

Full Paper

Determination of Lead in Oral Squamous Cell Carcinoma Tissue by New Potentiometric Sensor based on [2-{4-(Diphenylphosphanyl) Phen-2-YI} Pyrimidin-4-YI]-3-(Triethoxysilyl) Prop-1-YI Urea

Faezeh Azmoudeh,¹ Farhang Mizani,^{2,*} and Fatemeh Rajabi³

¹*Department of Oral and Maxillofacial Pathology, Dental Caries Prevention Research Center, Qazvin University of Medical Sciences, Qazvin, Iran*

²*Department of Chemistry, Faculty of Sciences, Imam Khomeini International University, Qazvin, Iran*

³*Department of Chemistry, Payame Noor University, PO Box 19395-3697 Tehran, I. R. IRAN*

*Corresponding Author, Tel.: +98-2833375225

E-Mail: mizani@sci.ikiu.ac.ir

Received: 5 February 2023 / Received in revised form: 17 April 2023 /

Accepted: 20 April 2023 / Published online: 30 April 2023

Abstract- Inorganic lead compounds have recently been classified as human carcinogens by the International Agency for Research on Cancer (IARC). In this light and given the capability of ion selective electrodes for potentiometric measurements of heavy metal ions, a novel lead ion membrane electrode was prepared based on a novel synthesized compound, and was used for the determination of lead content in oral squamous cell carcinoma tissues. The selectivity of the electrode response to lead ions was good in the presence of many commonly occurring interfering species such as alkali, alkaline earth, transition and other heavy metal ions, as further reflected by conductance studies. The optimal membrane composition was 7 % wt. of the ion carrier, 30 % wt. of PVC powder, 60 % wt. of NPOE, and 3% wt. KTCPB. The response of the sensor was linear in the concentration window of 1.0×10^{-7} to 1.0×10^{-1} M with a detection limit of 8.5×10^{-8} M, and the slope of the calibration plot was determined to be 29.4 ± 0.3 mV per decade of concentration. The electrode response was pH-independent in the wide range of 2.2–8.9, and it offered merits of quick response, further to its low detection limit, selectivity profile, and broad linear response range. The sensor showed a fairly fast response ~30 s and could be reliably used for over 4 months. The membrane electrode was used in the determination of Pb^{2+} concentration in healthy and cancerous oral tissues.

Keywords- Lead; Squamous cell carcinoma; Potentiometric determination; Sensor; Oral cancer
