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Novel electrochemical devices and stretegies for practicing green analytical chemistry

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Recent development in the field of green and sustainable chemistry has focused very much on the synthesis of functional materials using more environmentally friendly synthetic routes. Also, functional nanocomposite materials have attracted a great deal of attention in recent years because of their potential applications in a wide range of technologies ranging from medical imaging, to chemical and biological sensors, to efficient catalysis. The diverse applications of the nanocomposite materials result from the unique set of properties that the two seemingly dissimilar materials – the inorganic nanostructures such as the carbon and boron nanotubes, graphene, and metal-nanoclusters and the biological molecules, macrocyclic compounds, conducting polymers, etc. bring together and often retain in the composite form. Electrochemical sensors are a class of devices that have found widespread use, ranging from the detection of gas molecules to the tracking of chemical signals in biological cells. These sensors, and specifically biosensors, are nowadays earning an exceptional prominence in analytical methodologies. They are also of great importance in their traditional niche of applications in the pathological and industrial processes. The research in this area demands promising functional materials with outstanding sensing properties. Different kinds of materials including carbon based materials (graphene, carbon nanotubes, carbon nanofibers); metal nanoparticles (gold, silver, platinum and metal oxides), conducting polymers (polypyrrole, polyaniline) and / or macrocyclic compounds have recently been employed for development of electrochemical sensors in my research group. A variety of electroanalytical and spectroscopic techniques such as cyclic voltammetry, chronocoulometry, electrochemical impedance spectroscopy, XRD, SEM, TEM, etc. were employed to study the surfaces of these electrode materials. The synergistic effect of these materials is found to be highly useful for the sensing of various classes of drugs such as central nervous system drugs, antitubercular drugs, antidepressant and cardiovascular drugs at ultra trace level in pharmaceutical and biomedical samples. Also, enantioselective analysis of multi-chiral drug, Moxifloxacin hydrochloride (MOX) enantiomers was investigated on carbon paste electrode modified with chiral selector β-Cyclodextrin and graphene nanosheets based on host-guest interactions employing differential pulse voltammetry. This talk will describe some of our recent research [1-5] on the application of functional nanocomposites for the development of electrochemical sensors.

Biography

Ashwini K Srivastava is a professor of analytical chemistry at the department of chemistry, University of Mumbai, India. He obtained his Master's and Ph.D. degrees from Banaras Hindu University, India. He has supervised a large number of Masters, Postdoctoral, and 26 Ph.D. students..He has published 125 research papers in peer reviewed journals with over 3100 citations and 29 h-index. His research activities have spanned diverse areas including electrochemical (bio) sensors, functional nanomaterials, energy storage, environmental pollution and chromatographic separations. His work is mainly focused on the development of sensors for trace level detection of biologically active molecules: vitamins, amino acids and neurotransmitters; analgesics, cardiovascular and psychiatric drugs; environmental pollutants: pesticides and metals. His recent interest involves the synthesis of a variety of nanocomposite materials for fabrication of energy storage devices like high performance supercapacitors.

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