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Fabrication of a New Electrochemical Sensor Based on New Nanostructured Molecularly Imprinted Polypyrrole for Selective and Sensitive Determination of Morphine

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Abstract : Morphine (MO), the most effective painkiller, is considered the reference by which analgesics are assessed. It is very necessary for the biomedical applications to detect and maintain the MO concentrations in the blood and urine with in safe ranges. To date, there are many expensive techniques for detecting MO. Recently, many electrochemical sensors for direct determination of MO were constructed. The molecularly imprinted polymer (MIP) is a polymeric material, which has a built-in functionality for the recognition of a particular chemical substance with its complementary cavity.This paper reports a sensor for MO using a combination of a molecularly imprinted polymer (MIP) and differential-pulse voltammetry (DPV). Electropolymerization of MO doped polypyrrole yielded poor quality, but a well-doped, nanostructure and increased impregnation has been obtained in the pH=12. Above a pH of 11, MO is in the anionic forms. The effect of various experimental parameters including pH, scan rate and accumulation time on the voltammetric response of MO was investigated. At the optimum conditions, the concentration of MO was determined using DPV in a linear range of 7.07 × 10−6 to 2.1 × 10−4 mol L−1 with a correlation coefficient of 0.999, and a detection limit of 13.3 × 10-8 mol L−1, respectively. The effect of common interferences on the current response of MO namely ascorbic acid (AA) and uric acid (UA) is studied. The modified electrode can be used for the determination of MO spiked into urine samples, and excellent recovery results were obtained. The nanostructured polypyrrole films were characterized by field emission scanning electron microscopy (FESEM) and furrier transforms infrared (FTIR).

Keywords : morphine detection, sensor, polypyrrole, nanostructure, molecularly imprinted polymer
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