

Sensory measurement of mercury and cadmium ions in water using silicon nanowires-modified screen printed carbon electrode

ABSTRACT

Modified screen printed carbon electrode (SPCEs) with silicon nanowires (SiNWs) were used as working electrode for the simultaneous detection of Hg(II) and Cd(II) ions in water. Linear sweep with anodic stripping voltammetry with optimum conditions of 0.05 M HCl as the supporting electrolyte, -1.2 V deposition potential and 150 s deposition time were applied. The formed electrode material was thoroughly investigated for the morphology, effects of supporting electrolyte, deposition time and potential were well calibrated for the detection of Hg(II) and Cd(II) ions. The interference studies in the presence of other competitive ions in waste water such as Ni(II), Al(III), SO_3^- , SO_4^{2-} , Mg(II), As(III), Zn(II) and Pb(II) indicated no significant interference, which reflects the availability of these species in the sample solution that did not affect the detection and measurement of Hg(II) and Cd(II) ions. However, Cu(II) presence found to affect the detection of Hg(II) or Cd(II) ions to some extent by suppressing the peak current. Further, the efficiency of the prepared electrode investigated by the testing of sea water samples and comparing its results against ICP-MS and AAS indicated that the screen printed carbon electrode can well be suited for the non-destructive measurement of Hg(II) and Cd(II) ions in real-time samples.

Keyword: Screen printing; Carbon electrode; Silicon nanowires; Mercury; Cadmium; Wastewater analysis