

Contents

| | |
|---|------------|
| Preface | vii |
| Keynote Lecture | |
| Challenges and Opportunities of Solid State Ionic Devices <i>W. Weppner</i> | 1 |
| Part I: Ionically Conducting Inorganic Solids | |
| Invited Papers | |
| Multinuclear NMR Studies of Mass Transport of Phosphoric Acid in Water <i>J. R. P. Jayakody, E. S. Mananga, A. Khalfan, S. H. Chung, R. Lopato, S. G. Greenbaum</i> | 19 |
| Crystalline Glassy and Polymeric Electrolytes: Similarities and Differences in Ionic Transport Mechanisms <i>J.-L. Souquet</i> | 29 |
| 30 Years of NMR/NQR Experiments in Solid Electrolytes <i>D. Brinkmann</i> | 30 |
| Analysis of Conductivity and NMR Measurements in $\text{Li}_{3x}\text{La}_{2/3-x}\text{TiO}_3$ Fast Li^+ Ionic Conductor: Evidence for Correlated Li^+ Motion <i>O. Bohnké, J. Emery, A. Orliukas, T. Salkus, J. C. Badot</i> | 42 |
| Transport Pathways for Ions in Disordered Solids from Bond Valence Mismatch Landscapes <i>S. Adams</i> | 54 |
| Proton Conductivity in Condensed Phases of Water: Implications on Linear and Ball Lightning <i>K. Tennakone</i> | 66 |

Contributed Papers

- Proton Transport in Nanocrystalline Bioceramic Materials: An Investigative Study of Synthetic Bone with that of Natural Bone 69
H. Jena, B. Rambabu
- Synthesis and Properties of the Nanostructured Fast Ionic Conductor $\text{Li}_{0.3}\text{La}_{0.56}\text{TiO}_3$ 77
Q. N. Pham, O. Bohnké, A. Boulant, J. Emery, M. Vijayakumar
- Hydrogen Production: Ceramic Materials for High Temperature Water Electrolysis 85
A. Hammou
- Influence of the Sintering Temperature on pH Sensor Ability of $\text{Li}_{3x}\text{La}_{2/3-x}\text{TiO}_3$. Relationship between Potentiometric and Impedance Spectroscopy Measurements 96
Q. N. Pham, C. Galven, O. Bohnké, C. Bohnke
- Microstructure Characterization and Ionic Conductivity of Nano-Sized $\text{CeO}_2\text{-Sm}_2\text{O}_3$ System ($x = 0.05 - 0.2$) Prepared by Combustion Route 104
K. Singh, S. A. Acharya, S. S. Bhoga
- Red Soil in Northern Sri Lanka is a Natural Magnetic Ceramic 112
K. Ahilan, S. Ketheeswaran, M. Bennett, M. C. Aronso
- Neutron Scattering of LiNiO_2 121
K. Basar, X. Lian, H. Honda, T. Sakuma, H. Takahashi, O. Abe, N. Igawa, Y. Ishii
- Preparation and Properties of LiFePO_4 Nanorods 129
L. Q. Mai, L. Xu, W. Chen, Q. Xu, H. X. Liu, X. J. Zhao, V. Shuba Reddy
- Structural and Electrochemical Properties of Monoclinic and Orthorhombic MoO_3 Phases 136
O. M. Hussain, C. V. Ramana, K. Zaghbi, C. M. Julien

