

Online analysis of oxygen inside silicon-glass microreactors with integrated optical sensors - DTU Orbit (08/11/2017)

Online analysis of oxygen inside silicon-glass microreactors with integrated optical sensors

A powerful online analysis set-up for oxygen measurements within microfluidic devices is presented. It features integration of optical oxygen sensors into microreactors, which enables contactless, accurate and inexpensive readout using commercially available oxygen meters via luminescent lifetime measurements in the frequency domain (phase shifts). The fabrication and patterning of sensor layers down to a size of 100 μm in diameter is performed via automated airbrush spraying and was used for the integration into silicon-glass microreactors. A novel and easily processable sensor material is also presented and consists of a polystyrene- silicone rubber composite matrix with embedded palladium(II) or platinum(II) meso-tetra(4-fluorophenyl) tetrabenzoporphyrin (PdTPTBPF and PtTPTBPF) as oxygen sensitive dye. The resulting sensor layers have several advantages such as being excitable with red light, emitting in the near-infrared spectral region, being photostable and covering a wide oxygen concentration range. The trace oxygen sensor (PdTPTBPF) in particular shows a resolution of 0.06-0.22 hPa at oxygen concentrations lower than 20 hPa (<2% oxygen) and the normal range oxygen sensor (PtTPTBPF) shows a resolution of 0.2-0.6 hPa at low oxygen concentrations (<50 hPa) and 1-2 hPa at ambient air oxygen concentrations. The sensors were integrated into different silicon-glass microreactors which were manufactured using mass production compatible processes. The obtained microreactors were applied for online monitoring of enzyme transformations, including d-alanine or d-phenylalanine oxidation by d-amino acid oxidase, and glucose oxidation by glucose oxidase.

General information

State: Published

Organisations: Department of Chemical and Biochemical Engineering, CAPEC-PROCESS, IX-factory GmbH, Graz University of Technology

Authors: Ehgartner, J. (Ekstern), Sulzer, P. (Ekstern), Burger, T. (Ekstern), Kasjanow, A. (Ekstern), Bouwes, D. (Ekstern), Krühne, U. (Intern), Klimant, I. (Ekstern), Mayr, T. (Ekstern)

Pages: 748-757

Publication date: 2016

Main Research Area: Technical/natural sciences

Publication information

Journal: Sensors and Actuators B: Chemical

Volume: 228

ISSN (Print): 0925-4005

Ratings:

BFI (2017): BFI-level 1

Web of Science (2017): Indexed yes

BFI (2016): BFI-level 1

Scopus rating (2016): CiteScore 5.07 SJR 1.333 SNIP 1.463

Web of Science (2016): Indexed yes

BFI (2015): BFI-level 1

Scopus rating (2015): SJR 1.25 SNIP 1.509 CiteScore 4.84

Web of Science (2015): Indexed yes

BFI (2014): BFI-level 1

Scopus rating (2014): SJR 1.229 SNIP 1.679 CiteScore 4.37

Web of Science (2014): Indexed yes

BFI (2013): BFI-level 1

Scopus rating (2013): SJR 1.242 SNIP 1.622 CiteScore 4.25

ISI indexed (2013): ISI indexed yes

Web of Science (2013): Indexed yes

BFI (2012): BFI-level 1

Scopus rating (2012): SJR 1.405 SNIP 1.679 CiteScore 3.92

ISI indexed (2012): ISI indexed yes

Web of Science (2012): Indexed yes

BFI (2011): BFI-level 1

Scopus rating (2011): SJR 1.474 SNIP 1.744 CiteScore 4.08

ISI indexed (2011): ISI indexed yes

Web of Science (2011): Indexed yes

BFI (2010): BFI-level 1

Scopus rating (2010): SJR 1.409 SNIP 1.437

Web of Science (2010): Indexed yes
BFI (2009): BFI-level 1
Scopus rating (2009): SJR 1.297 SNIP 1.509
Web of Science (2009): Indexed yes
BFI (2008): BFI-level 1
Scopus rating (2008): SJR 1.436 SNIP 1.576
Web of Science (2008): Indexed yes
Scopus rating (2007): SJR 1.434 SNIP 1.592
Scopus rating (2006): SJR 1.336 SNIP 1.526
Scopus rating (2005): SJR 1.267 SNIP 1.849
Web of Science (2005): Indexed yes
Scopus rating (2004): SJR 1.336 SNIP 1.504
Web of Science (2004): Indexed yes
Scopus rating (2003): SJR 1.159 SNIP 1.381
Web of Science (2003): Indexed yes
Scopus rating (2002): SJR 1.086 SNIP 1.07
Scopus rating (2001): SJR 0.835 SNIP 1.128
Web of Science (2001): Indexed yes
Scopus rating (2000): SJR 0.928 SNIP 1.2
Web of Science (2000): Indexed yes
Scopus rating (1999): SJR 0.907 SNIP 1.07
Original language: English
Enzyme reactions, Integrated sensor, Microfluidics, Microreactor, Optical oxygen sensor
Electronic versions:
[Online_analysis_of_oxygen_inside_silicon_glass_microreactors_withintegrated_optical_sensors.pdf](#)
DOIs:
[10.1016/j.snb.2016.01.050](https://doi.org/10.1016/j.snb.2016.01.050)
Source: FindIt
Source-ID: 277235303
Publication: Research - peer-review › Journal article – Annual report year: 2016