Abstract No: 280 ***Earth & Environmental Sciences***

NOVEL ANODE STRIPPING VOLTAMMETRIC METHOD USING ELECTROCHEMICALLY MODIFIED ELECTRODES FOR ARSENIC SPECIES DETECTION IN WATER

S.D.S. Kashmitha[1,2], N.A. Wickramasinghe[1,2] and M.B. Wijesinghe[2*]

[1]Department of Environmental and Industrial Sciences, Faculty of Science, University of Peradeniya, Sri Lanka
[2]Department of Chemistry, Faculty of Science, University of Peradeniya, Sri Lanka
[*]manjulaw@sci.pdn.ac.lk

Arsenic is a heavy metal that is particularly toxic in its inorganic form, As^{3+}, and causes health issues in humans, even in trace amounts. Conventional analytical techniques for detecting As^{3+}, such as atomic absorption spectroscopy, inductively coupled plasma mass spectrometry, and neutron activation analysis, are not suitable for real-time onsite detection of arsenic in water, which is essential for minimizing arsenic contamination. Recent studies have reported that anodic stripping voltammetry on a modified glassy carbon electrode offers a cheaper and field-portable alternative for detecting trace amounts of As^{3+} in water samples. The drop-casting method was used to modify the bare electrode with AuNPs in such studies. However, the drop-casting method leads to poor reproducibility and high noise levels. Alternatively, this study employed the electrochemical deposition of AuNPs from a solution of 1.00 mM $HAuCl_4$ in 0.500 M H_2SO_4 by cathodically scanning the potential between +1.0 V and -0.6 V at a scan rate of 50 mV/s under air-saturated conditions. The optimum number of cycles for the electrodeposition was found to be twenty. A detection limit of 0.0625 mM for As^{3+} with an R^2 value of 0.9847 was obtained through cyclic voltammetric analysis of As^{3+} in 0.500 M H_2SO_4 on the modified electrode. An enhanced detection limit of 100 nM, with an R^2 value of 0.9723, was achieved using anodic stripping voltammetry. The deposition time and applied voltage for the anodic stripping analysis were optimized to 1200 s and -0.4 V, respectively. Future studies will focus on analysing water and soil samples using the newly developed method.

Keywords: Anodic stripping voltammetry, Arsenic, Electrodeposition, Gold nanoparticles, Modified glassy carbon electrode