IFMBE Proceedings
Volume 56, 2016, Pages 86-93
International Conference for Innovation in Biomedical Engineering and Life Sciences, ICIBEL 2015; Putrajaya; Malaysia; 6 December 2015 through 8 December 2015; Code 158329

Ion-selective electrode biochip for applications in a liquid environment

(Conference Paper)

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Abstract

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Physiological sensing conducted in a liquid environment requires electrodes with long lifetime. The development of a robust ion-selective electrode–based biochip in a labon- a-chip platform is described. To compare electrode lifetime, which is driven by the transducer layer, electrochemical measurements were performed in a custom-made flow-cell chamber. The results of potentiometric measurement of cationic analytes demonstrate the electrodes to have a near-Nernstian slope profile even after they are stored for almost a month in liquid medium. The electrodes also achieved H_2O_2 amperometric sensitivity (1.25 and 3.32 $\mu AmM^{-1}cm^{-2}$ for PEDOT:PSS and PEDOT:CaSO4 respectively) and lower detection limit (2.21 μM, 8.4 μM, 3.44 μM, for H^+, NH_4^+, Ca_2^+ respectively) comparable to that of wire-type electrodes. Furthermore, the lifetime is dependent on the electrodeposition method of the conductive polymer, and the transducer layer must be modified to fit the analyte types. These results indicate that extended lifetime of microfabricated ion-selective electrodes in a multiplex format can be realized by optimizing the microfabricated electrode surface functionalization. © International Federation for Medical and Biological Engineering 2016.

Reaxys Database Information

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Author keywords

All-solid-state ion-selective electrode | Electrochemical sensor | Lab-on-a-chip | PEDOT

Indexed keywords

Engineering controlled terms: Biochips | Biomedical engineering | Chemical sensors | Conducting polymers | Electrochemical electrodes | Electrochemical sensors | Electrodes | Ions | Lab-on-a-chip | Liquids | Microfabrication | Transducers

Compendex keywords: All-solid state | Electrochemical measurements | Electrodeposition methods | Lower detection limit | Microfabricated electrodes | PEDOT | Physiological sensing | Potentiometric measurements

Engineering main heading: Ion selective electrodes

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Funding details

Funding number	Funding sponsor	Acronym
	National Aeronautics and Space Administration	NASA

ISSN: 16800737
ISBN: 978-981100265-6
Source Type: Conference Proceeding
Original language: English
DOI: 10.1007/978-981-10-0266-3_18
Document Type: Conference Paper
Volume Editors: Ibrahim F.,Mohktar M.S.,Ahmad M.Y.,Usman J.
Sponsors:
Publisher: Springer Verlag

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