Determination of Penicillamine on Cerium Oxide Nanoparticles by Electrochemical Methods

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Sulfhydryl compounds (thiols, R-SH) are known to possess a multitude of roles within physiological systems. As such, depletion of cysteine and glutathione has been noted to accompany premature arteriosclerosis, leukemia and cervical cancer [1].

Nanometer size materials have been used successfully for a wide range of technological applications including, bioelectronics, catalysis, optics, biomedical and chemical or biological sensors and biosensors [2-4], due to their catalytic properties and roughening of the conductive sensing interface.

In this study, cerium oxide film is electrodeposited on the surface of GC electrode using cyclic voltammetry technique. In this work, a glassy carbon electrode coated with cerium oxide film has been developed as a simple, sensitive, rapid and new assay method for penicillamine. Novel cerium oxide nanoparticles based sensor for the detection of penicillamine (PA) in aqueous solution has been developed. Cyclic voltammetry at potential range -1.1 to 1.1V from aqueous buffer solution (pH 7) containing CeO2 produced a well-defined cerium oxide nanoparticles deposited on the surface of glassy carbon electrode. The Differential pulse voltammetry detection of penicillamine is carried out at 0.451V in buffer solution with pH 7. Cerium oxide nanoparticles have many advantageous such as remarkable catalytic activity, simple preparation procedure and long-term stability of signal response during of penicillamine oxidation.

In conclusion, the glassy carbon electrode modified with electrodeposited cerium oxide nanoparticles showed excellent electrocatalytic activity toward oxidation high PA over the pH range 5-11 and a wide range of concentration. This electrode can be use for determination of micromolar or nanomolar concentration ranges of PA using, voltammetry or DPV, respectively. The electrochemical system will be applicable for analysis of PA in real samples containing different reducing compounds and other interferences exists in sample matrix. Furthermore, the modification procedure offers considerable simplicity and economy of electrode preparation as compared to other electrochemical methods for PA detection. Due to low detection limit of this system, it can be used for determination of PA in real samples.

REFERENCES