

INTERNATIONAL WORKSHOPS



GLOBAL INITIATIVE OF ACADEMIC NETWORKS



Organized By

PANJAB UNIVERSITY

Under the aegis of





Panjab University
Chandigarh

Global Initiative of Academic Network

GIAN

INTERNATIONAL WORKSHOP

on

Advanced Lithium Batteries: Science and Technology

'An event under'

GiAN

Global Initiative of Academic Networks

December 12-17, 2016



सत्यमेव जयते



Guest Faculty : Prof. Christian M. Julien, France
Prof. Alain Mauger, France
Prof. Ashok Vijh, Canada

Course Coordinator : Dr. Subash Ch. Sahoo
Dr. Deepak B. Salunke

Prof. Arun K. Grover
Vice Chancellor
Panjab University



Prof. S.K. Mehta
Coordinator
(GIAN & CRIKC)

Guest Faculties



Prof. Christian M. Julien is presently emeritus member at the University Pierre et Marie Curie, Paris (UPMC). He has 35 years of research experience in the field of solid state ionics and materials for energy storage, and lithium-ion battery technology. He has more than 500 articles and 31 books in his credit and has organized several MRS and ECS symposia,



Prof. Alain Mauger at present held a full professor position at the Institute of Mineralogy, Materials Physics and Cosmochemistry (IMPMC), Paris working on materials science for Li-ion batteries. He contributed in the field of statistical physics, solid state and complex matter physics, before joining IMPMC in 2007.



Prof. Ashok Vijh is *Maître-de-recherche* at the *Institut de recherche d'Hydro-Québec* and, concurrently, invited Professor at the INRS of *Université du Québec*. He is an electrochemist and materials scientist who has published over 360 refereed papers and six books on different problems of electrochemical Materials Science including advanced Lithium Batteries.



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Christian Julien · Alain Mauger
Ashok Vijh · Karim Zaghib

Lithium Batteries

Science and Technology

 Springer

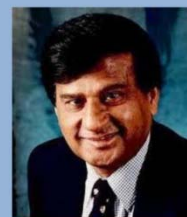
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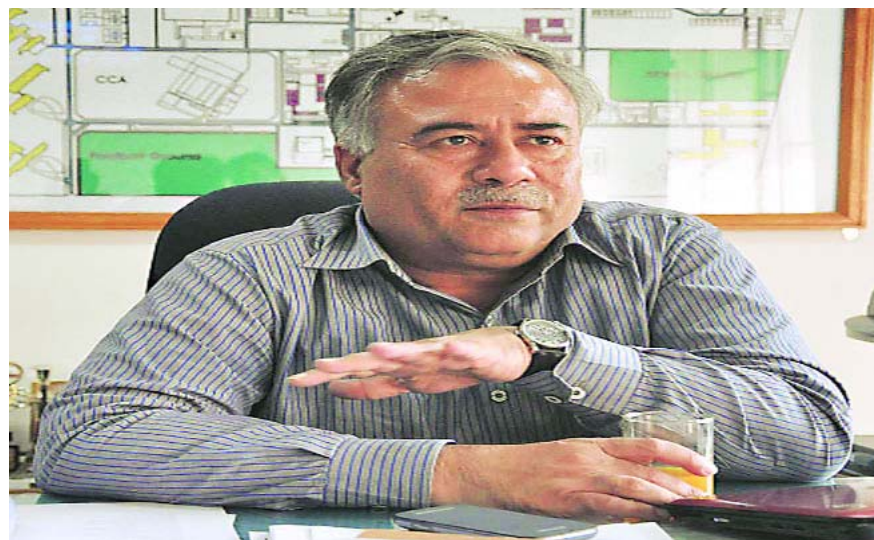
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Day: 1

