The investigation of biocatalytic growth of gold nanoparticles

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Gold nanoparticles (Au-NPs) could be synthesized of different shape, sizes and by different techniques, for example using green synthesis protocol [1]. Au-NPs have been enlarged in a solution containing tetrachlorauric acid ($HAuCl_4$) and H_2O_2. In this case the Au-NP seeds acted as catalysts for the reduction of $AuCl_4^-$ by H_2O_2, resulting in the enlargement of nanoparticles [2]. The application of enzymes for the growth of Au-NP seeds and enhancement of analytical signal is a very promising field in analytical chemistry [3,4,5]. Glucose oxidase (GOx) in the presence of oxygen catalysed oxidation of glucose to gluconolactone and H_2O_2, followed by the reduction of $AuCl_4^-$ on Au-NPs by the H_2O_2. As a result of these reactions, the growth of Au-NPs immobilized on the GOx was used for the improvement of the electrical contact of redox enzyme with the electrode and for the enhancement the electron transfer in the ferrocene mediated system [3].

The main aim of this study was the development of optical glucose biosensor using glucose oxidase for the biocatalytic growth of 13 nm Au-NPs. The phosphate buffered saline solution containing GOx, glucose and tetrachlorauric acid was mixed with Au-NPs solution at different ratios. The growth of Au-NPs was studied by dynamic light scattering (DLS) method. DLS measurements were performed using a Malvern Zetasizer Nano ZS (Germany) equipped with a 633 nm He–Ne laser and operating at an angle of 173°. The obtained data were analysed using Dispersion Technology Software version 6.01 from Malvern. The obtained results showed that hydrodynamic radius of enlarged Au-NPs depended on the glucose concentration in the solution.

References

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