

Free Full Text from Publisher

Find PDF

Full Text Options

Export...

Add to Marked List

◀ 1 of 1 ▶

A secondary, coplanar design Ni/MCM-41/Zn microbattery

By: Meskon, SR (Meskon, S. R.)^[1]; Othman, R (Othman, R.)^[1]; Ani, MH (Ani, M. H.)^[1]

[View Web of Science ResearcherID and ORCID](#)

INTERNATIONAL CONFERENCE ON ADVANCES IN MANUFACTURING AND MATERIALS ENGINEERING (ICAMME 2017)

Book Group Author(s): IOP

Book Series: IOP Conference Series-Materials Science and Engineering

Volume: 290

Article Number: UNSP 012073

DOI: 10.1088/1757-899X/290/1/012073

Published: 2018

Document Type: Proceedings Paper

Conference

Conference: International Conference on Advances in Manufacturing and Materials Engineering (ICAMME)

Location: Int Islam Univ, Kuala Lumpur, MALAYSIA

Date: AUG 08-09, 2017

Abstract

A secondary Ni/Zn microbattery (similar to 200 μm thick) has been developed in a coplanar electrode configuration. The cell is essentially of a circular shape (similar to 30 mm in diameter) consisting of a fine circular ring (cathode) and a circle (anode) split apart (similar to 800 μm). Unlike the stacking cell architecture, coplanar configuration offers simple design, ease of fabrication and eventually cost saving. The use of MCM-41 mesoporous silica as the membrane separator cum electrolyte reservoir enables the successful implementation of coplanar configuration. The fabrication of Ni/Zn microbattery first begins with electrodeposition of zinc (Zn) and nickel hydroxide (Ni(OH)₂) thin films onto patterned FR4 printed circuit board, followed by deposition of zinc oxide (ZnO) slurry onto the zinc active layer, and finally ends by multiple drop-coating procedures of MCM-41 from its precursor solution at ambient temperature. Once a potassium hydroxide (6 M KOH)/MCM-41 electrolyte-separator mixture is incorporated, the cell is sealed with an acrylic sheet and epoxy adhesive. The fabricated microbatteries were capable to sustain around 130 deep charge-discharge cycles. When rated at 0.1 mA, the energy density of the microbattery was around 3.82 Wh l(-1) which is suitable for low rate applications and storage for micro energy harvesters such as piezoelectric generators.

Keywords

KeyWords Plus: FABRICATION; STABILITY; BATTERIES; VAPOR

Author Information

Reprint Address: Othman, R (reprint author)

IIUM, Fac Engr, POB 10, Kuala Lumpur 50728, Malaysia.

Addresses:

[1] IIUM, Fac Engr, POB 10, Kuala Lumpur 50728, Malaysia

E-mail Addresses: raihan@iium.edu.my

Publisher

IOP PUBLISHING LTD, DIRAC HOUSE, TEMPLE BACK, BRISTOL BS1 6BE, ENGLAND

Categories / Classification

Research Areas: Engineering; Materials Science

Web of Science Categories: Engineering, Manufacturing; Engineering, Mechanical; Materials Science, Multidisciplinary

[See more data fields](#)

Citation Network

In Web of Science Core Collection

0

Times Cited

Create Citation Alert

17

Cited References

[View Related Records](#)

Use in Web of Science

Web of Science Usage Count

1

Last 180 Days

6

Since 2013

[Learn more](#)

This record is from:

Web of Science Core Collection

- Conference Proceedings Citation Index-Science

[Suggest a correction](#)

If you would like to improve the quality of the data in this record, please suggest a correction.

Cited References: 17

Showing 17 of 17 [View All in Cited References page](#)

(from Web of Science Core Collection)

