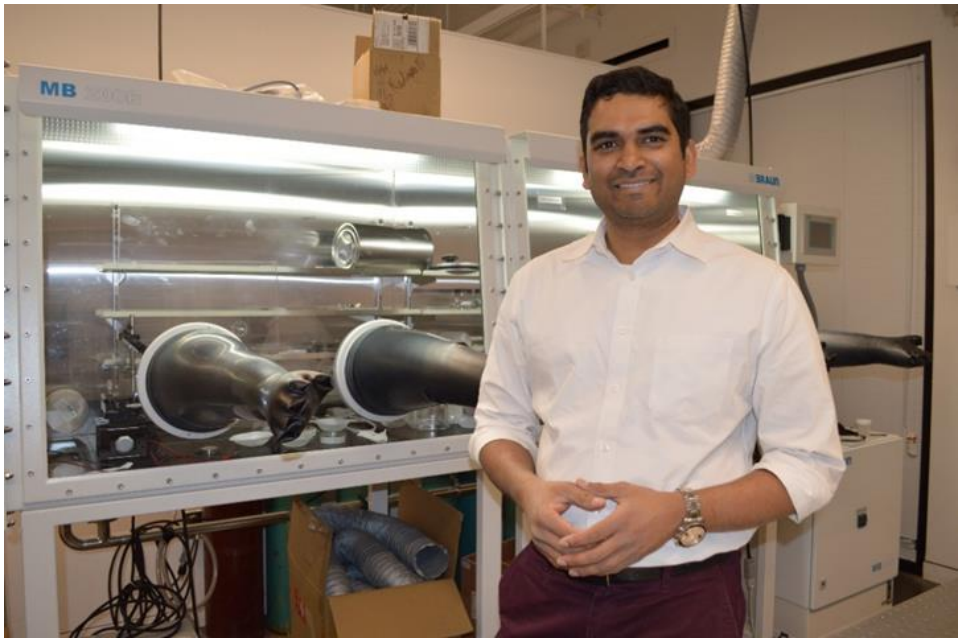

DR. SIVA NADIMPALLI

Department of Mechanical and Industrial Engineering
New Jersey Institute of Technology (NJIT), Newark, NJ

"MECHANICS AND ELECTROCHEMISTRY OF BATTERY ELECTRODES"

November 1st, 2019 ~ 11:30AM
Life Science Center II, Room 130

FALL 2019 CHEMISTRY SEMINAR SERIES

HOST: DR. HUIXIN HE

COFFEE SOCIAL 11:00 AM OLSON HALL, 338

ALL THOSE INTERESTED ARE WELCOME TO ATTEND

Abstract: Rechargeable (e.g. Li-ion and Na-ion) batteries are attractive candidates as energy storage devices for solar power, wind power, and electric vehicle applications; however, their capacities and energy densities are still not enough to meet the industry requirements. Replacing existing electrode materials with higher performance materials could address the capacity issue to some extent, but it poses other challenges. The new anode materials (such as Si, Sn, Ge etc.) undergo large volume changes (~100-270%) upon reacting with lithium or sodium which induces significant amount of stresses in the electrodes during battery operation. These stresses cause fracture and mechanical damage, which also promotes chemical degradation. Both of these processes lead to rapid capacity fade. In addition, stresses can affect transport process in electrodes which can hinder battery performance. Although cathode materials do not undergo significant volume changes, mechanical degradation due to stresses is still a major issue. Hence, there is a need to understand the mechanical behavior of electrode materials and coupling between electrochemistry and mechanics to be able to design efficient, durable, and higher-energy density batteries. In this talk, I will explain the ongoing experimental and modeling efforts in understanding the mechanics and electrochemistry of different electrode materials. In addition to the work on thin film electrodes, I will talk about stress measurements in composite electrodes and explain how this data can be used to estimate pressure that the casing of a commercial (jelly roll configuration) Li-ion battery will undergo as a function of state of charge.

Biographical Sketch: Siva Nadimpalli is currently an Associate Professor in the Department of MIE at NJIT, Newark, NJ. Siva obtained his PhD (2011) from University of Toronto, MSc (Engg) (2005) from Indian Institute of Science, and B.E (2002) from Andhra University, all in Mechanical Engineering. After completing his MS, Siva Nadimpalli joined GE Wind Energy group as a Mechanical Engineer and carried out projects involving prototype testing of wind turbines and design of turbine components. During his PhD, Siva Nadimpalli developed experimental techniques to characterize fracture behavior of solder joints and printed circuit boards in microelectronic packages. After finishing PhD, he worked as a postdoctoral research associate in School of Engineering at the Brown University. Dr. Nadimpalli received the prestigious NSF CAREER award in 2017. His current research focus is to understand mechanical and electrochemical behavior of various battery electrode materials by using in situ experimental methods, which is supported by funding from National Science Foundation and Office of Naval Research.

RUTGERS
UNIVERSITY | NEWARK

Department of chemistry
73 Warren Street, Olson Hall
Newark, New Jersey
https://sasn.rutgers.edu/chemistry