

Optimisation of an electrochemical sensor based on bare gold electrode for detection of aluminium ion

ABSTRACT

In this work, an electrochemical method for detection of trace amount of aluminium (Al^{3+}), a heavy metal ion, based on a bare gold electrode (AuE) was developed. Current responses of the AuE under various type of electrolytes, redox indicators, pH, scan rate and accumulation time were investigated using cyclic voltammetry (CV) method to obtain the optimum conditions for Al^{3+} detection. The sensing properties of the AuE towards the target ion with different concentrations were investigated using differential pulse voltammetry (DPV) method. From the CV results, the optimal conditions for the detection of Al^{3+} were Tris-HCl buffer (0.1 M, pH 2) supported by 5 mM Prussian blue with scan rate and accumulation time respectively of 100 mVs^{-1} and 15 s. Under the optimum conditions, the DPV method was detected with different concentrations of aluminium ion ranging from 0.2 to 1.0 ppm resulted in a good linear regression $r^2 = 0.9806$. This result suggests that the optimisation of the basic parameters in electrochemical detection using AuE is crucial before further modification of the Au-electrode to improve the sensitivity and selectivity especially for the low concentration of ion detection. The developed method has a great potential for rapid detection of heavy metal ion (Al^{3+}) in drinking water samples.