Molecularly Imprinted Electrochemical Sensor for Detection of Prednisolone in Human Plasma as a Doping Agent in Sports

Youliang Li, Yujun Xiong*

School of Physical Education, East China University of Technology, Nanchang, 330013, China

*E-mail: yujun_xiong2021@163.com

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This work was carried out on the synthesis of poly(4-vinylpyridine)- molecularly imprinted polymer on graphene oxide (4-VP/MIP/GO) as an electrochemical sensor for detection of prednisolone as a doping agent in sports. The GO was prepared using the modified Hummers method and electrodeposited on a glassy carbon electrode (GCE). The GO/GCE was modified by MIP which was prepared from tetrabutylammonium perchlorate and acetonitrile, and then 4-VP was electrodeposited on MIP/GO/GCE. Results of morphological analysis of modified electrodes using FESEM revealed GO was overlapping of flake nanosheets on the surface with cracks and fractures. The surface morphology of 4-VP/MIP/GO/GCE also showed a highly porous structure due to created cavities from the agglomeration of 4-VP and MIP molecules on corrugated edges of GO nanosheets. Results of electrochemical studies using DPV technique showed good stability, high selectivity, acceptable linear range (1 μ M to 120 μ M), highest selectivity (0.7397 μ A/ μ M) and lowest detection limit (0.004 μ M) in comparison with the other synergetic effect of GO nanosheets and 4-VP and MIP molecules. The validity and precision of 4-VP/MIP/GO/GCE to the determination of prednisolone were evaluated in pharmaceutical samples and human biological fluids and results exhibited acceptable recovery values (96 to 99.38 %) and RSD values (2.53 to 3.89 %). Therefore, 4-VP/MIP/GO/GCE can be used as an accurate and reliable sensor for determination of prednisolone as a doping agent in sports.

Keywords: Graphene oxide; Molecularly imprinted polymers; Prednisolone; Steroidabuse; Clinical Samples; Differential pulse voltammetry

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