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High sensitivity electrochemical biosensor for drug analysis based on biocompatible nano-composites probe

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Pharmaceutical analysis is one of the important branches of analytical chemistry with extensive impact on public health. Many pharmaceutical/drug residues have been found in water and environmental samples thereby increasing the importance of its analysis in bulk, dosage, biological fluids and in environmental samples. Therefore, the establishment of simple, rapid, sensitive and reliable method for the determination of active ingredient is welcome and necessary. The current investigation aimed at fabrication of electrochemical biosensor that was prepared by immobilization of horseradish peroxidase (HRP) enzyme onto a polyaniline-graphene oxide (PANI-GrO) biocompatible nanocomposite probe for detection of drug artesunate. HRP was immobilized onto the surface of the (PANI-GrO) film by simple adsorption method and voltammetry was used to monitor the electro-catalytic reduction of artesunate under diffusion controlled condition. Electrochemical interfacial properties and immobilization of enzyme onto the (PANI-GrO) probe have been evaluated, and confirmed using Fourier Transform Infrared Spectroscopic (FT-IR), Cyclic Voltammetry (CV) and Electrochemical Impedance Spectroscopic (EIS) techniques. The (PANI-GrO-HRP) bio-probe was further applied for sensing artesunate a potent antimalarial drug. The biosensor shows linearity as 0.05-0.40 ngmL⁻¹ of artesunate with sensitivity 0.15 μ AngmL⁻¹. The limits of detection for parenteral artesunate, human urine, human serum and human plasma were 0.012 ngmL⁻¹, 0.013 ngmL⁻¹, 0.014 ngmL⁻¹ and 0.014 ngmL⁻¹, respectively. Precision and accuracy as evidenced have shown a promising selectivity in their implicational attributes.

Biography

Raju Khan has completed his PhD at the age of 28 years from Jamia Millia Islamia, Central University, New Delhi, India and postdoctoral studies from University of the Western Cape, Cape Town, South Africa. He is the Scientist of NEIST, a premier CSIR Government of India organization. He has published more than 35 papers in reputed journals and has more than 500 citations of his reputed papers. The contribution made have received recognition from the Department of Science & Technology, Govt. of India, and awarded the BOYSCAST fellowship towards better understanding and deputed for one year from July 2010 to August 2011 to Department of Chemistry, University of Texas at San-Antonio, USA. R Khan also has engaged in several International collaborative projects such as Czech Republic, Prague and Moscow Russia etc.

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