ABSTRACT

Thin films of mercaptothiadiazole compounds were prepared on Au, GC and ITO electrodes by self-assembly and electropolymerization methods. These films were used for the electrochemical determination of biologically important molecules. Adsorption of 2,5-dimercapto-1,3,4-thiadiazole (DMT) on Au surface from a completely deaerated aqueous solution led to the formation of a multilayer assembly via hydrogen bonding with water molecules, whereas adsorption from non-aqueous solvents led to the formation of a monolayer. On the other hand, adsorption of structurally related DMT derivatives, 5-amino-2-mercapto-1,3,4-thiadiazole (AMT) and 5-methyl-2-mercapto-1,3,4-thiadiazole on Au electrode from water and other solvents led to the formation of a monolayer. The monolayer and multilayer assemblies of DMT on Au surface were characterized by CV, ATR-FT-IR, Raman spectroscopy, XPS and SEM. SEM images showed that DMT formed a leaflike structured multilayer assembly on Au surface. The sub-monolayer of DMT formed on Au electrode was utilized for the simultaneous determination of ascorbic acid (AA) and uric acid (UA).

Nanostructured films of AMT and 2-amino-1,3,4-thiadiazole (ATD) were fabricated on electrodes by potentiodynamic polymerization method in 0.1 M H₂SO₄. The electropolymerized films were characterized by CV, AFM, ATR-FT-IR and XPS techniques. These films showed excellent electrocatalytic activity towards AA, UA, folic acid, L-cysteine, homocysteine, xanthine, dopamine, epinephrine, norepinephrine, 3,4-dihydroxyphenylacetic acid, paracetamol and nitrite ion. Since
both p-AMT and p-ATD films have positively charged backbone and heteroatoms, it is expected that anionic forms of the analytes were attracted by the positively charged back bone of the polymers and positively charged analytes were attracted by heteroatoms of the polymer films. Thus, remarkable enhancement in the oxidation peaks current of both positively and negatively charged analytes were observed at polymer modified electrodes.