| | |
|--|-----|
| Preparation of Zircon ($ZrSiO_4$) Ceramics <i>via</i> Solid State Sintering of ZrO_2 and SiO_2 and the Effect of Dopants on the Zircon Yield <i>U. Dhanayake, B. S. B. Karunaratne</i> | 146 |
| Preparation and Properties of Vanadium Doped ZnTe Cermet Thin Films <i>M. S. Hossain, R. Islam, K. A. Khan</i> | 154 |
| Dynamical Properties and Electronic Structure of Lithium-ion Conductor <i>M. Kobayashi, Y. Maruyama, H. Ogawa, M. Kamimura, S. Ono, Y. Seki, S. Kashida</i> | 162 |
| Cuprous Ion Conducting Montmorillonite- Polypyrrole Nanocomposites <i>D. M. M. Krishantha, R. M. G. Rajapakse, D. T. B. Tennakoon, W. M. A. T. Bandara, P. N. L. Thilakarathna</i> | 170 |
| Frequency Dependence of Conductivity Studies on a Newly Synthesized Superionic Solid Solution/Mixed System: $[0.75AgI: 0.25AgCl]$ <i>R. K. Nagarch, R. Kumar</i> | 179 |
| Diffuse X-ray and Neutron Scattering from Powder PbS <i>X. Lian, K. Basar, H. Honda, T. Hojo, T. Sakuma, H. Takahashi, N. Igawa, Y. Ishii</i> | 185 |
| Electron Affinity and Work Function of Pyrolytic MnO_2 Thin Films Prepared from $Mn(C_2H_3O_2)_2 \cdot 4H_2O$ <i>A. K. M. Farid Ul Islam, R. Islam, K. A. Khan</i> | 193 |
| Crystal Structure and Heat Capacity of $Ba_3Ca_{1.18}Nb_{1.82}O_{8.73}$ <i>T. Shimoyama, J. Sagiya, T. Tojo, H. Kawaji, T. Atake, N. Igawa, Y. Ishii</i> | 201 |
| XPS and Impedance Investigations on Amorphous Vanadium Oxide Thin Films <i>M. Kamalanathan, R. T. Rajendra Kumar, M. Vijayakumar, N. Pasupathi, S. Selvasekarapandian</i> | 206 |
| Sintering and Mixed Electronic-Ionic Conducting Properties of $La_{1.9}Sr_{0.1}NiO_{4+\delta}$ Derived from a Polyaminocarboxylate Complex Precursor <i>D.-P. Huang, Q. Xu, F. Zhang, W. Chen, H.-X. Liu, J. Zhou</i> | 213 |

- Preparation and Characteristics of Ball Milled $\text{MgH}_2 + \text{M}$ ($\text{M} = \text{Fe}, \text{VF}_3$ and FeF_3) Nanocomposites for Hydrogen Storage 220
N. W. B. Balasooriya, Ch. Poinsignon
- Structural Studies of Oxysulfide Glasses by X-Ray Diffraction and Molecular Dynamics Simulation 228
R. Prasada Rao, M. Seshasayee, J. Dheepa
- Synthesis, Sintering and Oxygen Ionic Conducting Properties of $\text{Bi}_2\text{V}_{0.9}\text{Cu}_{0.1}\text{O}_{5.5-\delta}$ 236
F. Zhang, K.-Q. Xu, Q. Xu, W. Chen, H.-X. Liu, D.-P. Huang, J. Zhou
- Synthesis and Transport Characteristics of $\text{PbI}_2\text{-Ag}_2\text{O-Cr}_2\text{O}_3$ Superionic System 244
S. A. Suthanthiraraj, V. Mathew
- Electronic Conductivity of $\text{La}_{0.8}\text{Sr}_{0.2}\text{Ga}_{0.8}\text{Mg}_{0.2-x}\text{Co}_x\text{O}_{3-\delta}$ Electrolytes 252
K. Yamaji, Y. Xiong, H. Kishimoto, T. Horita, N. Sakai, M. E. Brito, H. Yokokawa

Part II: Electrode Materials

Invited Papers

- Cathodic Properties of Al-Doped LiCoO_2 Prepared by Molten Salt Method Li-Ion Batteries 265
M. V. Reddy, G. V. Subba Rao, B. V. R. Chowdari
- Layered Ion-Electron Conducting Materials 283
M. A. Santa Ana, E. Benavente, G. González
- $\text{LiNi}_{0.80}\text{Co}_{0.20}\text{O}_2$ Cathode Thin-film Prepared by RF Sputtering for All-Solid-State Rechargeable Microbatteries 295
X. J. Zhu, C. Hu, W. Zhang, X. Y. Gan, M. H. Cao, D. B. Luo, W. Chen, Q. Xu, J. Zhou, H.-X. Liu

