Fabrication of a New Carbon Paste Electrode Based on 5,11,17,23-tetra-*tert*-butyl-25,27-bis(pyren-1-yl-methylimido-propoxy)-26,28-dihydroxy-calix[4]arene for Potentiometric Perchlorate Determination

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A new perchlorate-selective carbon paste electrode based on a calix[4]arene derivative was prepared and evaluated in terms of construction, performance, and applications. The optimum carbon paste combination was specified as 30.0% ionophore, 30.0% graphite powder, and 40.0% 2-nitrophenyloctyl ether as binder. The proposed electrode showed a near-Nernstian slope of 56.3 ± 0.6 mV/pClO₄ in the concentration range of 1.0×10^{-6} – 1.0×10^{-1} M over the wide pH range. It has relatively short response time (6-8 s) and a long lifetime (at least 18 months). The selectivity sequence of the electrode was given according to the coefficients calculated by SSM. Furthermore, perchlorate ions in tap water, river water and human urine samples were successfully determined by direct potentiometry and the resulting mean recoveries were found in the order of 99.4%, 99.8% and 99.1%. Therefore, the proposed perchlorate-selective carbon paste electrode could be an alternative indicator electrode for potentiometric perchlorate analysis.

Keywords: Calix[4]arene; Carbon paste electrode; Potentiometry; Perchlorate-selective electrode; Determination of perchlorate

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