Hydrothermal Synthesis of Carbon Coated NiCo₂O₄ Nano flower for the Electrochemical Oxidation of Sulfite in Real Sample

Karuppiah Pandi, Mani Sivakumar, Shen-Ming Chen*, Yi-Hui Cheng, Tse-Wei Chen

Electroanalysis and Bioelectrochemistry Lab, Department of Chemical Engineering and Biotechnology, National Taipei University of Technology, Taipei 10608, Taiwan.

*E-mail: smchen78@ms15.hinet.net

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A facile synthesis of carbon-coated nanoflowers C@NiCo₂O₄ by using the simple hydrothermal method and nitrogen-rich melamine as a carbon source for electrochemical detection of sulfite. As synthesized materials were analyzed by using the physiochemical methods such as X-ray diffraction (XRD), X-ray photoelectron spectroscopy (XPS), Fourier transform infrared spectroscopy (FTIR), Scanning electron microscopy (SEM) and EDAX mapping confirms the crystal structural, the presence of chemical species, functional groups, flower like morphology and quantity of specific elements of C@NiCo₂O₄ respectively. Among the all the prepared sample C@NiCo₂O₄-3 are reveals greater electrocatalytic activity by earlier oxidation of sulfite at 0.42 V in cyclic voltammetry studies. Amperometry depicts that the good sensitivity (3.57 $\mu\text{A mM}^{-1}\text{cm}^{-2}$), low limit of detection (0.05 μM) and linear range (0.3 to 724 μM) of C@NiCo₂O₄-3 due to boosted electrical conductivity by synergetic effect (between coated carbon and NiCo₂O₄) and enlargement of surface area. Six time repeatability of single modified GCE of pristine and C@NiCo₂O₄-3 CV curve shows oxidation peak current with RSD of 43% and 4% respectively, stable operation of C@NiCo₂O₄-3 is owing to chemical inertness of carbon. Real-time detection of sulfite in red wine and tape water guarantee the commercialization of electrochemical sulfite sensor.

Keywords: Nickel cobaltite, sulfite, electrochemical oxidation, carbon coating NiCo₂O₄.

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