Enzymatic polymerization of polythiophene by immobilized glucose oxidase

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In this study 'green', environmentally friendly enzymatic reaction-based synthesis of conducting polymer polythiophene (PTP) is proposed. Glucose oxidase (GOx) was shown as an effective catalyst, which, in the presence of glucose, produces hydrogen peroxide suitable for the oxidative polymerization of PTP under ambient conditions at neutral pH. Enzymatically induced formation of the PTP layer over GOx-modified graphite rod electrode (GRE) was demonstrated and evaluated amperometrically and by attenuated total reflectance - Fourier transform infrared (ATR-FTIR) spectroscopy. Surface morphology of GOx- and PTP-modified GR electrodes was characterized by atomic force microscopy. It was clearly shown that the apparent kinetic Michaelis constant ($K_{M(app.)}$) of GOx/PTP-modified GRE increased by increasing the duration of polymerization reaction. Therefore, enzymatic polymerization could be applied in adjustment and/or tuning of $K_{M(app.)}$ and other kinetic parameters of GOx-based electrodes used in biosensor design. (C) 2014 Elsevier Ltd. All rights reserved.

General information
State: Published
Organisations: Vilnius University, Selcuk University
Contributors: Krikstolaityte, V., Kuliesius, J., Ramanaviciene, A., Mikoliunaite, L., Kausaite-Minkstimiene, A., Oztekin, Y., Ramanavicius, A.
Number of pages: 8
Pages: 1613-1620
Publication date: 2014
Peer-reviewed: Yes

Publication information
Journal: POLYMER
Volume: 55
Issue number: 7
ISSN (Print): 0032-3861
Ratings:
BFI (2019): BFI-level 1
Web of Science (2019): Indexed yes
BFI (2018): BFI-level 1
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 1
Scopus rating (2017): CiteScore 3.59 SJR 1.097 SNIP 1.163
Web of Science (2017): Impact factor 3.483
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 3.77 SJR 1.207 SNIP 1.253
Web of Science (2016): Impact factor 3.684
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
Scopus rating (2015): CiteScore 3.72 SJR 1.144 SNIP 1.277
BFI (2014): BFI-level 1
Scopus rating (2014): CiteScore 3.85 SJR 1.326 SNIP 1.613
Web of Science (2014): Impact factor 3.562
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
Scopus rating (2013): CiteScore 4.07 SJR 1.414 SNIP 1.649
Web of Science (2013): Impact factor 3.766
ISI indexed (2013): ISI indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): CiteScore 3.74 SJR 1.589 SNIP 1.777
Web of Science (2012): Impact factor 3.379
ISI indexed (2012): ISI indexed yes
BFI (2011): BFI-level 1
Scopus rating (2011): CiteScore 4.04 SJR 1.623 SNIP 1.797
Web of Science (2011): Impact factor 3.438
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 1
Scopus rating (2010): SJR 1.85 SNIP 1.782
Web of Science (2010): Impact factor 3.829
Web of Science (2010): Indexed yes
BFI (2009): BFI-level 1
Scopus rating (2009): SJR 2 SNIP 1.698
Web of Science (2009): Indexed yes
BFI (2008): BFI-level 1
Scopus rating (2008): SJR 1.896 SNIP 1.629
Web of Science (2008): Indexed yes
Scopus rating (2007): SJR 1.888 SNIP 1.696
Web of Science (2007): Indexed yes
Scopus rating (2006): SJR 1.826 SNIP 1.624
Web of Science (2006): Indexed yes
Scopus rating (2005): SJR 1.644 SNIP 1.564
Web of Science (2005): Indexed yes
Scopus rating (2004): SJR 1.747 SNIP 1.724
Web of Science (2004): Indexed yes
Scopus rating (2003): SJR 1.603 SNIP 1.601
Web of Science (2003): Indexed yes
Scopus rating (2002): SJR 1.583 SNIP 1.434
Web of Science (2002): Indexed yes
Scopus rating (2001): SJR 1.46 SNIP 1.387
Web of Science (2001): Indexed yes
Scopus rating (2000): SJR 1.314 SNIP 1.38
Web of Science (2000): Indexed yes
Scopus rating (1999): SJR 1.307 SNIP 1.284
Original language: English
DOIs:
10.1016/j.polymer.2014.02.003
Source: FindIt
Source-ID: 260842855
Research output: Research - peer-review › Journal article – Annual report year: 2014