Development of 4-methoxyphenol chemical sensor based on NiS2-CNT nanocomposites

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Abstract
Nickel disulphide decorated carbon nanotube nanocomposites (NiS2-CNT NCs) was synthesized by the wet-chemical method in alkaline medium. Characterization of the resulting NiS2-CNT NCs was performed in details by field emission scanning electron microscopy (FESEM) attached with energy-dispersive spectroscopy (EDS), X-ray photoelectron spectroscopy (XPS), UV/vis. spectroscopy, FT-IR spectroscopy, and X-ray diffraction pattern (XRD). Glassy carbon electrode (GCE; Surface area: 0.0316 cm(2)) was fabricated with NiS2-CNT NCs and developed in chemical sensing performance by a simple and reliable I-V method. Toxic chemical 4-methoxyphenol (4-MP) was used as a target analyte in selectivity study, which exhibits a fast response towards NiS2-CNT NCs fabricated GCE sensor by the I-V method. It also displayed an excellent sensitivity, lower-detection limit, large linear dynamic range, long-term stability, and reproducibility. In analytical investigation, the calibration plot was found linear (r(2): 0.8744) over a large concentration range (from 0.1 nM to 10.0 mM), where the sensitivity was around 632.9224 μA mM(-1) cm(-2) with a very low detection limit (LOD) of 30.0 +/- 0.02 pM (Based on the S/N=3). Potentials of NiS2-CNT NCs in terms of chemical sensing are also discussed in this report. This approach is introduced as a well-organized route of efficient phenolic sensor development in environmental and healthcare fields in broad scales. (C) 2016 Taiwan Institute of Chemical Engineers. Published by Elsevier B.V. All rights reserved.

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