DEVELOPMENT OF EFFECTIVE ELECTROCHEMICAL TECHNIQUES FOR GLUTATHIONE (GSH) DETERMINATION

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Sulfur containing molecules like glutathione (GSH), are known to possess a variety of roles within physiological systems [1]. Altered levels of GSH in plasma have been implicated in a number of pathological conditions, including Alzheimer’s, Parkinson’s diseases, diabetes, macular degeneration, and HIV disease [2]. On the other hand, detection of GSH level in wine samples is also important because it prevents the oxidation of phenolic compounds in wine. Moreover, it is claimed to have potential to play a major role in protecting volatile thiols during the aging of bottled white wines [3]. Electrochemical techniques are practical, economical and sensitive techniques that can be applied for detection of wide variety of compounds including GSH [2]. However, there are some disadvantages that are needed to be overcome for the direct electrochemical oxidation of GSH at unmodified traditional electrodes. These can be describe as slow electron transfer reaction of GSH which requires high working potential and strong adsorption of GSH at the surface of metallic electrode that makes GSH detection harder. These problems have been solved using modified electrodes which were prepared by suitable modifiers including nanoparticles (nps) [2]. It was reported that the thiol-containing amino acids were detected by using gold nanoparticles (Au-nps). The reactivity involves strong affinity of the thiol functional group of the amino acids to gold [4] because of well known strong Au-S bonding interaction [5].

In recent years carbon nanotubes (CNTs) have been the subject of numerous investigations in chemical, physical and materials areas, due to their unique structural, mechanical, electronic and chemical properties [6]. In this study, detection of GSH was accelerated with electrodes modified with combination of Au-np, CNTs and silica gel as a carrier material. For this purpose, a new electrochemical method namely centri-voltammetry was applied for the detection of GSH. Centri-voltammetry is a novel method, which allows combination of centrifugation with voltammetry [7]. This novel method was developed by our group and applied for heavy metal analysis where sensitive results were obtained. For conducting GSH detection with centri-voltammetry, a home-made centri-voltammetric cell was constructed and used during the measurements. After optimization of working parameters and characterization studies, by using standard addition method, the developed sensor was employed in detection of GSH in wine samples without any sample decomposition step.

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References