

Author's Accepted Manuscript

A bio-image sensor for simultaneous detection of multi-neurotransmitters

You-Na Lee, Koichi Okumura, Tomoko Horio, Tatsuya Iwata, Kazuhiro Takahashi, Toshiaki Hattori, Kazuaki Sawada



PII: S0039-9140(17)31186-4
DOI: <https://doi.org/10.1016/j.talanta.2017.11.058>
Reference: TAL18120

To appear in: *Talanta*

Received date: 4 October 2017
Revised date: 22 November 2017
Accepted date: 26 November 2017

Cite this article as: You-Na Lee, Koichi Okumura, Tomoko Horio, Tatsuya Iwata, Kazuhiro Takahashi, Toshiaki Hattori and Kazuaki Sawada, A bio-image sensor for simultaneous detection of multi-neurotransmitters, *Talanta*, <https://doi.org/10.1016/j.talanta.2017.11.058>

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting galley proof before it is published in its final citable form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

A bio-image sensor for simultaneous detection of multi-neurotransmitters

You-Na Lee*, Koichi Okumura, Tomoko Horio, Tatsuya Iwata, Kazuhiro Takahashi,
Toshiaki Hattori, and Kazuaki Sawada

Electrical & Electronic Information Eng., Toyohashi University of Technology, Hibarigaoka 1-1, Tempaku-cho,
Toyohashi, Aichi, Japan 441-8580;

*Author for correspondence: lee@ee.tut.ac.jp

Abstract

We report here a new bio-image sensor for simultaneous detection of spatial and temporal distribution of multi-neurotransmitters. It consists of multiple enzyme-immobilized membranes on a 128 × 128 pixel array with read-out circuit. Apyrase and acetylcholinesterase (AChE), as selective elements, are used to recognize adenosine 5'-triphosphate (ATP) and acetylcholine (ACh), respectively. To enhance the spatial resolution, hydrogen ion (H⁺) diffusion barrier layers are deposited on top of the bio-image sensor and demonstrated their prevention capability. The results are used to design the space among enzyme-immobilized pixels and the null H⁺ sensor to minimize the undesired signal overlap by H⁺ diffusion. Using this bio-image sensor, we can obtain H⁺ diffusion-independent imaging of concentration gradients of ATP and ACh in real-time. The sensing characteristics, such as sensitivity and detection of limit, are determined experimentally. With the proposed bio-image sensor the possibility exists for customizable monitoring of the activities of various neurochemicals by using different kinds of proton-consuming or generating enzymes.

Keywords

Simultaneous detection, Bio-image sensor, Enzyme-immobilized membrane, Multi neurotransmitters, Multiplexing bio-image sensor, H⁺ diffusion-barrier layer

Download English Version:

<https://daneshyari.com/en/article/7677421>

Download Persian Version:

<https://daneshyari.com/article/7677421>

[Daneshyari.com](https://daneshyari.com)