Virtual Scientific Workshop
Eurachem2020
Quality Assurance for Analytical Laboratories in The University Curriculum
14 – 15 July 2020

THE DYNAMIC PARAMETERS OF A CALCIUM MICROSENSOR

Eugenia Eftimie Totu[1], Ibrahim Isildak[2], Daniel Costinel Petre[1], Ismail Agir[3], Ozlem Tavukcuoglu[2], Tiberiu Totu[4], Mustafa Nidge[2]

[1]University Politehnica of Bucharest, Romania. [2]Yildiz Technical University, Istanbul, Turkey.
[3]Istanbul Medeniyet University, Istanbul, Turkey. [4]Swiss Federal Institute of Technology Lausanne, Lausanne, Switzerland

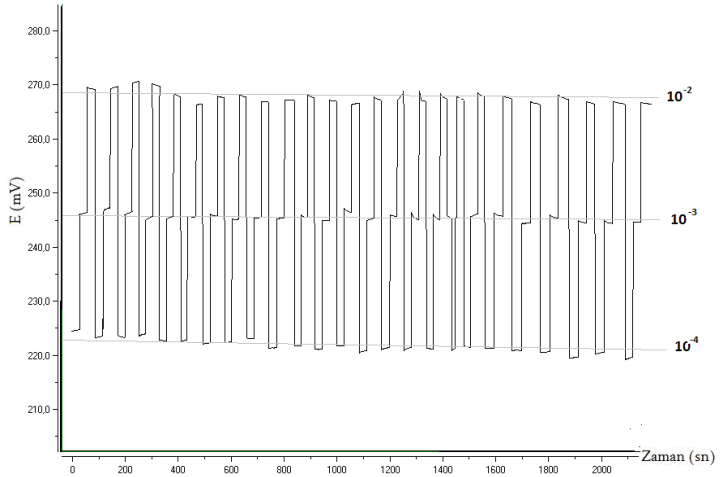
A successful class of selective microelectrodes is the microelectrodes realized by covering conducting wires with selective membranes, being simple and without requiring internal reference electrode. Depending on their dimension, form and configuration, the microsensors could be also used as portable tools for medical diagnosis.

Electrochemical measurements have been performed on a multichannel potentiometer with associated software (ISEMS-4, Medisen). As reference electrode it has been used a homemade micro-sized solid-state Ag/AgCl reference electrode.

Selectivity constants calculated for PVC-matrix Ca^{2+} - selective microelectrode.

Interfering ion, *i*	$K_{Ca,i}$	log $K_{Ca,i}$
Mg^{2+}	2.39×10^{-4}	-3.62
Na^{+}	1.09×10^{-4}	-3.96
K^{+}	7.38×10^{-5}	-4.13
Li^{+}	1.47×10^{-4}	-3.83
NH_4^{+}	3.06×10^{-5}	-4.51
Sr^{2+}	9.43×10^{-2}	-1.02
Ba^{2+}	1.70×10^{-3}	-2.77

The prepared microelectrode exhibited **fast, selective and reproducible response** against Ca^{2+} ion in the presence of interfering ions.



Repeatability of the obtained Ca^{2+} - selective microelectrode

Statistical parameters

$[Ca^{2+}]$, mol/L	Mean Potential (mV)	Standard deviation	Standard deviation of the mean
10^{-2}	268.02	0.98	0.20
10^{-3}	246.06	0.43	0.09
10^{-4}	222.86	0.38	0.08

The lower value of the standard deviation of the mean indicates a higher reliability of the results.

The electrochemical dynamic characteristics of the calcium microsensor:
Nernstian response, 6s for response time, detection limit of 3.26×10^{-6} mol/L
allow its usage for assessing the calcium level from complex biological matrices.

Acknowledgements

This work was supported by a grant of the Romanian National Authority for Scientific Research and Innovation, CCCDI – UEFISCDI, project number 39/2018 COFUND-MANUNET III-HAMELDENT, within PNCDI III and by the Scientific and Technological Research Council of Turkey (TÜBITAK), Grant no: BIYOTEG-9170032. Also, the authors acknowledge the support of the grant of the Romanian National Authority for Scientific Research and Innovation, CCDI- UEFISCDI, project number 30/2016, MANUNET II – PRIDENTPRO within PNCDI III