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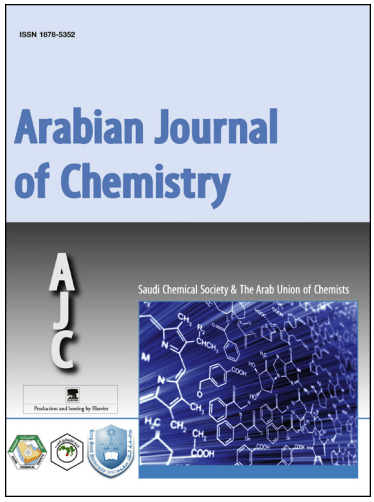

Original article

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Hamdy H. Hassan, Ibrahim H.A. Badr, H.T.M. Abdel-Fatah, Esmat M.S. Elfeky, Ali Mostafa

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Low Cost Chemical Oxygen Demand Sensor Based on Electrodeposited Nano-Copper Film

Hamdy H. Hassan[1] [a], Ibrahim H. A. Badr[a, b], Abdel-Fatah, H. T M[c], Esmat M. S. Elfeky [d], Ali Mostafa[a]

[a] Chemistry Department, Faculty of Science, Ain-Shams University, Cairo, Egypt. [b] Present address: Taibah University, Faculty of Science, Department of Chemistry, Al Madenah Al Monwarah, KSA.
[c] Central Chemical Laboratories, Egyptian Electricity Holding Company, Sabtia, Cairo, Egypt
[d] Holding Company for Water and Waste water (HCWW), Cairo, Egypt

Abstract

A commercially available copper electrical cable and pure Cu disk were used as substrates for the electrodeposition of copper nanoparticles (nano-Cu). The surface morphology of the prepared nano-Cu/Cu electrodes were investigated by scanning electron microscope (SEM), energy dispersive X-ray spectrometer (EDX). The bare copper substrates and the nano-copper modified electrodes were utilized and optimized for electrochemical assay of chemical oxygen demand (COD) using glycine as a standard. A comparison was made among the four electrodes (i.e., bare and nano-Cu coated copper cable and pure copper disk) as potential COD sensors. The oxidation behavior of glycine was investigated on the surface of the prepared sensors using linear sweep voltammetry (LSV). The results indicate significant enhancement of the electrochemical oxidation of glycine by the deposited nano-Cu. The effects of different deposition parameters, such as Cu^{2+} concentration, deposition potential, deposition time, pH, and scan rate on the response of the prepared sensors were investigated. Under optimized conditions, the optimal nano-Cu based COD sensor exhibited a linear range of 2 to 595 ppm, lower limit of detection (LOD) as low as 1.07 ppm (S/N = 3). The developed method exhibited high tolerance level to Cl^- ion where 1.0 M Cl^- exhibited minimal influence. The sensor was utilized for the detection of COD in different real water samples. The results obtained were validated using the standard dichromate method.

Keywords: COD; LSV; electrochemical sensors; nano-Cu.

Contents

[1] Corresponding Author: Ain Shams University, Faculty of Science, Department of Chemistry, Cairo, Egypt. E-mail: hamdihh@sci.asu.edu.eg