



Novel hierarchical composite electrode construction based on magnetic nanoparticles: Application for impedimetric thyroxine hormone determination in human blood samples

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ABSTRACT

As a novel performance, silicon oxide was firstly loaded on Fe₃O₄ magnetic nanoparticles substrate (Fe₃O₄@SiO₂), and then functionalized with -NH₂ group (Fe₃O₄@SiO₂@NH₂). The resultant array was reacted with terephthalaldehyde schiff-base to fabricate novel hierarchical magnetic nano-composites. A sensitive sensor involving immobilized gold nanoparticles and nano-composites in electropolymerized polypyrrole was achieved. Cyclic voltammetry (CV), scanning electron microscopy (SEM) and electrochemical impedance spectroscopy (EIS) techniques were demonstrated the morphology of modified electrode's surface and electrochemical behavior of thyroxine on this platform. We believe that such kind of bio-devices possesses the prominent potential to trace determination of bio-compounds in biological fluids with excellent accuracy and precise analysis. This sensor covered a linear concentration range from 10 to 210 nM of thyroxine with the detection limit of 8 nM.

Keywords: Cyclic voltammetry; Scanning Electron Microscopy; Electrochemical Impedance Spectroscopy; Magnetic Nano Composites.

1. INTRODUCTION

One of the most exciting features of nanotechnology is its potential application in almost any field. The nanoparticles (NPs) discovery with the different size, shape, and composition has stretched the boundaries of science in ways that scientists would never have imagined a century ago [1]. Nature makes and chemistry reshapes;