Timing			Lecture's title	Faculty
Morning				
	9:00 – 9:30		Registration	
	9:30 – 11:00		Inaugural Opening Session	Prof. Mehta
	11:00 - 11:20		Coffee break	
	11:20 – 12:10	S	General Introduction to Lithium Batteries Principle Engineer (Retd.) Hitachi Global Storage Technologies , USA	Dr. G. P. Singh
Lunch	12:10 – 14:00			
Afternoon				
	14:00 - 14:50	L1	Introduction to energy storage and conversion. Definitions – Energy diagrams.	Prof. Julien
	14:50 – 15:40	L2	Electrochemistry of Materials: Interfaces in Chemistry, Physics, Engineering and Biology	Prof. Vijn
	15:40 -16:00		Coffee break	
	16:00 – 16:50	L3	Transport phenomena in semiconductors	Prof. Mauger










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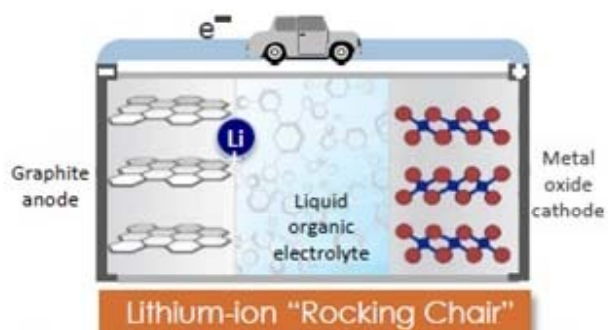
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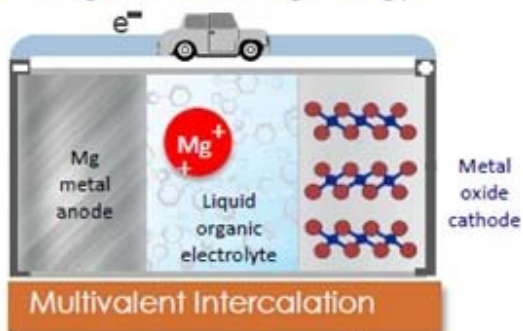
2007	2008	2010	2012	2013	2014	
						
iPhone 3.5"	3G 3.5"	4 3.5"	5 4"	5C 4"	6 4.7"	6 Plus 5.5"
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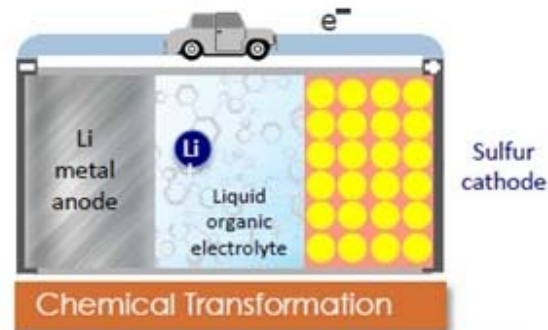
Battery Concepts



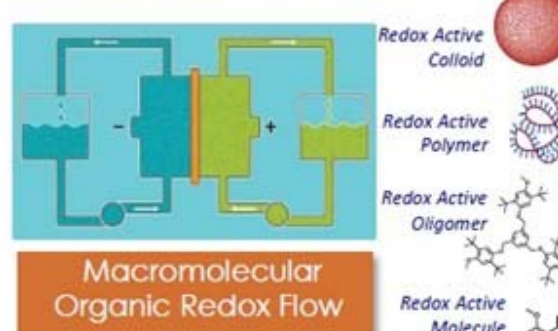
Li^+ cycles between anode and cathode, storing and releasing energy



Replace monovalent Li^+ with di- or tri-valent ions: Mg^{2+} , Ca^{2+} , Al^{3+} , ...
Double or triple capacity



Replace intercalation with high energy chemical reaction: Li-S , Li-O , Na-S , ...



