Optical sugar sensor based on synthesis of gold nanoparticles

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Gold nanoparticles (AuNP) are widely used in many fields due their unique optical and physical properties [1]. A wide array of solution based approaches has been developed in the past few decades to control the size, shape and surface functionality of AuNP [2]. Formation and growth of AuNP can be used as analytical signal in design of sensors and biosensors [3-5]. Sugars are interesting analyte for sensors development. Determination of sugars is important due their influence to human health and importance for manufacture of foods [6-7].
The main aim of this study was to develop rapid and simple method for sugars detection in different solutions. Optical methods such as UV-Vis absorption spectroscopy and Dynamic light scattering (DLS) were chosen due to their desirable properties such as easy sample preparation and determination of analyte. Formation of gold nanoparticles was observed as an indirect signal of sugars presence in solution. The solution for optical measurements contains a sugar sample, cetyltrimethylammonium bromide (CTAB) as a surfactant, tetrachloroauric acid as a precursor for AuNP and sodium hydroxide as a solvent. In basic conditions at room temperature during sugar oxidation $AuCl_4^-$ ions are reduced to Au^0 creating AuNP. Obtained results showed that surfactant is necessary for AuNP stability in colloidal solution. Furthermore, optimal concentrations of NaOH and CTAB were chosen for quick reaction and for preventing AuNP aggregation. In addition, for quantitative measurements calibration curves were obtained for various sugars (glucose, fructose etc.). Moreover, it was discovered that formation rate of AuNP depends on the type of sugar.

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