

Voltammetric studies of cadmium ion at the mercury electrode in the presence of glutathione

Abstract

Voltammetric behaviors of cadmium (II) ion in the presence of a ligand with sulphur bearing group, such as glutathione: $\{(COO^-)(NH_3^+(CH_2)_2CONHCH(CH_2SH)CONH(CH_2)(COO^-)\}$ were studied using mainly Osteryoung square wave voltammetry (OSWV) and cyclic voltammetry (CV) at a mercury electrode. The coordination chemistry of reduced glutathione (GSH) is of great importance as it acts as excellent model system for the binding of metal ions. In this study, it was observed that an addition of glutathione as ligand to solution containing Cd(II) with sulphate as supporting electrolyte caused an increase in the reduction current of Cd(II) by several factors and also with a slight cathodic shift in the reduction peak potential of Cd(II). Further assessment of the chemical and physical conditions that may favor optimum current enhancement was done by studying the effect of varying pH, supporting electrolyte concentration of ligand and metal ion, interfering ions and scan rate. The presence of 1-3 mM glutathione, a weakly complexing supporting electrolyte at pH 4-5 caused a 3.5 fold increase in the reduction current of Cd(II) and a slight negative shift in peak position. The current enhancement observed in different electrolytic media varied in the following order: sulphate >nitrate> perchlorate. The presence of other metal ion such as Cr(III) or Co(III) appear to cause further increase in the reduction current of the Cd(II)-glutathione peak while the presence of Ni(II) was found to suppress the enhanced peak current. An anion-induced adsorption mechanism can be used to account for the observed current enhancement of Cd(II) ion in the presence of glutathione.

Keyword: Voltammetric behaviors; Cd(II); GSH; Glutathione; OSWV