

18th ASIAN CONFERENCE ON SOLID STATE IONICS

ACSSI - 2024

19th - 22nd FEBRUARY, 2024

MEENAKSHI COLLEGE FOR WOMEN
(Autonomous)

Kodambakkam, Chennai - 600024, India

BOOK OF ABSTRACTS

Sponsored by



Solid State Ionics
Society of Japan



Subramanian - Thangathai
Educational Trust



Council of Science
&
Industrial
Research



Defence Research
&
Development
Organisation



MTN College



Royal Eastern

Organized by

MATERIALS RESEARCH CENTER

Run by Subramanian - Thangathai Educational Trust
Coimbatore - 641045, India

&

MEENAKSHI COLLEGE FOR WOMEN
(Autonomous)

Kodambakkam, Chennai - 600024, India

For

Asian Society for Solid State Ionics

Editors

Dr. S. Selvasekarapandian
Dr. K. S. Lakshmi
Dr. V. Meenakshi Sundaram
Dr. A. R. Kulkarni
Dr. C. Sanjeeviraja
Dr. K. Hariharan

	<i>Lakshmi K.S¹, Meenakshisundaram^a V, SelvasekarapandianS^{b,c}, Punniyakotti.J^{1*}, Muniraj VigneshN^{b,e}</i>	
C2-PP10	First-Principles Study on Proton Transfer in Poly(acrylic acid)-Triazole Molecules <i>Khusnul Yakin^{a,b*}, Naoya Yamaguchi^c, Motohiro Mizuno^c, and Fumiyuki Ishii^{c**}</i>	213
C2-PP11	From Shrimp Shells and Bacteria to Energy Storage: Structural and Electrochemical Properties of Magnesium Ion Conducting Blend Polymer Electrolyte for Battery Application <i>Pradeep Nayak^a, Ismayil*</i>	215
C2-PP12	Si-doped Li₇La₃Zr₂O₁₂ Filler Incorporated Composite Solid Electrolyte Membrane for All-Solid-State Lithium Metal Batteries <i>Ajith K^{1,2}, Kumlachew Zelalem Walle², Chelladurai Karuppiah², Christopher Selvin P^{1,*}, Sakthivel P³, Chun-Chen Yang^{2,*}</i>	217
C2-PP14	Ionic Liquid Dispersed Garnet-Type Fast Ionic Ceramics for Solid State Supercapacitors <i>Gurpreet Kaur^a, Bhargab Sharma^{b*}, S. C. Sivasubramanian^a, Anshuman Dalvi^b</i>	219
C2-PP16	Transfer matrix based analysis of optical transmission and Reflection prospects in Au/TiO₂ hyperbolic Metamaterials <i>Ancemma Joseph^{1*}, Aafrin Hazaana S¹</i>	220
C2-PP17	Investigation of Ion Conducting Gel Polymer Electrolytes for Zinc Ion Battery Application <i>Suleman¹, Y. K. Mahipal^{1*}</i>	221
C2-PP18	In-situ pre-lithiation of porous carbon nanosheets for highly stable lithium-ion capacitor <i>Neetu Bansal^a, Rahul R. Salunkhe^{a*}</i>	222
C2-PP19	Enhancing Solid-State Supercapacitor Performance through Polymer-Modified Activated Carbon Electrodes <i>Shrishti Sharma*, Anshuman Dalvi</i>	223
C2-PP20	Biomaterial Electrolyte based on <i>Phelltophorum pterocarpum</i> flower with NH₄NO₃ and graphene quantum dots for Electrochemical device applications <i>Mohanaa Muthuselvi P^{*1,2}, Leena Chandra M V¹, Selvasekarapandian S^{2,3}, Aafrin Hazaana S^{1,2}, Muniraj @ Vignesh N^{2,4}, Meera Naachiyar R^{1,2}</i>	224
C2-PP21	Combustion Assisted Synthesis and Characterization of Amorphous Carbon nanoparticles for Electrolytic Double Layer Capacitors <i>Abirami S^{a,*} and Amrtha Bhide^a</i>	225
C2-PP22	Tuning the Low Spin Fe^{LS} Redox of Iron Hexacyanoferrate Prussian Blue analogue for Efficient Sodium ion battery	226

