Voltammetric Determination Of Nitrofurantoin By Modified Electrodes With Molecuarly Imprinted Polymers

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The most important point in analytical chemistry is selectivity, particularly at low analyte concentrations in the presence of interfering substances. The sensitive and selective determination of a large number of trace compounds found extensive applications in many fields such as food industry, biotechnology, environment, and health care for the diagnosis of diseases.

Molecularly imprinting can be used for preparing polymeric materials in applications of molecular recognition. The approach in preparing an imprinted polymer involves interactive preorganization of functional monomers and print or template molecules, followed by polymerization in the presence of a large excess of cross-linking agents. The resulting polymer exhibits a high selectivity for rebinding the template molecules.

Nitrofurantoin is an antibacterial drug. It is used in the treatment of initial or recurrent urinary tract infections caused by susceptible organism. The drug has numerous toxic effects, which have been associated with lung and liver damage. The European Union has prohibited the use of nitrofuran antibiotics in food producing animals since January of 1997.

The cyclic voltammetric behavior and the cathodic adsorptive stripping voltammetry using square wave waveform response of nitrofurantoin was examined in BR buffers (pH 2-11) at carbon paste electrode. A maximum developed peak current was achieved at pH 2.

Molecularly imprinted polymers were prepared in two different forms and carbon paste electrodes were modified by these polymers. In first molecularly imprinting method (traditional MIP); template, functional monomer and cross-linker were dissolved in DMF. The mixture was degassed with N₂ for 10 min and then the tube was sealed and put into a water bath at 50°C for 40 h. In second molecularly imprinting method (MIP-resin); 0.24 g nitrofurantoin was dissolved in 0.5 ml DMF and 1 g resin was added to this solution. Swelled resin was dried at 50°C for 3 h. MIPs were ground and sieved. The particles were washed with ethanol and DMF. The washing and rebinding solutions were controlled by UV and voltammetry.

Non-imprinted polymers (NIPs), which did not contain the template, were obtained in parallel with imprinted polymers using the same synthetic route. Response of MIP-resin modified carbon paste electrodes was compared with response of traditional MIP modified carbon paste electrodes for the determination of nitrofurantoin.

References