Facile one-step synthesis of porous graphitic carbon nitride nanosheets/oxidized multi-wall carbon nanotubes composite for simultaneous anodic stripping voltammetric detection of heavy metals in food samples

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We demonstrate a facile one-step synthesis of three-dimensional (3D) porous graphitic carbon nitride nanosheets (P-g-C₃N₄-NSs)/oxidized multi-wall carbon nanotubes (O-MWCNTs) composite by simultaneous chemical oxidation of bulk g-C₃N₄-NSs and bulk MWCNTs. This one-step chemical oxidation method results in the simultaneous formation of acid functional groups on the basal surfaces of both g-C₃N₄ and MWCNTs and also the formation of the porous structure of P-g-C₃N₄/oxidized MWCNTs composite at the same time. The acid functionalization and surface morphology of the prepared P-g-C₃N₄-NSs/O-MWCNTs composite were examined using attenuated total reflectance infrared spectroscopy (ATR-IR), X-ray diffraction methods (XRD) and high-resolution transmittance electron microscopy (HR-TEM). The electrochemical properties of the P-g-C₃N₄/O-MWCNTs composite modified screen-printed electrode (SPE) was studied using cyclic voltammetry (CV), electrochemical impedance spectroscopy (EIS) and differential pulse voltammetry techniques (DPV). P-g-C₃N₄/O-MWCNTs/SPE exhibits excellent sensitivity and selectivity towards the simultaneous detection of heavy metals (Cd, Hg, Pb & Zn) in food samples with the detection limits (S/N=3) ranging between 8 to 60ngL⁻¹ under stripping analysis. The practical feasibility of the developed sensor was examined for simultaneous detection of heavy metals in various food samples and the obtained results exhibit good accuracy and good reproducibility. These results imply that the developed composite might be an alternative sensor material for practical applications in electrochemical detection of heavy metals in foods.

Biography
Vinoth Kumar Ponnusamy has completed his PhD at the age of 26 years from NCHU, Taiwan and Postdoctoral studies from NCHU School of Chemistry. Currently, he is an Assistant Professor in Department of Medicinal and Applied Chemistry, Kaohsiung Medical University, Taiwan. He has published more than 25 papers in reputed journals and has been serving as an Editorial Board and peer-review member of repute.

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