A Novel All-Solid-State Ion-Selective Electrode with Selenite-doped Polyaniline

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doi: 10.20964/2018.12.610

Received: 26 August 2018 / Accepted: 11 October 2018 / Published: 5 November 2018

A novel all-solid-state selenite electrode with Ag and nano-Ag as a substrate and selenite-doped polyaniline as a sensitive membrane was fabricated by using electrochemical methods. Nano-Ag particles were electrodeposited on the surface of a cathode Ag wire in 0.1 M AgNO₃ standard solution with a 1.2 V amplitude, 50 Hz frequency and 30 s action time. The polyaniline layer was coated by chronoamperometry and doped with selenite in selenite solution by the same technique. Scanning electron microscopy (SEM) and energy-dispersive spectroscopy (EDS) analysis proved the successful doping of selenite. The selenite electrode, which had excellent stability and repeatability, had an excellent Nernst linear response (slope -30.08 mV per decade, $R^2 > 0.99$) with a linear range of $5 \times 10^{-6} \sim 1 \times 10^{-1}$ M and detection limit of 1.627×10^{-6} M. The response time was less than 2 s, and the lifespan was more than 178 days. The electrode showed a high selectivity to selenite ions during the interference study. The recovery rates in the sample test were from 95~99%, indicating that the electrode can be applied in real sample measurements. Compared to previous work, this electrode is superior in terms of multiple properties.

Keywords: Ion-selective electrode; Selenite; selenite doped polyaniline; all-solid-state

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