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## Development of 4-methoxyphenol chemical sensor based on NiS<sub>2</sub>-CNT nanocomposites

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### Abstract

Nickel disulphide decorated carbon nanotube nanocomposites (NiS<sub>2</sub>-CNT NCs) was synthesized by the wet-chemical method in alkaline medium. Characterization of the resulting NiS<sub>2</sub>-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 Xray diffraction pattern (XRD). Glassy carbon electrode (GCE; Surface area: 0.0316 cm<sup>2</sup>) was fabricated with NiS<sub>2</sub>-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 NiS<sub>2</sub>-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  $\mu\text{A mM}^{-1} \text{cm}^{-2}$  with a very low detection limit (LOD) of 30.0  $\pm$  0.02 pM (Based on the S/N=3). Potentials of NiS<sub>2</sub>-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.

### Keywords

**Author Keywords:** NiS<sub>2</sub>-CNT nanocomposites; Wet-chemical method; Optical properties; 4-methoxyphenol sensor; I-V method; Sensitivity

**KeyWords Plus:** GLASSY-CARBON ELECTRODES; P-AMINOPHENOL; ELECTROCHEMICAL PROPERTIES; NANOSTRUCTURE MATERIALS; MASS-SPECTROMETRY; PHENOL DETECTION; NANOPARTICLES; FES<sub>2</sub>; FABRICATION; NANOTUBES

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