Fast prototyping of conducting polymer microelectrodes using resistance-controlled high precision drilling - DTU Orbit (09/12/2018)

Fast prototyping of conducting polymer microelectrodes using resistance-controlled high precision drilling

We present a straightforward method for fast prototyping of microelectrode arrays in the highly conductive polymer poly(3,4-ethylenedioxythiophene) (PEDOT). Microelectrode arrays were produced by electrical resistance-controlled microdrilling through an insulating polymer layer (TOPAS® 5013) covering a PEDOT layer. The sudden drop in electrical resistance between the metal drill and the PEDOT layer upon physical contact was employed as stop criterion for the drilling process. Arrays of 3×3 microelectrodes of diameter 30μm or 100μm, respectively, and having center-to-center electrode spacings of 130μm and 300μm, respectively, were fabricated. Their functionality was verified by chronoamperometry on potassium ferro-/ferricyanide. Comparison of the experimentally obtained results to finite element modeling of the respective electrode configurations shows that the conducting polymer electrodes approach the steady state currents predicted from modeling, but at a much slower rate than expected. This is shown to be caused by the use of electroactive PEDOT electrodes. Subtraction of the latter contribution gives approach to steady state currents within a few seconds, which is in very good agreement with the modeled response time.

General information
State: Published
Organisations: Polymeric Enabling Microsystems Group, Polymer Micro and Nano Engineering Section, Department of Micro- and Nanotechnology, Energy and Materials, Department of Chemistry
Contributors: Kafka, J. R., Geschke, O., Skaarup, S., Larsen, N. B.
Pages: 2589-2592
Publication date: 2011
Peer-reviewed: Yes

Publication information
Journal: Microelectronic Engineering
Volume: 88
Issue number: 8
ISSN (Print): 0167-9317
Ratings:
BFI (2018): BFI-level 2
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 2
Scopus rating (2017): CiteScore 1.87 SJR 0.604 SNIP 0.937
Web of Science (2017): Impact factor 2.02
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 2
Scopus rating (2016): CiteScore 1.69 SJR 0.589 SNIP 0.949
Web of Science (2016): Impact factor 1.806
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 2
Scopus rating (2015): CiteScore 1.35 SJR 0.507 SNIP 0.796
Web of Science (2015): Impact factor 1.277
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 2
Scopus rating (2014): CiteScore 1.44 SJR 0.586 SNIP 0.86
Web of Science (2014): Impact factor 1.197
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 2
Scopus rating (2013): CiteScore 1.45 SJR 0.595 SNIP 0.964
Web of Science (2013): Impact factor 1.338
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 2
Scopus rating (2012): CiteScore 1.44 SJR 0.737 SNIP 0.949
Web of Science (2012): Impact factor 1.224
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes