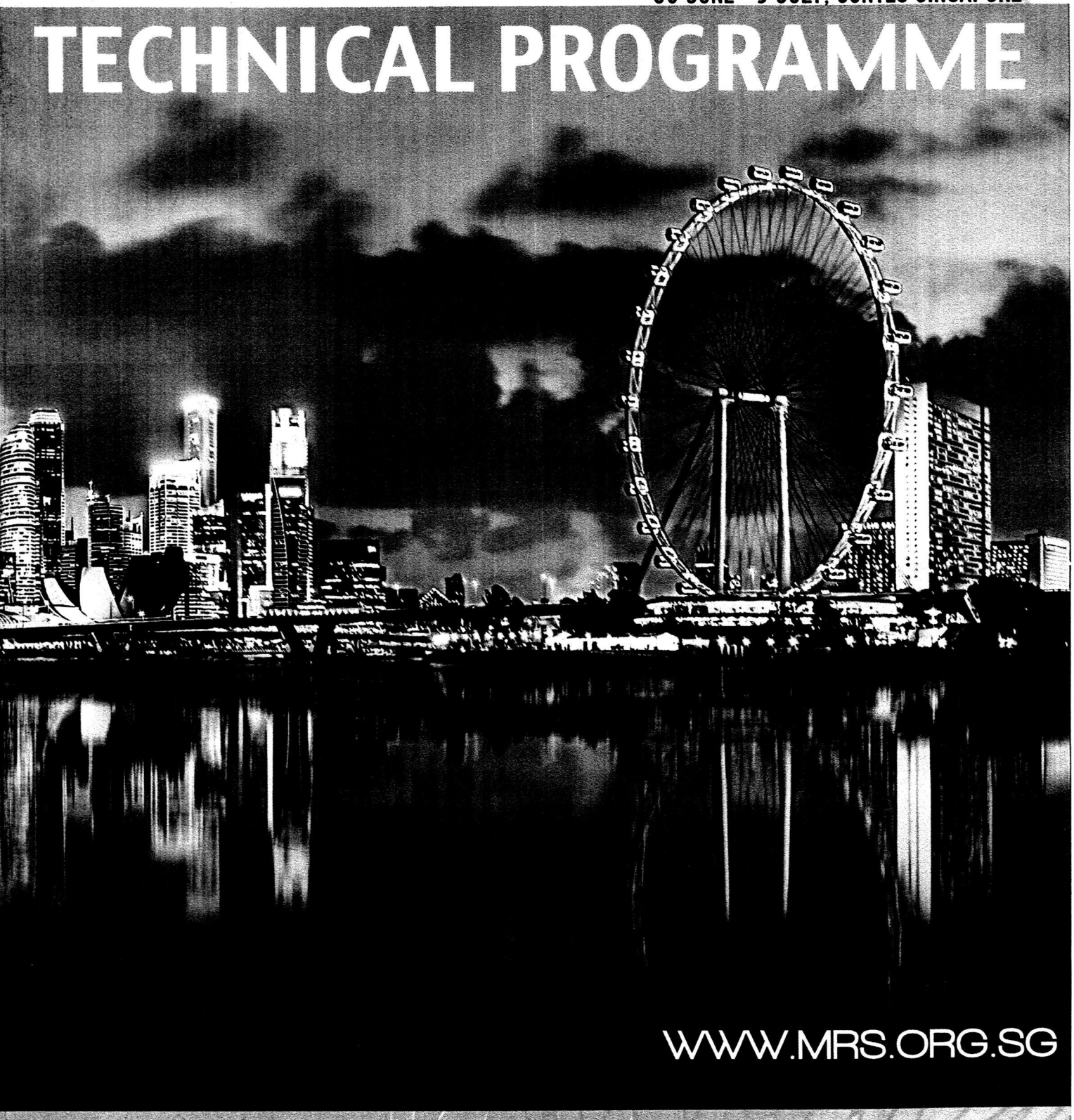
ICMAT 2013

7TH INTERNATIONAL CONFERENCE ON MATERIALS FOR ADVANCED TECHNOLOGIES

30 JUNE - 5 JULY, SUNTEC SINGAPORE

TECHNICAL PROGRAMME



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MRS Materials Research Society SINGAPORE

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NANYANG TECHNOLOGICAL UNIVERSITY

