



# Lithium Ion Batteries: Fundamentals, characterization techniques and applications

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## Overview

In recent years, energy, water and health care are the important research topics over worldwide researchers. Among different forms of energy, electrochemical power sources which convert chemical energy in to electrical energy, especially lithium ion batteries (LIBs) are extensively used in the present-day portable electronic devices such as cell phones, for high-power applications like, electric/hybrid electric vehicles and back-up power supplies. LIBs use layer-type compounds of the kind lithium cobalt oxide ( $\text{LiCoO}_2$ ) as the cathode (positive electrode) and graphite (C) as the anode (negative electrode) material, and a non-aqueous Li- ion conducting electrolyte. The latter is in the form of a solution or immobilized in a gel-polymer. This course will discuss principles and operation of batteries and prediction of voltage of cathode and anode materials. Various preparation methods of the battery materials and materials characterization techniques like Rietveld refinement X-ray diffraction, Neutron diffraction, X-ray absorption spectroscopy(XPS), SEM, TEM, density and BET surface area methods will be discussed. Use of Electroanalytical studies like cyclic voltammetry, galvanostatic cycling and electrochemical impedance spectroscopy techniques for testing and understanding the electrochemical behaviour of the battery materials will be discussed.

<b>Date</b>	03-12-2018 to 08-12-2018
<b>Location</b>	B.M.S College of Engineering, Bull Temple Road, Bangalore-560019
<b>Course Schedule</b>	Day 1: Introduction to Energy Storage and Batteries, Materials synthesis Day 2: Battery Terminologies, Material Characterization Techniques Day 3: Characterization of battery materials by Cyclic Voltammetry and Impedance spectroscopy Day 4: Insitu structural studies of battery materials, Solving crystal structure Day 5: Supercapacitors and Miscellaneous Topics
<b>You Should Attend If... Who can attend</b>	<ul style="list-style-type: none"><li>▪ Students or faculty from academic/research institutions and industry willing to start basic research on batteries and other alternate energy sources.</li><li>▪ Executives, engineers and researchers from manufacturing, service and government organizations including R&amp;D laboratories.</li></ul>

	<ul style="list-style-type: none"> <li>The course emphasizes on the fundamentals and synthesis and characterization of materials for Li-ion batteries.</li> </ul>
<b>Fees</b>	<p>Participants from abroad : US \$500  Industry/ Research Organizations : Rs. 5,000  Faculty from other Institutions : Rs. 3,000  Students from other Institutions : Rs. 1,000</p> <p>The above fee includes all instructional materials, computer use for tutorials and assignments. Payment to be made through NEFT. The details are as follows:  Name of Account Holder : GIAN-CHEMISTRY  Account Number : 50462123526  Bank &amp; Branch : Allahabad Bank, Hanumanthnagar Branch  IFSC Code : ALLA0212011  MICR Code : 560010007</p> <p>The participants will be provided with accommodation based on availability on payment basis.</p> <p><b>All course registrations will be processed via the national GIAN portal (<a href="http://www.gian.iitkgp.ac.in">www.gian.iitkgp.ac.in</a>), where Rs. 500/- one-time fee is payable in addition to the above amount.</b></p> <p><b>Number of the participants for the course is limited to 50</b></p>

## Foreign Faculty



**M.V. Reddy**

Department of Materials Science & Engineering  
Department of Physics, National University of Singapore

Dr. M.V. Reddy is currently working at National University of Singapore (NUS), Singapore. His research interests include development of nano/submicron sized materials for energy, their characterization and evaluation of their electrochemical properties. He has published around 190 research articles, several review papers and delivered talks at various conferences and workshops related to Energy and Nanotechnology. His h-index is 51 and has around 10,000 citations. He is serving as an editorial advisory board member in "Materials Research Bulletin" and several other journals. He has trained many local high school/college and International exchange students, Ph.D students and Indian exchange Ph.D students and his projects have won many awards in national and international conferences. One of his project has won 2<sup>nd</sup> prize in prestigious Intel International Science & Engg. Fair (ISEF 2013) and 1<sup>st</sup> prize from American Chemical Society, USA. He has won Outstanding Science Mentorship Award, from Ministry of Education, Singapore and Inspiring Research Mentor Award from NUSHS. He is a visiting professor at various universities in Malaysia, South Africa and India.

## Local Institutional Co-ordinator



Dr. Ravishankar Deekshit  
Dean, Student Affairs and  
Professor, Electrical Engineering Department  
BMS College of Engineering

## Course Co-ordinators



Dr. M.S. Dharmaprakash is currently working as a Professor at the Department of Chemistry, BMS College of Engineering. He has obtained a Ph.D. degree from the Materials Research Centre, Indian Institute of Science. He worked as a Post-Doctoral Fellow in Australian National University (ANU), Canberra and Australian Nuclear Science and Technology Organization (ANSTO) Menai, Australia. He has two patents filed and more than 30 publications to his credit. He is involved in teaching Chemistry and related courses (UG and PG) and his research interest is in synthetic organic chemistry and materials chemistry. He has guided many student research projects and is presently guiding 6 research scholars for their Ph.D. He has received research grants from the Government of Karnataka (VGST KFIST L-II) for the year 2016-17.



Dr. K. L. Nagashree is currently working as an Assistant Professor in the Department of Chemistry, BMS College of Engineering. She has obtained a Ph.D. degree from the Chemistry Department of Bangalore University. She worked as a Postdoctoral Fellow at the IPC Department, IISc. She has received research grants from the Government of Karnataka (VGST SMYSR) for the year 2014-15 and the Government of India (DST SERB ECR) in the year 2016. She has one patent filed and has published 12 papers.

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Course Registration:

<http://www.gian.iitkgp.ac.in>