A Novel Sensor Based on Ag Nanoparticles Functionalized with Poly-Acid Chrome Blue K and Graphene for the Sensitive Determination of Diclofenac Sodium

Qing Huang¹, Xiaokun Li^{1,*}, Suxiang Feng¹, Wenfeng Zhuge¹, Jinyun Peng², Xiaoting Li²

¹ School of Pharmacy, Henan University of Traditional Chinese Medicine, Zhengzhou 450046, China

² College of Chemistry and Chemical Engineering, Guangxi Normal University for Nationalities, Chongzuo 532200, China

*E-mail: li96052122@126.com

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Ag nanoparticles functionalized with poly-acid chrome blue K and graphene (Ag-poly-ACBK@Gr) were successfully fabricated on the surface of a glassy carbon electrode using layer-by-layer electropolymerization. The surface structure of the synthesized modified glassy carbon electrode was characterized by scanning electron microscopy. The electrochemical behaviours of diclofenac sodium (DS) at the Ag-poly-ACBK@Gr-modified electrode were investigated by cyclic voltammetry and differential pulse voltammetry. It was found that the prepared sensor exhibited a cathodic peak at 0.78 V with higher peak current response compared to the related modified electrodes. Under optimal conditions, the sensor for the determination of DS exhibits a good linear relationship between the peak current and DS concentration in the range from 0.1 to 40 μM , and the equation is $I_p(\mu\text{A}) = 7.23 \times 10^3 c(\mu\text{M}) + 3.46 \times 10^{-2}$ ($R = 0.9955$) with the estimated limit of detection of 34.2 nM ($S/N = 3$). The Ag-poly-ACBK@Gr-modified glassy carbon electrode with high sensitivity and excellent stability and selectivity was successfully applied to detect DS in real drugs and human urine at the recoveries ranging from 99.60 to 101.84%.

Keywords: Ag-poly-ACBK@Gr; Diclofenac sodium; Electrochemistry

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