A*STAR SINGAPORE Agency for Science, Technology and Research

15:00 A2.2-3
Thermodynamics Study of Nano-size Lithium Cobalt Oxide Cathode Material
Shahnaz GHASEMI[1]*, Kenza MAHER[1], Harry HOSTER[1], Rachid YAZAMI[2]
[1]*TUM CREATE, Singapore,* [2]*School of Materials Science and Engineering, Nanyang Technological University, Singapore*

15:15 A2.2-4
The Synthesis, Structural Characterisation and Interlayer Mixing of Layered LiNi0.4Mn0.4Co0.2O2 Cathode Material
Tze Qing TAN[1]*, Mohd Sobri IDRIS[1], Azmi RAHMAT[1], Shamsul Baharin JAMALUDIN[1], Rozana Aina MAULAT OSMAN[1], Zul Azhar ZAHID JAMAL[1]
[1]*Sustainable Engineering Research Cluster, School of Materials Engineering, University Malaysia Perlis, Malaysia*

15:30 A2.2-5
General Template-free Synthesis of the Mixed Metal Oxide Complex Hollow Microspheres and Their Lithium Storage Properties
Genqiang ZHANG[1]*, Harry HOSTER[1], David LOU[2]
[1]*TUM CREATE, Singapore,* [2]*School of Chemical and Biomedical Engineering, Nanyang Technological University, Singapore*

15:45 A2.2-6
Development of Cathode Materials for Lithium Ion Rechargeable Batteries Based on the System Li(ni1/3 Mn1/3co1/3-xmx)o2, M = Cu, Zn, Fe, Mg .... ; X = 0 to 0.33
Athula WIJAYASINGHE[1]*, Pushpaka SAMARASINGHE[2], Gayani AMARAWEERA[1]+, Manoj WIJESINGHE[1], Lakshman DISSANAYAKE[1]
[1]*Institute of Fundamental Studies, Sri Lanka,* [2]*Department of Chemistry, University of Oslo, Norway*

A3.1: Anodes II
Mon - 1 Jul 13 | 16:30 - 18:00 | Room 326

Session Chair(s): Jaephil Cho & Dominik Samuelis

16:30 A3.1-1
A High Capacity Molybdenum Oxide-Reduced Graphene Oxide Composite as Anode Material for Li Ion Battery
wei TANG[1]+, Kian Ping LOH[2]*, M. V. REDDY[3]
[1]*Chemistry, National University of Singapore, Singapore,* [2]*National University of Singapore, Singapore,* [3]*Department of Physics, Solid State Ionics/Advanced Batteries Lab, Singapore*

16:45 A3.1-2
Carbon-encapsulation of F-doped Li4Ti5O12 as High Performance Anode Material for Reversible Lithium Ion Storage
Yue MA[1]+, Jim Yang LEE[2]*
[1]*NUS Graduate School for Integrative Sciences and Engineering, National University of Singapore, Singapore,* [2]*National University of Singapore, Singapore*

17:00 A3.1-3
Three-dimensional ZnCo2O4/C Core/shell Nanowire Array Anode for Lithium-ion Batteries
Qinqin XIONG[1]+, Jiangping TU[2]*, Chang Dong GU[3], Xiuli WANG[2]
[1]*Zhejiang University, China,* [2]*Department of Materials Science and Engineering, Zhejiang University, China,* [3]*Department of Materials Science and Engineering, China*

17:15 A3.1-4
Free Standing Multi -walled Carbon Nanotubes Based Anode for Lithium Ion Battery
Indu ELIZABETH[1]*
[1]*Physics and engineering of carbon, National Physical Laboratory, India*

17:30 A3.1-5
Synthesis of Reduced Graphite Oxide (RGO) – Fe3O4 Composite with the Aid of Microwave and Electrochemical Characterization for Lithium Ion Battery Anode
Ravikumar RAMAN[1]*
[1]*ECPS, CSIR-CECRI, India*

17:45 A3.1-6
Hierarchical Fe3o-4-cuo Hybrids as Lithium-ion Battery Anodes
Somaye SAADAT[1]+, Qingyu YAN[1]*, Rachid YAZAMI[2]
[1]*Nanyang Technological University, Singapore,* [2]*School of Materials Science and Engineering, Nanyang Technological University, Singapore*

A3.2: Redox Molecular Grafting / Electrolytes I
Mon - 1 Jul 13 | 16:30 - 18:00 | Room 325

