Preparation of an Electrochemical Sensor Based on Multi-Walled Carbon Nanotubes/Molecularly Imprinted Polymers for the Detection of Capsaicin in Gutter Oil by Differential Pulse Voltammetry

Mi Wang¹, Bin Gao², Yu Xing^{1,*}, Xingliang Xiong^{2,*}

¹ Department of forensic medicine, Chongqing Medical University, #1 Yixueyuan Road, Chongqing 400016, China.

² Laboratory of Biomedical Engineering, Chongqing Medical University, #1 Yixueyuan Road, Chongqing 400016, China.

*E-mail: 100485@cqmu.edu.cn, xxlsober@sina.com

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Despite great technological advancements, the rapid, on-the-spot identification of gutter oils continues to be a great challenge. In this study, capsaicin is chosen as a biochemical marker of gutter oil, and an electrochemical sensor of this marker is developed based on multi-walled carbon nanotubes/molecularly imprinted polymers (MWCNTs-MIP). The MIP-modification of MWCNTs is achieved using 4-vinylpyridine as a functional monomer and capsaicin as a template. The electrochemical behavior of the prepared sensor is evaluated by differential pulse voltammetry, and the optimal conditions are determined. The results show a significantly linear response of the sensor towards capsaicin in the range of 0.05×10^{-6} - 1×10^{-4} mol L⁻¹, with a limit of detection (LOD) of about 0.02 μmol L⁻¹. The sensor also exhibits excellent selectivity, repeatability, and stability in real sample detection.

Keywords electrochemical sensor, molecularly imprinted polymers, gutter oil, capsaicin

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