Thermal operating window for PEDOT:PSS films and its related thermoelectric properties -
DTU Orbit (16/08/2019)

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The intrinsically conducting polymer PEDOT:PSS is widely used and has found high recognition due to its excellent
electrical conductivity. Its potential applications cover many fields, e.g. thermoelectric energy conversion. Therefore we
compared the thermoelectric properties of pristine and DMSO treated PEDOT:PSS films at potential operating
temperatures. Here we observed the electrical degradation of the film up to complete failure. Further, the thermal aging of
PEDOT:PSS still lacks of understanding. It is pointed out that PEDOT:PSS films show a complex degradation mechanism
which includes a morphological and a chemical part. In the range of room temperature and ~160 °C PEDOT:PSS films
follow the known exponential degradation which imposes morphological degradation, while at higher temperatures this law
is not suitable to match the experimental data. Thus we extended the known exponential equation by an additional
exponential degradation term which shows good agreement with the experimental data. The optical absorption spectrum
indicates a loss in bipolaron and polaron charge carriers, which reflects the degradation behavior. It can be seen that
changes in the optical absorption spectrum after isothermal annealing for more than 50 h occur at temperatures around
120 °C, which marks the transition from morphological to chemical degradation.

General information
Publication status: Published
Organisations: Department of Energy Conversion and Storage, Mixed Conductors, Ceramic Engineering & Science,
Fraunhofer Institute for Material and Beam Technology
Contributors: Stepień, L., Roch, A., Tkachov, R., Leupoldt, B., Han, L., Van Nong, N., Leyens, C.
Pages: 49-54
Publication date: 2017
Peer-reviewed: Yes

Publication information
Journal: Synthetic Metals
Volume: 225
ISSN (Print): 0379-6779
Ratings:
BFI (2017): BFI-level 1
Scopus rating (2017): CiteScore 2.49 SJR 0.672 SNIP 0.766
Web of Science (2017): Impact factor 2.526
Web of Science (2017): Indexed yes
Original language: English
Keywords: Aging, Decomposition, Degradation, Electrical conductivity, Thermoelectric properties, PEDOT:PSS
DOIs: 10.1016/j.synthmet.2016.11.017
Research output: Contribution to journal › Journal article – Annual report year: 2017 › Research › peer-review