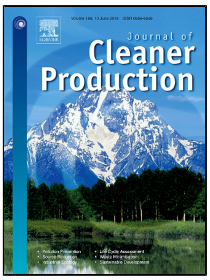
Accepted Manuscript



A clean approach for the reduction of hazardous 4-nitrophenol using gold nanoparticles decorated multiwalled carbon nanotubes

Abdullah A. Al-Kahtani, Turki Almuqati, Norah Al Haqbani, Tansir Ahamad, Mu. Naushad, Saad M. Alshehri

PII:	S0959-6526(18)31233-2
DOI:	10.1016/j.jclepro.2018.04.197
Reference:	JCLP 12778
To appear in:	*Journal of Cleaner Production*
Received Date:	11 December 2017
Revised Date:	20 April 2018
Accepted Date:	21 April 2018

Please cite this article as: Abdullah A. Al-Kahtani, Turki Almuqati, Norah Al Haqbani, Tansir Ahamad, Mu. Naushad, Saad M. Alshehri, A clean approach for the reduction of hazardous 4-nitrophenol using gold nanoparticles decorated multiwalled carbon nanotubes, *Journal of Cleaner Production* (2018), doi: 10.1016/j.jclepro.2018.04.197

Words 6500

A clean approach for the reduction of hazardous 4-nitrophenol using gold nanoparticles decorated multiwalled carbon nanotubes

Abdullah A. Al-Kahtani, Turki Almuqati, Norah Al Haqbani, Tansir Ahamad, Mu. Naushad*, Saad M. Alshehri*

Department of Chemistry, College of Science, Bld#5, King Saud University, Riyadh 11451, Saudi Arabia

Corresponding authors: mnaushad@ksu.edu.sa (M. Naushad); alshehri@ksu.edu.sa (S.M. Alshehri)

Abstract

4-Nitrophenol (4-NP) has become anthropogenic pollutant and poses a threat to the environment and human health. The fast detection and reduction of 4-NP can reduced their environmental and health issues. In this study, we have prepared the spherical shaped gold nanoparticles (AuNPs) decorated multi-walled carbon nanotubes (MWCNTs) in the hydrogel matrix. The prepared nanocomposite (Au@MWCNTs) was characterized successfully by several analytical techniques such as FTIR, Ramman, UV-visible spectra, XRD, XPS, and TEM. The surface of MWCNTs was decorated with AuNPs with the diameters range between 10–35 nm, the HRTEM results show 2.36 Å interlayer spacing corresponding to (111) crystal planes. The prepared nanocomposite was used as an electrochemical detector in the detection of 4-nitrophenol (4-NP). A large reduction peak was observed at -0.56 V corresponding to the reduction of 4-NP toward p-hydroxyaminophenol using 4 e^- processes, additionally two peaks were observed at 0.13 V and 0.19 V corresponding to the redox behavior p-hydroxyaminophenol and p-nitrosophenol. It was clearly observed, that the Au@MWCNts electrode detects at low concentration range with high sensitivity. Moreover, Au@MWCNTs was also used as a catalyst for the reduction 4-NP to 4-AP (4-aminophenol) using $NaBH_4$ via pseudo-first-order and the rate constant was found to be 4.9×10^{-3} s^{-1} supporting the promising reduction of 4-NP.

Keywords: Nanoparticles, Nitrophenol, Hazardous, Electrochemical detection