Construction of a new Lu$^{3+}$ poly(vinyl chloride) membrane sensor Based on 2,2'-[propane-1,3-diylbis(thio)]dianiline as a suitable sensing material

Nasim Ardakanifard$^1$, Hassan Ali Zamani$^{1,*}$, Majid Mohammadhosseini$^2$

$^1$ Department of Applied Chemistry, Mashhad Branch, Islamic Azad University, Mashhad, Iran
$^2$ Department of Chemistry, Faculty of Basic Sciences, Shahrood branch, Islamic Azad University, Shahrood, Iran
$^*$E-mail: haszamani@yahoo.com

doi: 10.20964/2018.09.47

Received: 8 April 2018 / Accepted: 26 June 2018 / Published: 5 August 2018

This paper introduces the development of an original Lu$^{3+}$-PVC membrane electrode based on 2,2'-[propane-1,3-diylbis(thio)]dianiline (PDTD) as a sensing carrier. The electrode presents a Nernstian slope of 19.8±0.4 mV decade$^{-1}$ for the in the Lu$^{3+}$ ions across a broad working concentration range from 1.0×10$^{-6}$ to 1.0×10$^{-2}$ mol L$^{-1}$ with a lower detection limit of 8.2×10$^{-7}$ mol L$^{-1}$ in the pH range of 2.5 –8.4. The electrode response time was rapid (~9 s), and its selectivity with respect to mono and divalent metal ions (Na$^+$, K$^+$, Ca$^{2+}$, Mg$^{2+}$, Co$^{2+}$, Cd$^{2+}$, and Pb$^{2+}$) and trivalent ions (Fe$^{3+}$, Al$^{3+}$ and Cr$^{3+}$), including members of the lanthanide family (Er$^{3+}$, Dy$^{3+}$, La$^{3+}$, Tm$^{3+}$, Nd$^{3+}$, Ho$^{3+}$, Gd$^{3+}$, Sm$^{3+}$, Yb$^{3+}$, Pr$^{3+}$, Eu$^{3+}$ and Tb$^{3+}$) other than Lu$^{3+}$ was good. The making sensor has been put to use successfully as an indicator electrode in analytical applications such as the potentiometric titration and determination of Lu$^{3+}$ ion in blend of different ions.

Keywords: PVC membrane, Potentiometry, Sensor, Ion-selective electrode

FULL TEXT

© 2018 The Authors. Published by ESG (www.electrochemsci.org). This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution license (http://creativecommons.org/licenses/by/4.0/).