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Fabrication of chloroform sensor based on hydrothermally prepared low-dimensional β-Fe_2O_3 nanoparticles

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ABSTRACT

Hydrothermally prepared as-grown low-dimensional nano-particles (NPs) have been characterized using UV–vis spectroscopy, Fourier transform infrared (FT-IR) spectroscopy, powder X-ray diffraction (XRD), field emission scanning electron microscopy (FE-SEM), Raman spectroscopy, and electron dispersion spectroscopy (EDS). The uniformity of the nano-material was executed by the scanning electron microscopy, where the single phase of the nano-crystalline β-Fe_2O_3 was characterized using XRD techniques. β-Fe_2O_3 nanoparticles fabricated glassy carbon electrode (GCE) have improved chloroform-sensing performances in terms of electrical response (*I–V* technique) for detecting analyte in liquid phase. The analytical performances were investigated, which showed that the better sensitivity, stability, and reproducibility of the sensor improved significantly by using Fe_2O_3 NPs thin-film on GCE. The calibration plot was linear ($R = 0.9785$) over the large range of 12.0 μM to 12.0 mM. The sensitivity was calculated as 2.1792 μA cm^{-2} mM^{-1} with a detection limit of 4.4 ± 0.10 μM in short response time (10.0 s).

1. Introduction

Nanotechnology is attracting significant attention due to its unique property and capability in investigating sensing analytes, which is hardly feasible for the conventional sensor systems [1–3].

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