACS Applied Materials & Interfaces 5:7852–7861.

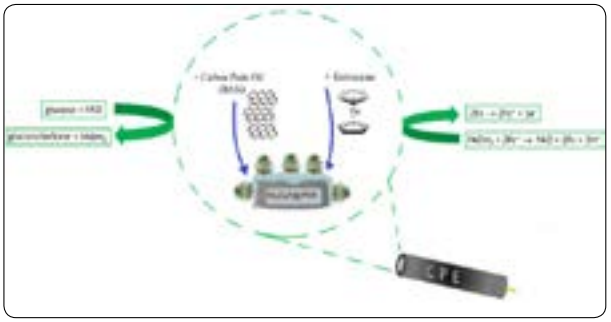

Figure 1: Scheme presents construction of biosensor using a carbon paste electrode (CPE).

Biography

A Jędrzak has received his MSc degree in Organic Chemistry in 2016 at Poznan University of Technology. Since 2016 he is a PhD student of Chemical Technology at Poznan University of Technology and also a Member of NanoBioMedical Centre in Poznan. His research interests are biosensors, enzymatic and catalytic systems and synthesis of hybrid/composite materials for nanomedicine.

artur.jedrzak@gmail.com