



Highly Selective Perchlorate Coated-Wire Electrode (CWE) based on an Electrosynthesized Dixanthylum Dye and Its Application in Water Samples

Mohsen Babaei^a*, Naader Alizadeh^b

^a Faculty of Intelligence and Criminal Investigation Science and Technology Amin Police University, P.O. Box 14515/1397, Tehran, Iran.

^b Department of Chemistry, Faculty of Basic Sciences, Tarbiat Modares University, P.O. Box 14115-175, Tehran, Iran

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ABSTRACT

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The fabrication, performance, and utilization of perchlorate coated-wire electrode (perchlorate-CWE) based on dixanthylum dye concerning the response towards perchlorate ions was defined. The recommended electrode exhibits a Nernstian response for perchlorate by a wide concentrations range of 1.0×10^{-6} to 6.1×10^{-2} M, with a slope of -57.4 mV in comparison to other anions. The limit of detection is 5.0×10^{-7} M. It has a quick response time of ~ 4 seconds. The recommended electrode shows adequately good discriminating ability towards perchlorate ions in comparison to other anions and it is profitably applied to the direct determination of perchlorate ions in water samples.

1. Introduction

Different factors including chemical and physical nature, present challenges for the analysis and the remediation cause an upswing interest in a perchlorate ion. A perchlorate ion is considered a substitute for rising persistent inorganic contamination attributable to its distinct properties, like high water solubility, quality and, wide stability. The perchlorate and the iodide ion have a similar size; hence, can incorporate instead of it by the mammalian thyroid gland. Hence, perchlorate can influence the secretion of thyroid hormones. Additionally, other physiologic systems may be indirectly affected. The effects of this ion cause developmental abnormalities in kids and who have thyroid cancer. It poses the greatest risk to the drinking water of pregnant women, kids under 12 years, and people with dysfunctioning thyroids [1, 2].

A perchlorate ion has used in fattening cows as a growth stimulant and as a thyrostatic drug. [3]. A thyroid gland tumor was viewed in rodent animals once exposed to a high dose of perchlorate [4]. The toxicological mechanisms action of perchlorate and its effects are expressed in some reports [5-7]. One of the main origins

of this environmental pollution is the production, inaccurate storage, or removal of ammonium perchlorate used as a primary component of a solid catalyst for explosive fireworks [8-11]. Perchlorate has also been found in processed food [12,13], soil [14], milk [15], fertilizers [8], plants, [16] and human urine [17]. according to the results, several institutions have been determined standard levels for perchlorate. The National Academy of Sciences (NAS's), In January 2005, a maximum permissible dose of $0.7 \mu\text{g} / \text{kg} / \text{day}$ was reported for perchlorate concentrations, associated with a drinking water level of $24.5 \mu\text{g} / \text{L}$ if drinking water was considered the sole source of perchlorate. [18]. Also in February 2005, the US Environmental Protection Agency (US EPA) set an official reference dose (RFD) of 24.5 micrograms per liter for drinking water perchlorate, which remained unchanged with the RFD recommended by NAS. [19]. Therefore, it is of great importance to determine perchlorate ions in various samples like subsurface water, propellants, explosives, and urine along with the presence of other anions. Directly or indirectly determination of perchlorate ions has been accomplished by classical and physical methods, involving Electrochemiluminescence [20],

* Corresponding author. Tel.: +989124422518; e-mail: babaei.mohsen@gmail.com