Facile Hydrothermal Synthesis of Cubic Zinc Ferrite Nanoparticles for Electrochemical Detection of Anti-inflammatory Drug Nimesulide in Biological and Pharmaceutical Sample

Jeyaraman Anupriya¹, Sivakumar Musuvadhi Babulal¹, Tse-Wei Chen^{1,2}, Shen-Ming Chen^{1,*}, Jeyaraj Vinoth Kumar³, Jeong-Won Lee³, Syang-Peng Rwei^{2,4}, Jaysan Yu⁵, Richard Yu⁵, Cheng-Yu Hong¹

¹ Electroanalysis and Bioelectrochemistry Lab, Department of Chemical Engineering and Biotechnology, National Taipei University of Technology, No. 1, Section 3, Chung-Hsiao East Road, Taipei 106, Taiwan, ROC

² Research and Development Center for Smart Textile Technology, National Taipei University of Technology, Taipei 106, Taiwan, ROC.

³ Advanced Nano Surface Engineering Laboratory, Department of Mechanical Engineering, Chosun University, 309, Pilmun-daero, Dong-gu, Gwangju 61452, Republic of Korea.

⁴ Institute of Organic and Polymeric Materials, National Taipei University of Technology, Taiwan

⁵ Well Fore special wire corporation, 10, Tzu-Chiang 7 rd., Chung-Li Industrial Park, Taoyuan, Taiwan

*E-mail: smchen78@ms15.hinet.net

doi: 10.20964/2021.07.72

Received: 2 April 2021 / Accepted: 21 May 2021 / Published: 31 May 2021

In this present work, a cubic ZnFe_2O_4 NPs was prepared using facile hydrothermal method. The as-prepared ZnFe_2O_4 NPs capably employed for the detection of anti-inflammatory drug Nimesulide (NS) with the surface modification on the glassy carbon electrode (GCE). The physicochemical properties of as-prepared ZnFe_2O_4 NPs were characterized by XRD, FTIR, FESEM, HR-TEM, and XPS analysis. The electrocatalytic efficiency was investigated through EIS, CV, and DPV electroanalytical techniques. The obtained electroanalysis result demonstrated excellent electrocatalytic activity towards the detection of NS. The constructed ZnFe_2O_4 NPs modified electrode achieved a good linear ranging from 0.001 to 166 μM with a detection limit of 0.006 μM . The calculated analytical sensitivity of the sensor was 0.625 $\mu\text{A } \mu\text{M}^{-1} \text{ cm}^{-2}$. Moreover, the modified electrode delivers good storage stability, reproducibility and repeatability. Evidently, the proposed sensor manifests the determination of NS in human urine samples and nimesulide tablets for practical applications.

Keywords: ZnFe_2O_4 nanoparticles, Nimesulide, human urine sample, pharmaceutical drug.

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