Session Chair(s): Erik Jämstorp Berg & R. Prasada Rao

16:30 A3.2-1 (Invited)
Interest of Redox Molecular Grafting for Energy Storage Applications
Lenaic MADEC[1], Bernard LESTRIEZ[1], Kalid SEID[2], Jean-Claude BADOT[3], Bernard HUMBERT[1], Philippe MOREAU[1], Dominique GUYOMARD[4]*, Joel GAUBICHER[1]
[1]*Institute of Materials Jean Rouxel (IMN), France,* [2]*Supelec, France,* [3]*Chimie ParisTech, France,* [4]*Electrochemical Energy Storage, Institute of Materials Jean Rouxel (IMN) - CNRS, France*

17:00 A3.2-2 (Invited)
Solid-like Electrolytes for Modern Rechargeable Batteries
Aninda BHATTACHARYYA[1]*
[1]*Solid State and Structural Chemistry Unit, Indian Institute of Science, India*

17:30 A3.2-3
Electrical, Optical and Structural investigations of Electrolyte Films - Pure and MnSO4 Doped PVA/PVP Polymer Blend
Sudha KAMATH[1]*, Chandramani R[2], Radhakrishna M C[3]
[1]*Department of Physics, R V College of Engineering, India,* [2]*Physics, Dayananda College of Engineering, India,* [3]*Physics, Bangalore University, India*

17:45 A3.2-4
Bio-inspired Lithium Salt Free Polymer Electrolyte Membranes
R. Shanti RAJANTHARAN[1]*, Ramesh SUBRAMANIAM[1], Ramesh KASI[1]
[1]*Department of Physics, University of Malaya, Malaysia*

18:00 A3.2-5
Functionlized Nano-porous Polymer Separator-cum-electrolyte for Lithium-ion Batteries
Rupesh ROHAN[1]+, Cheng HANSONG[1]*, Sun YUBAO[1]
[1]*Department of Chemistry, National University of Singapore, Singapore*

Development of Cathodes for Lithium Ion Rechargeable Batteries Based on the System $Li(Ni_{1/3}Mn_{1/3}Co_{1/3-x}M_x)O_2$, M = Cu, Zn, Fe, Mg; x = 0 to 0.33

Athula Wijayasinghe[1], Pushpaka Samrasinghe[2], Manoj Wijesinghe[1], Kobiga Sivabalasatkunam[1], Gayani Amaraweera[1] and Laxhman Dissanayake[1]

[1]*Institute of Fundamental Studies, Hantana Road, Kandy, Sri Lanka,*

[2]*Department of Chemistry, Center for Materials Science and Nano Technology University of Oslo University, Oslo, Norway*

NMC compositions such as $Li[Ni_{1/3}Mn_{1/3}Co_{1/3}]O_2$ are presently being commercialized as cathode materials for rechargeable Li-ion batteries (LIB). However, with very expensive cobalt content in the cathode, batteries having NMC compounds are limited to consumer electronics and still too costly for vehicular applications. Therefore considerable efforts are being made by different research groups worldwide to reduce the material cost by fully or partially substituting expensive Co with other cheaper elements. Accordingly, this study was based on developing less expensive but performance enhanced cathode materials for the LIB based on the system, $Li(Ni_{1/3}Mn_{1/3}Co_{1/3-x}M_x)O_2$, M = Mg, Fe, Zn, Cu and x = 0 to 0.33.

For this study, material synthesis was done by Pechini and Glycine Nitrate combustion techniques, followed by calcining at 800-1000 ^{0}C. X-ray diffractometry and Scanning Electron Microscopy were used for phase analysis and particle characterization, respectively. Dense pellets sintered at 1000 ^{0}C were used for electrical characterization by d.c. four probe technique. Bellcore-type electrodes were fabricated via tape casting and their electrical conductivity was determined by the van der Pauw technique. Electrochemical testing was performed in an argon filled glove box with $Li/LiPF_6/ Li(Ni_{1/3}Mn_{1/3}Co_{1/3-x}M_x)O_2$ coin cells cycling between 3.0 - 4.5 V.

The phase analysis revealed the formation of solid solutions of appropriate layered $Li(Ni_{1/3}Co_{1/3}Mn_{1/3})O_2$ phase of R3m structure in the prepared compositions up to x = 0.11, except with Mg. Further, most of these substituted compositions showed considerably higher electrical conductivity than the base material $Li(Ni_{1/3}Co_{1/3}Mn_{1/3})O_2$ (where it was 0.9 $x10^{-5}$ S/cm). In the cell studies, the Fe substituted composition with x = 0.11, showed a specific capacity of 122 $mAhg^{-1}$, which is comparable to the specific capacity of the state of the art $LiCoO_2$ cathode material of LIB. Hence this study revealed the possibility of preparing cheaper cathode materials suitable for LIBs.