Enhancing Safety and Fast Charge Capability of High Energy Li-Ion Batteries

Dr. Mahesh Krishnamurthy
Bodine Chair Professor of Electrical Engineering
Director, Grainger Power Electronics and Motor Drives Lab
Illinois Institute of Technology

Monday**, 09 October 2023,** 9.55 AM CT

Room: **Zoom** (Meeting ID# 976-269-9678; Passcode: K91Bwy https://zoom.us/j/9762699678?pwd=RUp5ZmN3cHUyQ1FvUExVQjVsc1hVUT09)

LECTURE ABSTRACT

Modern transportation applications have presented a growing demand for higher energy density and enhanced safety in addition to the ability to operate at much higher C-rate with longer duration of peak power. Further, several applications necessitate fast charging to reduce downtime and increase vehicle utilization rate to improve its economics and accelerate technology commercialization. Currently, many companies are experimenting with small cylindrical high energy density Li-ion batteries and continue to improve through steady tinkering with cell chemistry, design improvements, and innovative packaging and engineering approaches. However, these cells are limited to 1 C-rate charge and are prone to thermal runaway propagation if one cell fails catastrophically during operation.

This seminar will discuss some of the advancements in passive Li-ion battery thermal management technology using phase change composite (PCC™). The PCC technology is an elegant passive thermal management solution that can enhance battery performance, extend cycle life, and prevent thermal runaway propagation under catastrophic cell failure conditions. In this work, an intelligent battery thermal management (iBTM) system will be integrated in conjunction with the PCC technology and advanced battery management system (BMS). It enables real-time dynamic fast charging algorithms that considers battery temperature, state of charge (SOC), state of health (SOH), and PCC matrix thermal SoC (TSoC). The proposed iBTM technology will enable 50-60% rapid charge of high energy density Li-ion batteries in less than 15 minutes without compromising battery safety or cycle life.

SPEAKER BIOSKETCH

Dr. Mahesh Krishnamurthy is currently the Bodine Endowed Chair Professor of Electrical Engineering and Academic Director of the Kaplan Institute of Innovation and Tech Entrepreneurship at Illinois Tech. He is also the Director of the Grainger Power Electronics and Motor Drives Laboratory. He served as a Distinguished Lecturer with the IEEE-Vehicular Technology Society from 2011-2013 and 2013-2015 and Distinguished Speaker from 2015-2018 and 2018-2021. He has co-authored over 175 scientific articles, book chapters and technical reports and has 21 issued US patents. He has been awarded several teaching and research awards. He was the founding Deputy Editor-in-Chief of IEEE Transactions on Transportation Electrification from 2014 to 2020 and served as the Editor-in-Chief from 2020 to 2023. He also co-founded the IEEE Transportation Electrification Conference and Expo in 2012.