Electrochemical Detection of Codeine in Pharmaceutical Tablets Using a Tungsten Oxide Nanoparticles and Carbon Nanotubes Modified Electrode

Qian Yu^{1,*}, Xianhui Yang², Yan Chen¹

¹ Department of pharmacy, People's Hospital of Zhengzhou, No.33 the Yellow River Road, Zhengzhou, Henan, 450053, P. R. China

² Zhengzhou Railway Vocational and Technical College, No.2 the Xingfu Road, Two Seven District, Zhengzhou, Henan, 450000, P. R. China

*E-mail: qianyu_zph@yeah.net

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An electrochemical sensor with a glassy carbon electrode (GCE) decorated with a composite of carbon nanotubes (CNTs) and tungsten oxide (WO₃) was prepared for the quantification of codeine. The crystal structure of the CNT-WO₃ composite was characterized by X-ray powder diffraction (XRD) and the morphology by scanning electron microscopy (SEM). In comparison with bare GCE, WO₃ modified GCE and CNT modified GCE, the CNT-WO₃ composite modified GCE revealed a well-defined oxidation of codeine. Besides, the current response exhibited a remarkable enhancement during the oxidation process. The current response of codeine oxidation peak is linearly related with the codeine concentration ranging from 0.005 to 20 µM with the detection limit of 0.02 µM. The improved voltametric behaviour and long-time stability of the electrochemical sensor make it successfully applied for codeine determination in the medicament and human urine.

Keywords: Electrochemical sensor; Codeine; Carbon nanotubes; Tungsten oxide nanoparticles; Oxidation

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