Contributed Papers

- Nanocomposite Cathode for SOFCs Prepared by Electrostatic Spray Deposition 305
A. Princivalle, E. Djurado
- Effect of the Addition of Nanoporous Carbon Black on the Cycling Characteristics of $\text{Li}_2\text{CO}_2(\text{MoO}_4)_3$ for Lithium Batteries 313
K. M. Begam, S. R. S. Prabaharan
- Protonic Conduction in TiP_2O_7 321
V. Nalini, T. Norby, A. M. Anuradha
- Preparation and Electrochemical LiMn_2O_4 Thin Film by a Solution Deposition Method 329
X. Y. Gan, C. Hu, X. J. Zhu, W. Zhang, M. H. Cao, D. B. Luo, J. Zhou, W. Chen, Q. Xu, H. X. Liu
- Synthesis and Characterization LiMPO_4 (M = Ni, Co) 337
T. Savitha, S. Selvasekarapandian, C. S. Ramya
- Synthesis and Electrical Characterization of LiCoO_2 , LiFeO_2 and NiO Compositions 345
A. Wijayasinghe, B. Bergman
- Natural Sri Lanka Graphite as Conducting Enhancer in Manganese Dioxide (Emd Type) Cathode of Alkaline Batteries 353
N. W. B. Balasooriya, P. W. S. K. Bandaranayake, Ph. Touzain, Ch. Poinsignon
- Electrochemical Properties of $\text{LiNi}_{1-(x+y)}\text{Al}_x\text{Zn}_y\text{O}_2$ Cathode Material Synthesized by Emulsion Method 361
B.-H. Kim, S.-J. Han, M.-J. Jang, B.-G. Ahn, M.-Y. Song
- $\text{LiNi}_{0.80}\text{Co}_{0.20}\text{O}_2$ Cathode Materials Synthesized by Particulate Sol-gel Method for Lithium Ion Batteries 369
X. J. Zhu, W. Zhang, X. Y. Gan, C. Hu, M. H. Cao, D. B. Luo, Q. Xu, W. Chen, J. Zhou, H. X. Liu

- Pulsed Laser Deposition of Highly Oriented LiCoO_2 and LiMn_2O_4 Thin Films for Microbattery Applications 377
O. M. Hussain, K. Hari Krishna, V. Kalai Vani, C. M. Julien
- Preparation of $\text{LiNi}_{0.80}\text{Co}_{0.20}\text{O}_2$ Thin Films by a Sol-Gel Method 385
X. J. Zhu, C. Hu, W. Zhang, X. Y. Gan, M. H. Cao, D. B. Luo, W. Chen, Q. Xu, J. Zhou, H. X. Liu
- Electrochemical Lithium Insertion into a Manganese Dioxide Electrode in Aqueous Solutions 392
M. Minakshi, P. Singh, T. Issa, S. Thurgate, K. Prince, D. Mitchell
- AC Impedance Spectroscopic Analysis of Thin Film LiNiVO_4 Prepared by Pulsed Laser Deposition Technique 400
S. Selvasekarapandian, M. S. Bhuvaneshwari, T. Gnanasekaran, K. I. Ganasekar, E. Prabhu
- Synthesis and Characterization of LiFePO_4 Cathode Materials by Microwave Processing 408
J. Zhou, W. Yang, L. Wang, G. Liu, H. X. Liu, S. Ouyang, W. Chen
- Characterization of $\text{Nd}_{0.8}\text{Sr}_{0.2}\text{CoO}_{3-\delta}$ Including Pt Second Phase as the Cathode Material for Low-Temperature SOFCs 412
J. W. Choi, H. J. Kim, H. B. Shim, K. S. Yoo
- Thermodynamic Behavior of Lithium Intercalation into Natural Vein and Synthetic Graphite 418
N. W. B. Balasooriya, P. W. S. K. Bandaranayake, Ph. Touzain

