THE IMPORTANCE OF CHEMICALLY MODIFIED ELECTRODES IN VOLTAMMETRY AND FLOW SYSTEM

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Chemically modified electrodes(CMEs) have had a dominant position in many electrochemical studies since the 1970's. These electrodes are made by incorporating chemical groups on the bare electrode surface which are suitable for the analytical purpose. These procedures offer increased sensitivity and selectivity or decreased operational potential required to oxidized or reduced electroactive species, enrichment of metal ions and determination of non-electroactive compounds using ion-exchange properties. CMEs modification procedures are based on; (1) direct adsoption of modifier on to the bare electrode surface, (2) covalent bonding of the modifier to a specific surface site, (3) physical coating of the electrodse surface with a polymer and (4) mixing the slightly soluble modifier with a conductive matrix such as carbon paste.

Adsorption is the oldest procedure used for electrode modification. In this method, the electrode is simply soaked for a period of time in a solution of the modifier substance then washed with pure water. The self-assemble of mono layers(SAMs) of adsorption types of modification have been actively studied in recent years. SAMs of alkenthiols or aromaticthiols on single crystal metal surfaces such as gold, silver and nickel have been extensively studied for both scientific reasons and possible technolocigal applications for example, lubrication, adhesion, corrosion inhibition and microelectronic fabrications and eelectrochemical sensors or for modifying the cataliytic properties of electrodes. The second method; bare electrode surface are coated with linking agents such as organosilanes or cyanuric chloride which are used to covalently attach from one to several monomolecular layers of the chemical modifier to the electrode surfaces. Polymer film coated CMEs can be prepared by using dipcoating and droplet solvent evaporation, oxidation or reduction deposition, electropolymerization, cross-linking, and radiofrequency polymerization. The fourth method, CMEs can be prepared in a few minutes by simply hand

mixing required portions of modifier, graphite powder and organic binder. This mixture can be packed into an electrode body and smoothed to give the new surface by extrusion and repolishing to give the same reproducibilty as ordinary carbon paste.CMEs once optimized; can also be used in electrochemical detectors for the effective monitoring of flowing stream or hydrodynamic processes, such as Liquid chromatograpy(LC-EC) or amperometric detection with flow injection analysis(FIA). For analytical applications, CMEs should possess certain properties; good mechanical and chemical stability of electrode surface, good short-term reproducibility and long-term stability of the modifiers activity towards the analyte, wide dynamic range of responds, low and stable background currents over the potential range reguired, simple and reliable fabrication that results in consistency of the response from one electrode to another.