Determination of Folic Acid Using Graphene/Molybdenum Disulfide Nanosheets/Gold Nanoparticles Ternary Composite

Veerappan Mani¹,², Mani Govindasamy¹, Shen-Ming Chen¹,*, Boopathi Subramani³, Anandaraj Sathiyan⁴, Johnson Princy Merlin⁴

¹ Department of Chemical Engineering and Biotechnology, National Taipei University of Technology, Taipei, Taiwan 106 (ROC)  
² Graduate Institute of Biomedical and Biochemical Engineering, National Taipei University of Technology, Taipei, Taiwan (ROC)  
³ Research Center for Applied Sciences, Academia Sinica, Nangang, Taipei 11529, Taiwan (ROC)  
⁴ Department of Chemistry, Bishop Heber College (Autonomous), Tiruchirappalli-620 017, Tamil Nadu, India  
* E-mail: smchen78@ms15.hinet.net

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Currently, graphene nanosheets (GNS) and molybdenum disulfide (MoS₂) are two most popular 2D layered materials in electrochemical applications due to their excellent physico-chemical properties. Herein, we have developed a facile method to prepare a ternary nanocomposite composed of graphene, (MoS₂) and gold nanoparticles (AuNPs) and described its electrochemical sensing applicability in the determination of folic acid (FA). The morphological, elemental, impedance and electrochemical attributes of the GNS–MoS₂–AuNPs ternary nanocomposite are studied in detail. Next, GNS–MoS₂–AuNPs is deposited on screen printed electrode (SPCE) and applied for the electrochemical sensing of folic acid. Interestingly, the composite has excellent electrocatalytic ability to folic acid due to good synergic effect between GNS, MoS₂ and AuNPs. The developed sensor detects FA in wide linear range of 50 nM–1150 µM and displays low detection limit of 38.5 nM. The sensor performance of the GNS–MoS₂–AuNPs is either superior or comparable to the previously reported electrodes. Moreover, the electrode has good repeatability, reproducibility and stability. The practical applicability of the electrode is demonstrated in human urine samples and the results have shown good recovery.

Keywords: Two dimensional layered materials; metal dichalcogenides; vitamins; nanotechnology; physical chemistry; catalysis; Analytical chemistry; Food science; carbon nanotubes

FULL TEXT