Fabrication of a new electrochemical sensor based on Au-Pt bimetallic nanoparticles decorated multi-walled carbon nanotubes for determination of diclofenac

Muhaned Mohammed Altai, Gholam Hossein Rounaghi, Behjat Deiminiat

PII: S0026-265X(18)30797-5
DOI: doi:10.1016/j.microc.2018.09.009
Reference: MICROC 3357

To appear in: *Microchemical Journal*

Received date: 26 June 2018
Revised date: 10 September 2018
Accepted date: 10 September 2018

Please cite this article as: Muhaned Mohammed Altai, Gholam Hossein Rounaghi, Behjat Deiminiat , Fabrication of a new electrochemical sensor based on Au-Pt bimetallic nanoparticles decorated multi-walled carbon nanotubes for determination of diclofenac. Microc (2018), doi:10.1016/j.microc.2018.09.009

Fabrication of a new electrochemical sensor based on Au–Pt bimetallic nanoparticles decorated multi-walled carbon nanotubes for determination of diclofenac

Muhaned Mohammed Altai, Gholam Hossein Rounaghi*[1], Behjat Deiminiat

Department of Chemistry, Faculty of sciences, Ferdowsi University of Mashhad, Mashhad - Iran

Abstract

A new electrochemical sensor was developed for determination of diclofenac based on functionalized multi-walled carbon nanotubes (f-MWCNTs) and gold–platinum bimetallic nanoparticles (Au–PtNPs) modified gold electrode. The Au–PtNPs were deposited electrochemically on the surface of the f-MWCNTs modified electrode. The surface morphologies of the modified electrodes were investigated by scanning electron microscopy (SEM) and energy dispersive X-ray spectroscopy (EDX). Cyclic voltammetry (CV) and differential pulse voltammetry (DPV) were used to evaluate the electrochemical properties of the constructed sensor. Under the optimized experimental conditions, the calibration curve was linear in the concentration range of 0.5 μM to 1000 μM of diclofenac and the detection limit was found to be 0.3 μM. The developed electrode also showed a high selectivity for diclofenac in the presence of the interfering species. The reproducibility, repeatability and stability of the electrode were satisfactory. The proposed electrochemical sensor was successfully employed for determination of diclofenac in real samples such as tablet and human urine samples.

Keywords: electrochemical sensor, diclofenac, functionalized multi-walled carbon nanotubes, gold–platinum bimetallic nanoparticles, voltammetry

1. Introduction

Diclofenac sodium (sodium [*o*-(2, 6-dichloroanilino) phenyl] acetate, DS) which is classified as a nonsteroidal anti-inflammatory drug (NSAID), possesses analgesic, anti-inflammatory and antipyretic activity [1]. It is widely used for treating a variety of inflammatory and painful diseases including rheumatoid arthritis, osteoarthritis, soft tissue disorders, renal

[1] *Corresponding author: Tel: +98 5137626388

E-mail address: ghrounaghi@yahoo.com; ronaghi@um.ac.ir