Abstract

The thesis entitled '*Functional Molecular Assemblies and Nanomaterials for the Development of Electrochemical Sensing and Biosensing Platforms*' describes the use of functional nanomaterials such as metal/metal oxide nanoparticles, reduced graphene oxide (rGO) and molecular assemblies in the development of sensing/biosensing platform for the detection and quantification of bioanalytes. The unique properties of molecular assemblies and nanostructured materials have been exploited for the electrochemical sensing/biosensing of bioanalytes. Electrochemically-derived redox molecular architectures by the reaction of electrogenerated *o*-quinone with the surface adsorbed nucleophiles such as mercaptotriazole and mercaptoimidazole have been used for the electrocatalytic sensing of NADH at less positive potential. Mixed molecular assembly of cysteamine and redox mediator was developed for the interference free sensing of NADH. Polyelectrolyte-functionalized Au nanoparticles have been used in the development of electrochemical sensing platform for polyionic drugs such as heparin and protamine. First generation amperometric biosensing platforms for cholesterol (total) using rGO-Pt and rGO-Pd functional materials have been developed. Low potential detection of cholesterol was achieved using rGO-Pd-based platform for the first time without any interference from other electroactive species. The detection potential is ~150 mV less positive than that of the rGO-Pt-based platform. Rationally functionalized graphene oxide with redox unit ferrocene has been utilized for the development of disposable second generation biosensing platform for uric acid. Biosensing of other metabolites such as glucose and cholesterol (total) in human serum sample has also been demonstrated. A novel one-pot chemical route for the synthesis of ZnO/rGO hybrid material has been demonstrated and the material has been utilized for the development of third generation amperometric biosensor for glucose. Practical application of the biosensor has been demonstrated with real sample analysis.

Keywords: Electrochemical sensors/biosensors; Glucose; Cholesterol; Uric acid; NADH; Protamine; Heparin; Nanomaterials; Reduced graphene oxide.