Part III: Electroactive Polymers

Invited Papers

- Organised or Disorganised? Looking at Polymer Electrolytes from Both Points of View 431
Y.-P. Liao, J. Liu, Y. Zheng, P. V. Wright, D. C. Apperley, A. Pryke

| | |
|--|-----|
| Polymer Electrolytes - Simple Low Permittivity Solutions? <i>I. Albinsson, B.-E. Mellander</i> | 443 |
| Dependence of Conductivity Enhancement on the Dielectric Constant of the Dispersoid in Polymer-Ferroelectric Composite Electrolytes <i>A. Chandra, P. K. Singh, S. Chandra</i> | 444 |
| Design and Application of Boron Compounds for High-Performance Polymer Electrolytes <i>T. Fujinami</i> | 449 |
| Structural, Vibrational and AC Impedance Analysis of Nano Composite Polymer Electrolytes based on PVAC <i>S. Selvasekarapandian, R. Mangalam, M. Hema, R. Baskaran, T. Savitha, M.-P. Crosnier-Lopez, C. Bohnke, O. Bohnke, M. Vijayakumar</i> | 459 |
| Absorption Intensity Variation with Ion Association in PEO Based Electrolytes <i>J. E. Furneaux, A. M. McCoy, V. A. Seneviratne, R. Frech</i> | 469 |
| Study of Ion-polymer Interactions in Cationic and Anionic Ionomers from the Dependence of Conductivity on Pressure and Temperature <i>M. Duclot, F. Alloin, O. Brylev, J.-Y. Sanchez, J.-L. Souquet</i> | 477 |
| Triol Based Polyurethane Gel Electrolytes for Electrochemical Devices <i>A. R. Kulkarni</i> | 485 |
| Contributed Papers | |
| Accurate Conductivity Measurements to Solvation Energies in Nafion <i>M. Maréchal, J.-L. Souquet</i> | 499 |
| Ion Conducting Behaviour of Composite Polymer Gel Electrolyte: PEG - PVA - $(\text{NH}_4\text{CH}_2\text{CO}_2)_2$ System <i>S. L. Agrawal, A. Awadhia, S. K. Patel</i> | 506 |

| | |
|---|-----|
| Impedance Spectroscopy and DSC Studies of Poly(vinylalcohol)/ Silicotungstic Acid Crosslinked Composite Membranes <i>A. Anis, A. K. Banthia</i> | 514 |
| (PEO) _n :Na ₄ P ₂ O ₇ : A Report on Complex Formation <i>A. Bhide, K. Hariharan</i> | 522 |
| Experimental Studies on (PVC+LiClO ₄ +DMP) Polymer Electrolyte Systems for Lithium Battery <i>Ch. V. S. Reddy, Q.-Y. Zhu, Ai-Ping Jin, W. Chen</i> | 530 |
| Stability of the Gel Electrolyte, PAN : EC : PC : LiCF ₃ SO ₃ Towards Lithium <i>K. Perera, M. A. K. L. Dissanayake, S. Skaarup, K. West</i> | 538 |
| Montmorillonite as a Conductivity Enhancer in (PEO) ₉ LiCF ₃ SO ₃ Polymer Electrolyte <i>C. H. Manoratne, R. M. G. Rajapakse, M. A. K. L. Dissanayake, W. M. A. T. Bandara, D. T. B. Tennakoon</i> | 543 |
| Polymeric Gel Electrolytes for Electrochemical Capacitors <i>M. Morita, J.-L. Q., N. Ohsumi, N. Yoshimoto, M. Egashira</i> | 566 |
| Electrical Conductivity Studies on Proton Conducting Polymer Electrolytes Based on Poly (vinyl acetate) <i>D. Arun Kumar, T. Savitha, S. Selvasekarapandian, R. Baskaran</i> | 577 |
| Conductivity and Thermal Studies on Plasticized PEO:LiTf-Al ₂ O ₃ Composite Polymer Electrolyte <i>H. M. J. C. Pitawala, M. A. K. L. Dissanayake, V. A. Seneviratne</i> | 585 |
| Investigation of Transport Properties of a New Biomaterials – Gum Mangosteen <i>S. S. Pradhan, A. Sarkar</i> | 593 |
| Investigation of Ionic Conductivity of PEO- MgCl ₂ Based Solid Polymer Electrolyte <i>M. Sundar, P. N. Poovizhi, J. Arunkarthikeya, S. Selladurai</i> | 600 |

