A Highly Sensitive Hybrid Film Sensor for Voltammetric Detection of Calcium Antagonist Cilnidipine

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Abstract

A highly sensitive and selective sensor based on the synergistic effect of ZnO nanoparticles and multi-walled carbon nanotubes (MWCNTs) for voltammetric detection of calcium antagonist cilnidipine has been developed. The fabricated sensor was characterized by scanning electron microscopy, electrochemical impedance spectroscopy, chronocoulometry, square wave voltammetry and cyclic voltammetry. The proposed electrochemical sensor exhibited good analytical performance including high sensitivity and selectivity as compared to multiwalled carbon nanotubes modified (MWCNTs/GCE), zinc oxide nanoparticle modified (ZnO/GCE) and bare glassy carbon electrode (GCE). Fabrication of hybrid film increased surface area and active sites for electron transfer, thus enhancing the sensitivity of the fabricated sensor. The developed sensor was successfully applied for the electroanalytical determination of cilnidipine in its pharmaceutical formulation. Under optimal conditions, the peak current is linear to cilnidipine concentration ranging from 5 ng mL^{-1} to 5 µg mL^{-1}. The results of the study showed that the proposed electrochemical method is simple, rapid, precise and accurate, which is very useful for the routine analysis of cilnidipine in its pharmaceutical formulation.

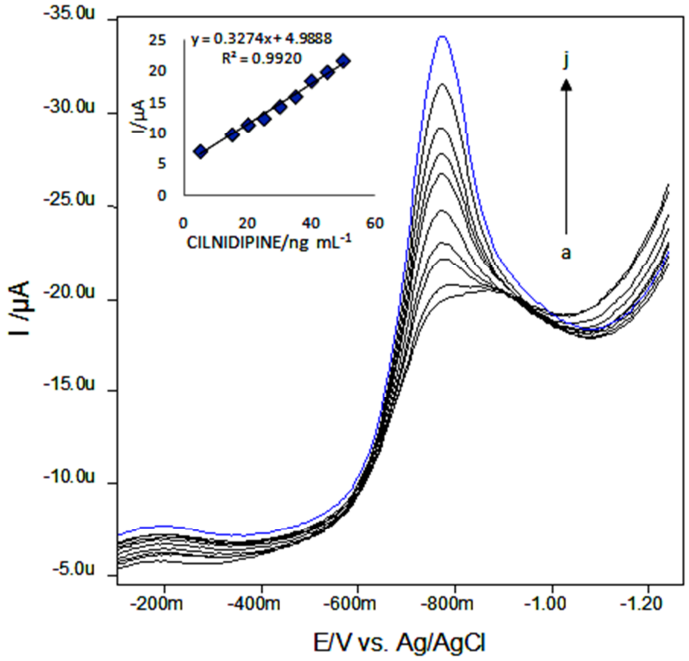

Figure: Linearity of square-wave voltammetric peak current of cilnidipine at different concentrations on ZnO-MWCNTs/GCE (pH 7.0). Inset: Plot of peak current, i_p vs cilnidipine concentration.