Replace solid electrodes with liquid organic solutions or suspensions:
lower cost, higher capacity, greater flexibility



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Day: 2

Timing			Lecture's title	Faculty
Morning				
	9:30 - 10:20	L4	Principle and performance of Li-ion batteries	Prof. Julien
	10:20 - 11:10	L5	Overview of carbon anodes for Li batteries	Prof. Vijn
	11:10 - 11:30		Coffee break	
	11:30 - 12:20	L6	Magnetic properties of solid state materials	Prof. Mauger
Lunch	12:20 - 14:00			
Afternoon				
	14:00 - 14:50	L7	Introduction to hydrogen, fuel cells and photo-electrochemistry	Prof. Vijn
	14:50 – 15:40	L8	Basic elements and key parameters of energy storage systems	Prof. Julien
	15:40 -16:00		Coffee break	
	16:00 -16:50	L9	Alloys and conversion anode materials for Li-ion batteries (silicon, oxides, metals)	Prof. Mauger
	16:50 - 17:30	IS2	Interactive session. Research projects at PU	Attendees



Day: 3

Timing			Lecture's title	Faculty
Morning				
	9:30 – 10:20	L10	Models of intercalation, conversion, alloying	Prof. Julien
	10:20 - 11:10	L11	Polyanionic compounds as cathode materials. I. The prototype lithium-iron phosphate olivine structure.	Prof. Mauger
	11:10 - 11:30		Coffee break	
	11:30 - 12:20	L12	Cathode materials with two-dimensional structure. Chemistry Vs Electrochemistry	Prof. Julien
Lunch	12:20 – 14:00			
Afternoon				
	14:00 - 14:50	L13	Cathode materials with three-dimensional structure: spinel structure and derivatives	Prof. Julien
	14:50 – 15:40	L14	Electrolytes for Li-ion batteries.	Prof. Vijn
	15:40 -16:00		Coffee break	
	16:00 - 16:20	L15	Separators for Li-ion batteries.	Prof. Mauger
	16:20 - 17:10	IS3	Interactive session. Research projects at PU	Attendees



Day: 4

Timing			Lecture's title	Faculty
Morning				
	9:30 - 10:20	L16	Structure versus energy – Stability of TM layered materials	Prof. Julien
	10:20 - 11:10	L17	Polyanionic compounds as cathode materials. Non-olivine structures, sulfophosphates, fluorosulfates	Prof. Mauger
	11:10 - 11:30		Coffee break	
	11:30 - 12:20	L18	Optimization of electrodes: surface modification, coating.	Prof. Julien
Lunch	12:20 – 14:00			
Afternoon :				
	14.00 – 16.00		Electrochemical Workstation for Li-ion Battery Research.	Metrohm
	16.00 – 16.30		Coffee	



Day: 5

Timing			Lecture's title	Faculty
Morning				
	9:30 – 10:20	L19	Electrochemical analytical methods	Prof. Julien
	10:20 - 11:10	L20	Li-ion polymer batteries based on low cost materials	Prof. Vijn
	11:10 - 11:30		Coffee break	
	11:30 - 12:20	L21	Energy storage for smart grid application. Vehicle-to-Grid (V2G)	Prof. Mauger
Lunch	12:10 - 14:00			
Afternoon				
	14:00 - 14:50	L22	Nanotechnology for energy storage	Prof. Julien
	14:50 – 15:40	L23	Safety aspects of Li-ion batteries	Prof. Mauger
	15:40 -16:00		Coffee break	
	16:00 - 16:30	L24	Li-air batteries. Principle.	Prof. Vijn
	16:30 – 17:10	IS4	Interactive session. Research projects at PU	Attendees



Day: 6

Timing			Lecture's title	Faculty
Morning				
	9:30 – 10:20	L25	Blended cathodes for Li-ion batteries	Prof. Julien
	10:20 - 11:10	L26	Introduction and technology of supercapacitors	Prof. Vijn
	11:10 - 11:30		Coffee break	
	11:30 - 12:20	L27	Lithium metal/polymer batteries(LMPs)	Prof. Mauger
Lunch	12:10 - 14:00			
Afternoon				
	14:00 – 15.00		General Discussion	
	15.00 – 15.30		Coffee break	
	15:30 -16:30		Closing Session	



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Thank You

**for the Experience we Gained
&
the Lessons we Learned.**