Electrospun nanofiber materials for energy and environmental applications

Zhang, Wenjing; Narang, Kritika; Jasso-Salcedo, Alma; Dou, Yibo; Simonsen, Søren Bredmose; Gudik-Sørensen, Mads; Vinkel, Nadja Maria; Akhtar, Farid; Hedin, Niklas; Kaiser, Andreas

Published in:
Energy Procedia

Link to article, DOI:
10.1016/j.egypro.2019.01.016

Publication date:
2019

Document Version
Publisher's PDF, also known as Version of record

Link back to DTU Orbit

Citation (APA):
Electrospun nanofiber materials for energy and environmental applications

Wenjing Zhang\textsuperscript{a}, Kritika Narang\textsuperscript{b}, Alma Jasso-Salcedo\textsuperscript{c}, Yibo Dou\textsuperscript{a}, Søren Bredmose Simonsen\textsuperscript{a}, Mads Gudik-Søren\textsuperscript{a}, Nadja Maria Vinkel\textsuperscript{a}, Farid Akhtar\textsuperscript{b}, Niklas Hedin\textsuperscript{c}, Andreas Kaiser\textsuperscript{a*}

\textsuperscript{a}Department of Energy Conversion and Storage, Technical University of Denmark (DTU), Denmark.
\textsuperscript{b}Division of Materials Science, Luleå University of Technology, Sweden.
\textsuperscript{c}Department of Materials and Environmental Chemistry, Stockholm University, Sweden.

© 2019 The Authors. Published by Elsevier Ltd.
This is an open access article under the CC BY-NC-ND license (http://creativecommons.org/licenses/by-nc-nd/4.0/)
Peer-review under responsibility of the scientific committee of ICAE2018 – The 10th International Conference on Applied Energy.

Abstract

Electrospinning is the one of the most versatile techniques to design nanofiber materials with numerous applications in the fields of energy conversion, catalytic chemistry, liquid and gas filtration.\textsuperscript{1} By electrospinning, complex structures can be designed from a rich variety of materials including polymers, metals, ceramics and composite, with the ability to control composition, morphology and secondary structure and tailor performance and functionality for specific applications. Moreover, with recent developments in the design of electrospinning equipment and availability of industrial-scale electrospinning technologies with production rates of several thousands of square meters per day new opportunities for electrospinning are imminent. With this, the advanced research on materials performed in our labs is getting closer to the commercialization of new products for applications in fields of energy and environment.

An overview will be given on electrospinning activities at DTU Energy that address the sizable challenges in energy and environmental applications by electrospinning: 1. Electrospun perovskite oxide nanofiber electrode for use in solid oxide fuel cells. In this application, a (La\textsubscript{0.8}Sr\textsubscript{0.2})\textsubscript{0.99}CoO\textsubscript{3-δ} cathode was shaped into 3-dimensional thin-film by so-gel assisted electrospinning method combined with calcination and sintering; 2. Electrospun nanofiber materials for gas adsorption. Both the advantages and challenges of using electrospun nanofiber materials will be discussed, in terms of electrochemical performance, surface area, packing efficiency and mechanical stability.
Figure 1. a) Electrospinning process; b) Industrial-scale electrospinning equipment (Elmarco); c) Pt-C/Nafion nanofiber electrodes for proton exchange membrane fuel cells\(^2\); d) metal oxide nanotubes; e) metal oxide nano-pearl string; f) metal oxide nanofiber.\(^3\)

Reference