Fuel cell based on novel hyper-branched polybenzimidazole membrane

By: Liu, C (Liu, Changzhi)[1] ; Khan, SB (Khan, Sher Bahadar)[2,3] ; Lee, M (Lee, Minju)[1] ; Kim, KI (Kim, Kwang In)[1] ; Akhtar, K (Akhtar, Kalsoom)[4,5] ; Han, H (Han, Haksoo)[1] ; Asiri, AM (Asiri, Abdullah M.)[2,3]

View ResearcherID and ORCID

MACROMOLECULAR RESEARCH
Volume: 21 **Issue:** 1 **Pages:** 35-41
DOI: 10.1007/s13233-012-0191-2
Published: JAN 2013
View Journal Impact

Abstract

A novel hyper-branched polybenzimidazole (HB-PBI) has been synthesized and efficiently utilized as a conducting polymer for the fabrication of an efficient high temperature fuel cell. The developed fuel cell showed outstanding proton conductivity (0.168 Scm(-1) at 150 A degrees C) along with excellent single cell performance, displaying a maximum power density of 0.346 Wcm(-2). The HB-PBI has been synthesized by polymerization of bibenzimidazole diterephthalic acid (BBIDTA) and 3,3'-diaminobenzene in the presence of poly phosphoric acid while the BBIDTA was synthesized by treating trimellitic anhydride with 3,3'-diaminobenzene. Both HB-PBI and BBIDTA were structurally characterized by nuclear magnetic resonance (H-1 and C-13 NMR). HB-PBI showed high thermal stability and mechanical properties, findings that were corroborated by thermogravimetric analysis and use of a universal testing machine. Additionally, proton conduction and the thermal and mechanical properties of HB-PBI were compared with polybenzene imidazole (m-PBI), and found that HB-PBI has higher proton conducting, thermal and mechanical properties.

Keywords

Author Keywords: polybenzimidazole; proton exchange membrane; fuel cell; thermal properties; mechanical properties

KeyWords Plus: COPOLYMER COMPOSITE MEMBRANES; POLYMER ELECTROLYTE MEMBRANES; ACID DOPED POLYBENZIMIDAZOLE; SULFONATED POLYIMIDE; METHANOL; PERFORMANCE; STABILITY; NETWORKS; HYDROGEN

Author Information

Reprint Address: Khan, SB (reprint author)

− King Abdulaziz Univ, Ctr Excellence Adv Mat Res, POB 80203, Jeddah 21589, Saudi Arabia.
Organization-Enhanced Name(s)
King Abdulaziz University

Addresses:

+ [1] Yonsei Univ, Dept Chem & Biomol Engn, Seoul 120749, South Korea

− [2] King Abdulaziz Univ, Ctr Excellence Adv Mat Res, Jeddah 21589, Saudi Arabia
Organization-Enhanced Name(s)
King Abdulaziz University

− [3] King Abdulaziz Univ, Dept Chem, Fac Sci, Jeddah 21589, Saudi Arabia
Organization-Enhanced Name(s)
King Abdulaziz University

[4] Ewha Womans Univ, Div Nano Sci, Seoul 120750, South Korea

[5] Ewha Womans Univ, Dept Chem, Seoul 120750, South Korea

E-mail Addresses: sbkhan@kau.edu.sa; hshan@yonsei.ac.kr

Funding

Funding Agency	Grant Number
National Research Foundation of Korea	
	NRF-2009-C1AAA001-0092926
	2011-0016750

View funding text

Publisher

SPRINGER, VAN GODEWIJCKSTRAAT 30, 3311 GZ DORDRECHT, NETHERLANDS

Categories / Classification

Research Areas: Polymer Science

Web of Science Categories: Polymer Science

Document Information

Document Type: Article

Language: English

Accession Number: WOS:000314280900006

ISSN: 1598-5032

eISSN: 2092-7673

Journal Information

Table of Contents: Current Contents Connect

Impact Factor: Journal Citation Reports

Other Information

IDS Number: 080YQ

Cited References in Web of Science Core Collection: 31

Times Cited in Web of Science Core Collection: 9