| | |
|---|-----|
| ¹ H NMR and Raman Analysis of Proton Conducting Polymer Electrolytes based on Partially Hydrolyzed Poly (vinyl alcohol) <i>G. Hirankumar, S. Selvasekarapandian, J. Kawamura, N. Kuwata, O. Kamishima, T. Hattori</i> | 608 |
| Influence of Al ₂ O ₃ Nanoparticles on the Phase Matrix of Polyethylene Oxide - Silver Triflate Polymer Electrolytes <i>S. Austin Suthanthiraraj, D. Joice Sheeba</i> | 616 |
| Effect of Different Types of Ceramic Fillers on Thermal, Dielectric and Transport Properties of PEO ₉ LiTf Solid Polymer Electrolyte <i>K. Vignarooban, B.-E. Mellander, I. Albinson, M. A. K. L. Dissanayake</i> | 623 |
| Characterization of PVP Based Solid Polymer Electrolytes Using Spectroscopic Techniques <i>C. S. Ramya, S. Selvasekarapandian, M. S. Bhuvaneswari, T. Savitha</i> | 631 |
| Electrochemical and Structural Properties of Polyvinylidene Fluoride – Silver Triflate Solid Polymer Electrolyte System <i>S. Austin Suthanthiraraj, B. Joseph Paul</i> | 639 |
| Micro Raman, Li NMR and AC Impedance Analysis of PVAC:LiClO ₄ Solid Polymer Electrolytes <i>R. Baskaran, S. Selvasekarapandian, N. Kuwata, O. Kamishima, J. Kawamura, T. Hattori</i> | 647 |
| Study of Na ⁺ Ion Conduction in PVA-NaSCN Solid Polymer Electrolytes <i>G. M. Brahmanandhan, J. Malathi, M. Hema, G. Hirankumar, D. Khanna, D. Arun Kumar, S. Selvasekarapandian</i> | 655 |
| Effect of Filler Addition on Plasticized Polymer Electrolyte Systems <i>M. Sundar, S. Selladurai</i> | 663 |
| Ionic Motion in PEDOT and PPy Conducting Polymer Bilayers <i>U. L. Zainudeen, S. Skaarup, M. A. Careem</i> | 671 |

| | |
|---|-----|
| Film Formation Mechanism and Electrochemical Characterization of V ₂ O ₅ Xerogel Intercalated by Polyaniline <i>Q. Zhu, A. Jin, W. Chen, Ch. V. S. Reddy</i> | 679 |
| Effect of NH ₄ NO ₃ Concentration on the Conductivity of PVA Based Solid Polymer Electrolyte <i>M. Hema, S. Selvasekarapandian, G. Hirankumar, J. Malathi, G. M. Brahmanandhan</i> | 687 |
| Dielectric and Conductivity Studies of PVA-KSCN based Solid Polymer Electrolytes <i>J. Malathi, G. M. Brahmanandhan, M. Hema, G. Hirankumar, D. Khanna, D. Arun Kumar, S. Selvasekarapandian</i> | 696 |
| Part IV: Emerging Applications | |
| Invited Papers | |
| The Use of Solid State Ionic Materials and Devices in Medical Applications <i>R. Linford</i> | 709 |
| Development of All-Solid-State Lithium Batteries <i>V. Thangadurai, J. Schwenzei, W. Weppner</i> | 723 |
| Reversible Intermediate Temperature Solid Oxide Fuel Cells <i>B.-E. Mellander, I. Albinsson</i> | 735 |
| Nano-Size Effects in Lithium Batteries <i>P. Balaya, Y. Hu, J. Maier</i> | 736 |
| Electrochromics: Fundamentals and Applications <i>C. G. Granqvist</i> | 747 |
| Electrochemical CO ₂ Gas Sensor <i>K. Singh</i> | 756 |

