Electrochemical Determination of Diclofenac Sodium in Pharmaceutical Sample Using Copper Nanoparticles/Reduced Graphene Oxide Modified Glassy Carbon Electrode

Haichi Yu*, Jianhang Jiao, Qiuju Li, Yingzhi Li

Department of Orthopaedics, The Second Hospital of Jilin University, Changchun, 300041, China

*E-mail: liyingzhi2014@126.com

Received: 29 May 2021/ Accepted: 27 July 2021 / Published: 10 September 2021

This study presents electrochemical determination of diclofenac sodium (DCS) in a pharmaceutical sample using copper nanoparticles reduced graphene oxide hybrid electrodes (Cu NPs/rGO). rGOnanosheets were synthesized on a glassy carbon electrode (GCE) by modified Hummers method, and then, Cu NPs were electrodeposited on rGO/GCE. Results of structure and morphology studies by SEM and XRD revealed that the irregular Cu NPs electrodeposited in crystal structure with approximately 130nm diameter. Electrochemical analyses using the CV technique showed that Cu NPs/rGO/GCE exhibited a higher sensitivity for determination of DCS than that GCE, rGO/GCE and Cu NPs/GCE due to synergetic effect of Cu NPs and rGO which facilitates the electron transfer between the electrode and the electroactive species in solution and improve electrocatalytic oxidation of DCS. Amperometry measurements on Cu NPs/rGO/GCE as DCS sensor showed that linear range, limit of detection and sensitivity were obtained 20 to 400 μM , 8nM and 0.0356 $\mu\text{A}/\mu\text{M}$, respectively. The applicability of Cu NPs/rGO/GCE to determine DCS concentration in the prepared real pharmaceutical sample was examined and results showed that recovery ($\geq 97.66\%$) and RSD ($\leq 3.05\%$) values were acceptable and this method provided suitable precision and accuracy for practical analyses in the pharmaceutical samples using Cu NPs/rGO/GCE.

Keywords: Diclofenac Sodium; Electrodeposition; Copper Nanoparticles; Reduced Graphene Oxide; Amperometry

[FULL TEXT](#)

© 2021 The Authors. Published by ESG (www.electrochemsci.org). This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution license (<http://creativecommons.org/licenses/by/4.0/>).