Biomaterial Electrolyte based on *Pheltophorum pterocarpum* flower with NH_4NO_3 and graphene quantum dots for Electrochemical device applications

Mohanaa Muthuselvi P^{*1,2}, Leena Chandra M V¹, Selvasekarapandian S^{2,3}, Aafrin Hazaana S^{1,2},

Muniraj @ Vignesh N^{2,4}, Meera Naachiyar R^{1,2}

¹Research Center of Physics, Fatima College (Affiliated to MKU), Madurai 625018, Tamil Nadu, India

²Materials Research Centre, Coimbatore, 641045, Tamil Nadu, India

³Department of Physics, Bharathiar University, Coimbatore 641046, Tamil Nadu, India

⁴Research Center of Physics, Mannar Thirumalai Naicker College (Affiliated to MKU), Madurai 625004, Tamil Nadu, India

*E-mail: mohanaa031199@gmail.com

Abstract

The development of high proton- conducting membrane is in need of recent times for efficient proton battery. In this present work, eco-being and cost-effective proton-conducting solid biomaterial electrolyte(SBE) membrane based on *Pheltophorum pterocarpum*(PP) flower with various concentrations of ammonium Nitrate NH_4NO_3 have been prepared by solution casting method for the fabrication of proton-conducting Battery (PCB) and Proton Exchange Membrane (PEM) fuel cell. Addition of graphene quantum dot (GQD) with the highest proton-conducting biomaterial electrolyte resulted with the increase in ionic conductivity of the biomaterial electrolyte [1]. The different composition of 1g PP with NH_4NO_3 prepared membranes were subjected to various characterisation techniques such as XRD, DSC, TGA, AC impedance, Linear sweep Voltammetry and transference number measurement. The crystalline/amorphous nature of the prepared SBEs are determined and the highest amorphous nature has been found for the composition of 1g PP with 0.7 M wt% NH_4NO_3 and 0.50 ml GQD membrane. The thermal behaviour of the prepared biomaterial membranes is analysed by using DSC and the glass transition temperature (T_g) has been measured. Highest ionic conductivity has been found to be $3.843 \times 10^{-3} \text{ S/cm}$ for 1g PP with 0.7 M wt% NH_4NO_3 and 0.50 ml GQD by using AC impedance technique. LSV technique is used to measure the electrochemical stability of the highest proton-conducting biomaterial electrolyte membrane. Transference number analysis reveals that the conductivity is mainly due to the presence of ions by using wagner's polarisation method. The primary proton- conducting battery (PCB) is constructed by using the highest ion conducting biomaterial membrane (1g PP with 0.7 M wt% NH_4SCN and 0.50 ml GQD) as an electrolyte, Zn: ZnSO_4 :Graphite (3:1:1) is used as anode and PbO_2 : V_2O_5 :Graphite (4:1:1) as cathode. The open circuit voltage of the primary proton-conducting Battery (PCB) is observed as 1.62V. Proton Exchange Membrane (PEM) fuel cell is fabricated and their performances are studied.

Reference

- [1] Vanitha N, Shanmugapriya C, Selvasekarapandian S, Krishna MV, Nandhini K. Investigation of N-S-based graphene quantum dot on sodium alginate with ammonium thiocyanate (NH_4SCN) biopolymer electrolyte for the application of electrochemical devices. Journal of Materials Science: Materials in Electronics. 2022 Jun;33(18):14847-67.

First Edition: February 2024

Published by

Subramanian – Thangathai Educational Trust
(Register. No: 60/BK-IV/2013)

200 – A, Thiruvalluvar Nagar,
Ramanathapuram, Coimbatore – 641045, India

**18th Asian Conference on Solid State Ionics
(ACSSI – 2024) – BOOK OF ABSTRACTS**

Copyright © 2024 by Subramanian – Thangathai
Educational Trust

*All rights reserved. This book, or parts thereof,
may not be reproduced in any form or by any
means, electronic or mechanical, including
photocopying, recording or any information
storage and retrieval system now known or to be
invented, without written permission from the
Publisher*

ISBN Number: 978-93-340-1267-5