Design and construction of ion-selective membrane electrode based on kryptofix-22DD for determination of uranyl ions in environmental samples

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Abstract

Uranium is a radioactive metal that exists ubiquitously in the Environment [1]. Since uranium is one of the main sources in nuclear energy generation and enriched uranium is a major component in nuclear weapons, human beings have a high chance of being exposed to uranium, which can cause severe adverse effects to human health [2,3]. large amount of uranium in drinking water may lead to harmful biological effects in humans. The chemical toxicity caused by natural uranium gives a major risk to the kidneys. For these reasons, detection of uranium is very important. Potentiometric sensors based on ion-selective electrodes are especially suited for such determination because they offer advantages such as selectivity, sensitivity, good precision, simplicity and low cost. One of the most common classes of sensors is that based on ionophores – organic and inorganic compounds that bind to ions [4]. An uranyl cation selective electrode based on kryptofix-22DD (1,10-didecyl-1,10-diaza-18-crown-6) incorporated into a polyvinylchloride (PVC) membrane has been developed. The electrode exhibits a Nernstian slope (30 mv.decade^{-1}) in a wide linear concentration range of 1.0×10^{-1} to 1.0×10^{-4} mol l^{-1}. The effects of the pH and possible interfering ions were investigated and the optimized conditions for electrode were evaluated. The sensor is used for the determination of uranium as uranyl ions in real sample. The results are compared with those obtained by independent UV–vis technique.

Keywords: *uranyl cation; Potentiometry; Environmental*

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