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ELECTROCHEMICAL DETERMINATION OF DOPAMINE AND URIC ACID IN THE PRESENCE OF ASCORBIC ACID USING NITROGEN DOPED GRAPHENE MODIFIED CARBON PASTE ELECTRODE

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ABSTRACT

Nitrogen doped multi layered graphene (NDMLG) is synthesized by annealing the black fluffy mass obtained by decomposing the complex formed from Zn(OAc)₂, di-ethanolamine and tri-ethanol amine. The NDMLG has been characterized by HRTEM, FESEM, XRD and XPS, which indicate formation of nitrogen doped multi-layer graphene flakes. The NDMLG shows better electrochemical oxidation property towards Dopamine and Uric acid. The linear response ranges for determination of DA and UA are 0.5-150 μ M, 3-60 μ M respectively and the detection limits (S/N = 3) are 50nM, 50nM respectively in the mixture.

Keywords: Nitrogen doped graphene, electrochemical determination, decomposition of Zn complex.

INTRODUCTION

Dopamine (DA) and Uric acid (UA) are biomolecules which play crucial roles in physiological processes. DA is an important neurotransmitter and lies in central nervous system of mammals. Low level of DA leads to diseases like Parkinson's (PD), Schizophrenia, cardiac arrest [1]. UA is known to be a primary purin base product of metabolisms and a natural antioxidant [2]. Abnormal levels of UA are symptoms of several diseases including PD, gout, hyperuricemia, and immunodeficiency. Therefore determination of DA and UA are vital for clinical diagnosis. Several techniques already have been developed such as chromatography, chemiluminescence, fluorimetry, electrophoresis but these are often time consuming, complicated and expensive. To overcome these problems, simplicity and cost effectiveness of electrochemical methods are drawing much attention for detection of these bio-active molecules. Graphene is a two dimensional crystalline form of monolayer sp^2 -hybridized carbon. It has unique properties [3, 4] such as high surface area, high thermal and electrical conductivity which have already been studied. Nitrogen doped graphene draws a lot of attention due to its large application in electrochemical biosensing [5]. Nitrogen atom in nitrogen doped graphene can drastically alter the electrode performance than pistringraphene by generating more active sites. In our method, we have synthesized NDMLG by the thermal decomposition of complex compound of Zn with ligands di- and tri-ethanol amine, followed by high temperature pyrolysis and its application in making efficient electrode for electrochemical analysis bio-molecules.

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