EVALUATING SOLID- ELECTROLYTE INTERFACE ON NANOSTRUCTURED SILICON
Khalid Ababtain¹, Ganguli Babu¹ and Leela Mohana Reddy Arava¹
¹ Wayne State University

With the great success in portable electronic devices, Li-ion batteries are promising to expand their applications in electric and hybrid electric vehicles and beyond due to their superior energy density and light weight. However, fabrication of lithium ion batteries with the ability to operate with safety and high energy density entails limitations on the choice of electrolytes and electrodes. Though room temperature ionic liquids (RTILs) have capability to tackle safety issues, their poor ionic conductivity limits their practical application. Towards addressing this issue, we explore the feasibility of 1-methyl-1-propylpiperidinium bis(trifluoromethylsulfonyl)imide (Pip) ionic liquid as an electrolyte and their electrochemical properties with engineered three dimensional Si (3D Si) anodes. Further, propylene carbonate is added as an additive to Pip electrolyte to enhance ionic conductivity without compromising the safety at elevated temperatures. Detailed electrochemical studies as a function of PC concentration and current-rates reveal that Pip electrolyte mixture in combination with 3D Si anode has potential to address safety and energy density issue of future Li-ion batteries.

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Presenting author's email: leela.arava@wayne.edu