An All-Solid-State Phosphate Electrode with H₃PO₄ Doped Polyaniline as the Sensitive Layer

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We here describe the construction of a highly sensitive and selective all-solid-state phosphate electrode based on polyaniline and H₃PO₄ doped polyaniline. The polyaniline layer was electroplated on the gold substrate with Chronoamperometry method and was in-situ doped by H₃PO₄. The Scanning Electron Microscopy-Energy Dispersive X-ray Spectroscopy (SEM, EDS) and contact angle measurement was taken to explain the difference of the two layers. This electrode can be used in both freshwater and seawater systems. In both of the two systems, the electrode exhibits linear response in the concentration range 10⁻¹ to 10⁻⁶ M with detection limit of 10⁻⁶ M. and response time of <1 seconds. The selectivity of the electrodes was also studied in 10⁻¹-10⁻⁵ M KH₂PO₄ solutions containing either 0.01 M sulfate, nitrate, chloride as the interference ions. During 12 hours continuous monitoring in 10⁻³ M KH₂PO₄ with 3.5% NaCl the potential drift was 0.05 mV/h and the lifetime of the electrode was over 40 days when preserved in this solution.

Keywords: Phosphate, All-solid-state electrode, Polyaniline, H₃PO₄ doped polyaniline, Artificial seawater

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