

Determination of cadmium in rice using mercury and bismuth coated carbon electrodes by voltammetric techniques

Kulasinghe, K.A.K.S, Hewage, J.W. and Fernando, K.R.*

*Department of Chemistry, Faculty of Science, University of Ruhuna,
Matara, Sri Lanka.*

Anodic Stripping Voltammetry (ASV) is a potentiodynamic technique, which is capable of measuring concentrations of different metal ions simultaneously, was used in this research. Four different methods were developed for determination of cadmium content in digested rice samples from the Hambantota district. This district has been identified as a possible chronic kidney disease (CKD) area and it has been hypothetically assumed that one of the causes of CKD could be due to high intake of Cd through drinking water and food. The samples were collected from four rice mills in the vicinity of Thissamharama. Four methods developed in this research work were based on coating glassy carbon and carbon disk electrode surfaces with thin films of mercury (TFM) and bismuth (TFBi) and subsequent attachment of cadmium to these surfaces under constant potential coulometric (CPC) conditions. Then Cd was stripped off using a linear sweep voltametric (LSV) step. The electrochemical parameters such as deposition and stripping potential and scan speed were optimized using known concentrations of Cd. The stripping current has been used to calculate the concentration of Cd by means of appropriate calibration plots. Of the four possible combinations investigated in this work, it was observed that depositing Cd on TFM gave the best option. The accepted level of cadmium in rice, according to WHO, is 0.4 mg kg^{-1} of rice. The maximum Cd concentration determined in this study was 0.2 mg kg^{-1} for rice varieties from Hambantota district. It can be concluded that Cd content of the rice samples investigated in this study are not contaminated as per WHO standards.

Keywords: *Linear sweep voltammetry, Cadmium, Anodic Stripping voltammetry, Controlled potential coulometry, chronic kidney disease.*

*Corresponding author: rodney@chem.ruh.ac.lk