

New trends in nanomaterials based electrochemical biosensor towards health care

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The use of nanomaterials in the development of electrochemical biosensors are gaining importance due to their ability to generate new signal transducers for enhancing the sensitivity and performance of a biosensor. Because of their nanoscale dimensions, systems based on nanomaterials allow simple and rapid chemical and biological analyses of multiple substances *in-vitro* as well as *in vivo*. Here we report some of our major achievements related to the developments of electrochemical biosensors for health care.

A reduced graphite oxide/Bismuth (RGO/Bi) nanocomposites has been used as electrode material for electrochemical detection of heavy metal ions. Trace analysis of Cd^{+2} , Pb^{+2} , Cu^{+2} and Zn^{+2} in water was carried out by stripping voltammetric analysis, and the sensitivity and detection limit of the electrode were quantitatively estimated. The three sigma detection limits at different deposition potential for Cd^{+2} , Pb^{+2} , Zn^{+2} and Cu^{+2} were obtained as 2.8, 0.55, 17 and 26 mg L^{-1} , respectively. Copper detection using Bi-film electrode was a major challenge, which has been resolved using the RGO/Bi nanocomposite electrode. Yet in another approach, iron oxide nanoparticles were anchored on reduced graphene oxide (RGO) nanosheets and their electrochemical behavior towards chromium ion was assessed using cyclic voltammetry. Expanding the horizons of these electrochemical sensors, iron oxide was successfully evaluated for the detection of cervical cancer cells and was established as an impedimetric biosensor with very low detection limits. PEGylated arginine was the functionalization entity of iron oxide anchoring the immunoglobulin-G which served as recognition site for the surface receptors of HeLa cells.

Biography

Dhirendra Bahadur is presently an institute chair professor at Department of Metallurgical Engineering and Materials Science, IIT Bombay, India. His research interests include nanostructured oxide materials, their hybrids, graphene and its composites, magnetic materials at nanoscale and biomedical applications. He is presently in the editorial board of Chinese Journals of Clinicians and Journal of Magnetism and Magnetic Materials. He is coauthor/author of more than 260 publications in international journals, book chapters, four books and seven patents. He has several awards and honors to his credit including the national research award of the Govt. of India which he received this year.

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