EVALUATION OF THE TARGET MOLECULE RECOGNITION MECHANISM BY THE NANOSIZED AND BULKY MOLECULARLY IMPRINTED POLYMER (MIP) VIA ELECTROCHEMICAL IMPEDANCE SPECTROSCOPY

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Abstract

Molecular imprinting nanotechnologies are expected to considerably increase the molecular affinity of MIP materials. MIP preparation in nanosized form is expected to greatly improve the binding capacity and kinetics and site accessibility of imprinted materials. The main reason for these advantages is that in the nano-MIP most of imprinted sites are situated at the surface or in the proximity of surface [1, 2]. In this work electrochemical impedance spectroscopy (EIS) was applied for evaluation of recognition event in the nanosized MIP particles and proving the above asserted reason. For this aim, MIP nanoparticles, and bulky MIPs were applied for modifying of carbon paste electrodes. Then, the electrodes were used as the working electrodes in the EIS experiments. the plots indicating the imaginary impedance variation versus the real impedance (as nyquist plot) at high and middle-low frequency domains were applied for inspection about the mechanism of recognition of target molecule by the selective sites of MIP nanoparticles and bulky MIP. The information related to the high frequency regions was particularly valuable because, it elucidated the changes induced on the bulk resistance and capacitance of the electrode surface, after target molecule rebinding. Comparison the nyquist plots obtained from the electrodes modified with nano-MIP and micro-MIP proved that the target molecules could by recognized by selective sites situated in the nano-MIP particle surface whereas, in the case of micro-MIP the target molecule penetrate in the selective site located in the interior areas of the MIP, inducing the swelling effect. This was concluded from the impedance behavior in the high frequency region.

Keywords: nanosized, imprinted polymer, impedance spectroscopy

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