



College of Engineering
Department of
Mechanical & Industrial Engineering

The Robert W. Courter Seminar Series

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1263 Patrick F Taylor Hall



Molecular Structure and Dynamics of Organic-Based Lithium Ion Electrolytes

by **Daniel Kuroda***

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Nowadays lithium ion batteries have become ubiquitous to the portable energy storage industry. Despite the advances made in this technology, there is still a need for improvements in areas such as safety and energy density of lithium ion batteries. To this end, most studies so far have concentrated on either improving the electrodes or optimizing the electrolyte composition. However, few studies have focused on understanding how the molecular structure and dynamics of the electrolytes affect the observed macroscopic properties. Here, we present our efforts to elucidate the structure and dynamics of lithium ion electrolytes composed of organic molecules with different chemical structures via steady-state and time-dependent infrared spectroscopies. Specifically, we focused on the effects of chemical structure of the organic molecules on the structure and dynamics of lithium ion solvation shell. Our results show that the solvation structure of lithium ion is significantly affected by the chemical structure of the solvent. However, macroscopic properties such dielectric constant are not good parameters for predicting the final properties of the electrolyte. Thus, our studies demonstrate that the molecular structure of the solvent has far reaching consequences on the structure and dynamics of the electrolyte at the molecular level than those predicted by macroscopic properties.

* Prof. Daniel Kuroda was born and raised in Buenos Aires, Argentina. He studied at University of Buenos Aires, where he studied Chemistry and graduate with honors in 2002. In August of 2002, he started his graduate studies in ultrafast spectroscopy with Prof. Valeria Kleiman at University of Florida, Gainesville. After obtaining his PhD. in Chemistry in 2008, Daniel join the group of Prof. Robin Hochstrasser as post-doctoral researcher. Finally, in August of 2013 Daniel started his faculty position at LSU, where he has been since.

Prof. Kuroda has a very successful scientific career. For example he has first author papers in the Journal of Science and Nature Chemistry, which he co-author as graduate student and postdoctoral researcher. Prof. Kuroda received many awards since the beginning of his scientific career at University of Florida. Lately, he has been awarded with the LSU Alumni Association Rising Faculty Research Award and the Tiger Athletic Foundation Undergraduate Teaching Award. Furthermore, Prof. Kuroda has been very successful in building a research program and has graduated a PhD. and Msc. in Chemistry. Moreover, Prof. Kuroda's group has published 17 papers from LSU and currently he has two more papers currently in revision. Finally, Prof. Kuroda has been successful in getting funding for his group. He obtained funding from local sources Board of Regents, as well as from NSF (CAREER award) and ACS-PRF (DNI award), which are very competitive national sources of funding for new faculty.