- 1. A NEW FAMILY OF MESOPOROUS MOLECULAR-SIEVES PREPARED WITH LIQUID-CRYSTAL TEMPLATES** Times Cited: 9,376
By: BECK, JS; VARTULI, JC; ROTH, WJ; et al.
JOURNAL OF THE AMERICAN CHEMICAL SOCIETY Volume: 114 Issue: 27 Pages: 10834-10843 Published: DEC 30 1992
- 2. Fabrication of high-aspect-ratio electrode arrays for three-dimensional microbatteries** Times Cited: 71
By: Chamran, Fardad; Yeh, Yuting; Min, Hong-Seok; et al.
JOURNAL OF MICROELECTROMECHANICAL SYSTEMS Volume: 16 Issue: 4 Pages: 844-852 Published: AUG 2007
- 3. Solid-state thin-film rechargeable batteries** Times Cited: 175
By: Dudney, NJ
MATERIALS SCIENCE AND ENGINEERING B-SOLID STATE MATERIALS FOR ADVANCED TECHNOLOGY Volume: 116 Issue: 3 Pages: 245-249
Published: FEB 15 2005
- 4. Studies on Degradation of Copper Nano Particles in Cathode for CO₂ Electrolysis to Organic Compounds** Times Cited: 11
By: Garg, Garima; Basu, Suddhasatwa
ELECTROCHIMICA ACTA Volume: 177 Pages: 359-365 Published: SEP 20 2015
- 5. Microscopic nickel-zinc batteries for use in autonomous microsystems** Times Cited: 39
By: Humble, PH; Harb, JN; LaFollette, R
JOURNAL OF THE ELECTROCHEMICAL SOCIETY Volume: 148 Issue: 12 Pages: A1357-A1361 Published: DEC 2001
- 6. ORDERED MESOPOROUS MOLECULAR-SIEVES SYNTHESIZED BY A LIQUID-CRYSTAL TEMPLATE MECHANISM** Times Cited: 13,629
By: KRESGE, CT; LEONOWICZ, ME; ROTH, WJ; et al.
NATURE Volume: 359 Issue: 6397 Pages: 710-712 Published: OCT 22 1992
- 7. Fabrication and properties of a carbon/polypyrrole three-dimensional microbattery** Times Cited: 131
By: Min, Hong-Seok; Park, Benjamin Y.; Taherabadi, Lili; et al.
JOURNAL OF POWER SOURCES Volume: 178 Issue: 2 Pages: 795-800 Published: APR 1 2008
- 8. Vapor-phase synthesis of mesoporous silica thin films** Times Cited: 98
By: Nishiyama, N; Tanaka, S; Egashira, Y; et al.
CHEMISTRY OF MATERIALS Volume: 15 Issue: 4 Pages: 1006-1011 Published: FEB 25 2003
- 9. Zirconium-containing mesoporous silica Zr-MCM-48 for alkali resistant filtration membranes** Times Cited: 46
By: Nishiyama, N; Saputra, H; Park, DH; et al.
JOURNAL OF MEMBRANE SCIENCE Volume: 218 Issue: 1-2 Pages: 165-171 Published: JUL 1 2003
- 10. Electrochemical Stability of Cu, Ni, Co, Pt and Ir Metals Sheet and Their Composite Electrodes in Potassium Hydroxide Solution** Times Cited: 7
By: Othman, Mohamed Rozali; Riyanto
INTERNATIONAL JOURNAL OF ELECTROCHEMICAL SCIENCE Volume: 7 Issue: 9 Pages: 8408-8419 Published: SEP 2012
- 11. Zn/MCM-41/MnO₂ Leclanche Button Cell R2025 for Low Rate Applications** Times Cited: 1
By: Othman, R.; Ani, M. H.; Zawi, N. L. Mohd.
Adv. Mater. Res Volume: 576 Pages: 374-377 Published: 2012
- 12. Enhancement of hydrothermal stability and hydrophobicity of a silica MCM-48 membrane by silylation** Times Cited: 93
By: Park, DH; Nishiyama, N; Egashira, Y; et al.
INDUSTRIAL & ENGINEERING CHEMISTRY RESEARCH Volume: 40 Issue: 26 Pages: 6105-6110 Published: DEC 26 2001
- 13. High-power lithium ion microbatteries from interdigitated three-dimensional bicontinuous nanoporous electrodes** Times Cited: 303
By: Pikul, James H.; Zhang, Hui Gang; Cho, Jiung; et al.
NATURE COMMUNICATIONS Volume: 4 Article Number: 1732 Published: APR 2013
- 14. Sorption of water vapor on HZSM-5 type zeolites** Times Cited: 26

By: Sano, T; Kasuno, T; Takeda, K; et al.

PROGRESS IN ZEOLITE AND MICROPOROUS MATERIALS, PTS A-C Book Series: Studies in Surface Science and Catalysis Volume: 105 Pages: 1771-1778 Part: A-C Published: 1997

15. **MCM-41 as a new separator material for electrochemical cell: Application in zinc-air system** Times Cited: 27
By: Saputra, Hens; Othman, Raihan; Sutjipto, A. G. E.; et al.
JOURNAL OF MEMBRANE SCIENCE Volume: 367 Issue: 1-2 Pages: 152-157 Published: FEB 1 2011
16. **Gel-like properties of MCM-41 material and its transformation to MCM-50 in a caustic alkaline surround** Times Cited: 4
By: Saputra, Hens; Othman, Raihan; Sutjipto, A. G. E.; et al.
MATERIALS RESEARCH BULLETIN Volume: 47 Issue: 3 Pages: 732-736 Published: MAR 2012
17. **Wall thickness determination of hydrophobically functionalized MCM-41 materials** Times Cited: 18
By: Schoeffel, Markus; Brodie-Linder, Nancy; Audonnet, Fabrice; et al.
JOURNAL OF MATERIALS CHEMISTRY Volume: 22 Issue: 2 Pages: 557-567 Published: JAN 14 2012

Showing 17 of 17 [View All in Cited References page](#)

Clarivate

Accelerating innovation

© 2019 Clarivate [Copyright notice](#) [Terms of use](#) [Privacy statement](#) [Cookie policy](#)

[Sign up for the Web of Science newsletter](#) [Follow us](#)

