Phosphate ions detection by using an electrochemical sensor based on metal-nanoparicles modified glassy carbon electrode

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Abstract

Phosphorus has critical values in both agricultural and biomedical applications. Determination of inorganic phosphate is of very high importance in environmental and health care applications.[1] Hence knowledge of suitable analytical techniques available for phosphate sensing for different applications becomes essential.[2] There is a need for highly sensitive, portable, inexpensive, repeatable and field deployable sensors with wide detection range to monitor the health of water and food system.[3,4] This work aims to develop electrochemical phosphate sensor based on metal nanopartices (Au-Np) modified glassy carbon electrodes (GCE) for phosphate detection to achieve simplicity, high sensitivity, wide detection range, and high repeatability and portability. Electrochemical techniques, cyclic voltammetry and square wave voltammetry (SWV) were used to quantify the concentration of phosphate, in $NaNO_3$ 0.5 mol/L^{-1} and KCl 0.5 mol/L^{-1} solution. Experimental parameters affecting the sensitivity of the nanosensors, such as amounts of the modifiers, the pH, the applied potential, and the temperature were optimized. A wide linear response for the detection of the phosphate ion was observed. The response time of the biosensors was about 5 s and maximum relative standard deviation (RSD) of around 5% confirms the repeatability of the proposed sensors.This paper suggests that nanomodified GCE sensors are promising for simple, low-cost, and portable phosphate ion detection.

References

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Figures

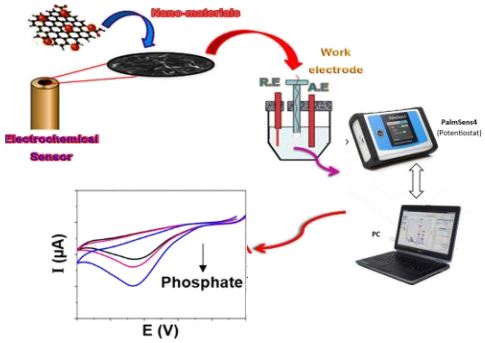

Figure 1: Electrochemical determination of $PO4^{3-}$ with modified glassy carbon electrode