Enhancement on protonation (H+) with incorporation of flexible ethylene carbonate in CMC-PVA-30 wt % NH4NO3 film

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INTERNATIONAL JOURNAL OF HYDROGEN ENERGY

Volume: 46 **Issue:** 33 **Page:** 17231-17245

DOI: 10.1016/j.ijhydene.2021.02.187

Published: MAY 13 2021

Document Type: Article

Abstract

In the present work, carboxymethyl cellulose (CMC)epolyvinyl alcohol (PVA)-NH4NO3 with the addition of ethylene carbonate (EC) based polymer blend electrolyte (PBE) was explored. The complexes of PBE with addition of EC revealed that an interaction of the -OH and -COO- of the CMC-PVA blend with the dissociation of H+ from NH4NO3 provides a flexibility pathway for ion hopping. The optimum ionic conductivity at room temperature was found to be 3.92 x 10(-3) S/cm for the sample containing 6 wt.% EC with an increment of amorphous phase and thermal stability. Based on the Impedance-Nyquist theoretical approach, it was shown that the ionic conductivity with cation transference number (t(H+) = 0.48) of the PBE is primarily influenced by the ionic mobility as well as the ions diffusion coefficient. The findings verified that the CMC-PVA-NH4NO3-EC possesses favorable conduction properties upon physical structural modification as a promising polymer electrolyte. (C) 2021 Hydrogen Energy Publications LLC. Published by Elsevier Ltd. All rights reserved.

Keywords

Author Keywords: Polymer blend; Physicochemical properties; Conductivity; H+ transport

Keywords Plus: BIO-POLYMER ELECTROLYTES; IONIC TRANSPORT-PROPERTIES; TRANSFERENCE NUMBER; ELECTROCHEMICAL PERFORMANCE; ELECTRICAL-PROPERTIES; AMMONIUM THIOCYANATE; SOLID-ELECTROLYTE; BLEND; CONDUCTIVITY; CHITOSAN

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Categories/Classification

Research Areas: Chemistry; Electrochemistry; Energy & Fuels

Funding

Funding agency	Grant number	Hide All Details
Ministry of Education, Malaysia	FRGS/1/2019/STG07/UMP/02/4	Hide details

Appeared in source as: Ministry of Higher Education Malaysia (MOHE)

Universiti Malaysia Pahang	RDU 190389
	PGRS 190307
Faculty of	

View funding text

Document Information

Language: English

Accession Number: WOS:000646140200017

ISSN: 0360-3199

eISSN: 1879-3487

Other Information

IDS Number: RV9IX

– See fewer data fields

Journal information

INTERNATIONAL JOURNAL OF HYDROGEN ENERGY

ISSN: 0360-3199

eISSN: 1879-3487

Current Publisher: PERGAMON-ELSEVIER SCIENCE LTD, THE BOULEVARD, LANGFORD LANE, KIDLINGTON, OXFORD OX5 1GB, ENGLAND

Journal Impact Factor: Journal Citation Report™

Research Areas: Chemistry; Electrochemistry; Energy & Fuels

Web of Science Categories: Chemistry, Physical; Electrochemistry; Energy & Fuels

5.816

Journal Impact Factor™ (2020)

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