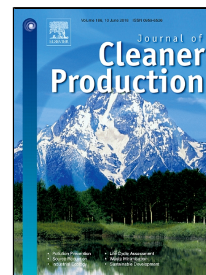


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A clean approach for the reduction of hazardous 4-nitrophenol using gold nanoparticles decorated multiwalled carbon nanotubes



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

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**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<sup>-</sup> 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<sub>4</sub> via pseudo-first-order and the rate constant was found to be  $4.9 \times 10^{-3} \text{ s}^{-1}$  supporting the promising reduction of 4-NP.

**Keywords:** Nanoparticles, Nitrophenol, Hazardous, Electrochemical detection

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