| | |
|---|-----|
| Polypyrrole for Artificial Muscles: Ionic Mechanisms <i>S. Skaarup</i> | 768 |
| Development and Characterization of Polyfluorene based Light Emitting Diodes and their Colour Tuning using Forster Resonance Energy Transfer <i>P. C. Mathur, A. Kumar, P. K. Bhatnagar, K. Tada, M. Onoda</i> | 780 |
| Mesoporous and Nanoparticulate Metal Oxides: Applications in New Photocatalysis <i>C. Boxall</i> | 788 |
| Proton Conducting (PC) Perovskite Membranes for Hydrogen Separation and PC-SOFC Electrodes and Electrolytes <i>H. Jena, B. Rambabu</i> | 789 |
| Contributed Papers | |
| Electroceramic Materials for the Development of Natural Gas Fuelled SOFC/GT Plant in Developing Country (Trinidad and Tobago (T&T)) <i>R. Saunders, H. Jena, B. Rambabu</i> | 799 |
| Thin Film SOFC Supported on Nano-Porous Substrate <i>J. Hoon Joo, G. M. Choi</i> | 811 |
| Characterization and Fabrication of Silver Solid State Battery Ag/AgI-AgPO ₃ /I ₂ ,C <i>E. Kartini, Mardiyanto', Gunawan', A. Hindasyah', M. Ikhsan, M. Collins</i> | 818 |
| Performance of Lithium Polymer Cells with Polyacrylonitrile based Electrolyte <i>K. Perera, M. A. K. L. Dissanayake, S. Skaarup, K. West</i> | 826 |
| Hydrothermal Synthesis and Electrochemical Behavior of MoO ₃ Nanobelts for Lithium Batteries <i>Y. Qi, L. Mai, H. Liu, X. Zhao, W. Chen</i> | 833 |

| | |
|--|------------|
| Electrochemical Behaviour of a PPy (DBS)/Polyacrylonitrile :LiTF:EC:PC/Li Cell <i>K. Vidanapathirana, M. A. Careem, S. Skaarup, K. West</i> | 841 |
| Characteristics of Thick Film CO ₂ Sensors Based on NASICON using Li ₂ CO ₃ -CaCO ₃ Auxiliary Phases <i>H. J. Kim, H. B. Shim, J. W. Choi, K. S. Yoo</i> | 849 |
| Solid State Battery Discharge Characteristic Study on Fast Silver Ion Conducting Composite System: 0.9[0.75AgI:0.25AgCl]: 0.1TiO ₂ <i>R. K. Nagarch, R. Kumar, P. Rawat</i> | 854 |
| Intercalating Protonic Solid-State Batteries with Series and Parallel Combination <i>K. Singh, S. S. Bhoga, S. M. Bansod</i> | 859 |
| Synthesis and Characterization of ZnO Fiber by Microwave Processing <i>Lin Wang, Jian Zhou, Guizhen Liu, Hanxing Liu, Shixi OuYang</i> | 866 |
| Preparation of Sn-Ge Alloy Coated Ge Nanoparticles and Sn-Si Alloy Coated Si Nanoparticles by Ball-Milling <i>J. K. D. S. Jayanett, S. M. Heald</i> | 870 |
| Synthesis of Ultrafine and Crystallized TiO ₂ by Alalkoxied Free Polymerizable Precursor Method <i>M. Vijayakumar, M.-P. Crosnier-Lopez, C. Bohnke, O. Bohnke</i> | 878 |
| Development and Characterization of Polythiophene/Fullerene Composite Solar Cells and their Degradation Studies <i>P. K. Bhatnagar, S. Singh, P. C. Mathur, S. K. Sengupta, J. Kumar</i> | 884 |
| Author Index | 895 |