

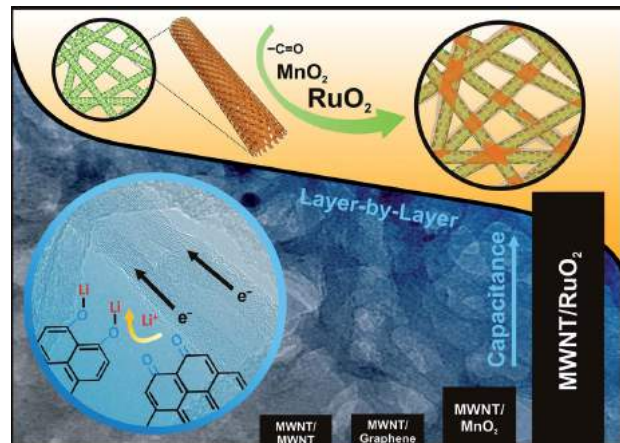
Overview of Electrochemical Energy Laboratory at Massachusetts Institute of Technology (MIT)

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The Electrochemical Energy Laboratory (EEL) at MIT is a very diverse group – both in the subjects of research and the cultural background of its members. Present members and alumni comprise of individuals from more than 10 countries across the globe. The different perspectives and outlooks that each member brings to the group make the environment stimulating for research and personal development.



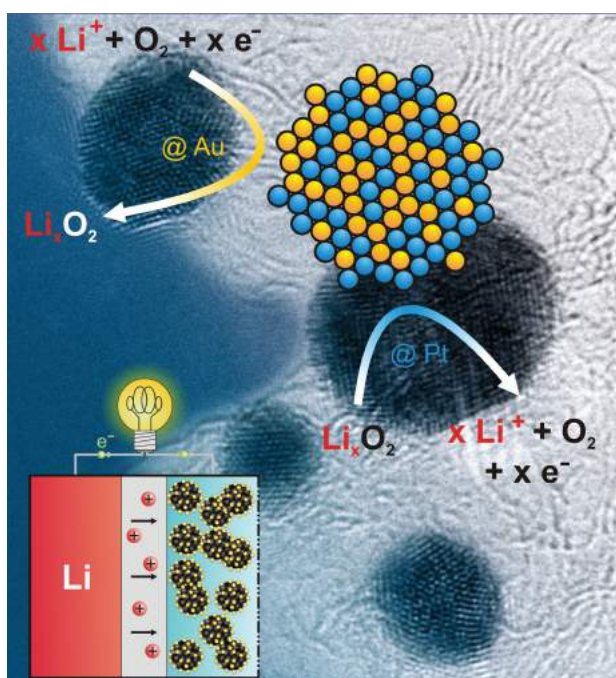
Scientifically, the lab focuses on a range of different topics, with a primary interest in understanding the fundamental mechanisms governing energy storage processes. In the aqueous electrochemistry subgroup, researchers focus on designing more active and stable materials for oxygen evolution, oxygen reduction, hydrogen evolution and hydrogen reduction reactions. There is also significant ongoing research to develop more active and selective



<http://web.mit.edu/eel/index.html>

catalysts for carbon dioxide reduction in order to facilitate conversion of atmospheric carbon to high-energy fuels. The lab also works on photocatalysis based projects to develop a synergy between the fields of photovoltaics and catalysis. In this subgroup, some researchers also work on gas phase catalysis of key environmentally relevant reactions such as carbon monoxide oxidation and formaldehyde oxidation. Industry funded research on redox flow cells that are an upcoming option for grid based energy storage is also carried out at EEL.

In the non-aqueous sub group, the lab largely focuses on Li-ion and Li-air batteries, which are largely funded by the automotive industry (BMW and Toyota). The Li-ion subgroup bases their research on the understanding of the formation of the electrode-electrolyte interface, a



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process that is considered to limit the efficiency of current batteries.

Work in the subgroup also consists of studying design descriptors for solid-state electrolytes with applications to batteries. The Li-air sub group studies the mechanisms responsible for lower life span of these batteries and explores new chemistries for use as both electrode materials and electrolytes. There is also significant study in the group on thermogalvanic systems, which use waste heat to produce electricity.

Experimental work at EEL is corroborated with density functional theory calculations performed by some members in the group. The research is complemented largely by spectroscopic measurements such as X-ray photoelectron spectroscopy, X-ray absorption, X-ray emission and surface diffraction, which are

performed in synchrotrons all around the US. Each subgroup meets regularly (~once a week) to discuss recent results and findings and experimental challenges encountered. Every Friday, there is also a group meeting attended by all members that includes a more formal research update by members. Every once a month the research updates are substituted by journal club meetings where all members discuss relevant and exciting literature in a particular field.



The social life in the lab is worthy of mention. Every Monday afternoon from 4-5, lab members gather in the conference room to have tea and donuts and discuss plans for the week or talk about interesting activities done on the previous weekend. This social hour provides a great kick-start to the week and adds some fun to the afternoon. Every Friday, at 12, lab members have lunch together, before attending the group meeting at 3. This informal setting provides a good opportunity to discuss science, current



affairs or just have friendly conversation! After the group meeting, at five minutes past five, (5:05), the last event of the week known as EEL 505 begins. In this hour, members get an assortment of snacks, some beverages and play board games or have general discussions. The lab also

celebrates each member's birthday by cutting a cake and singing 'Happy Birthday' in the birthday boy/girl's native language. With so many opportunities to socially interact, it is not surprising that the atmosphere in the lab is always very friendly and sociable.

In the end, I would like to express my appreciation to Prof. Yang Shao-Horn for accept my visit at MIT and also EEL members for their kind support. Also I greatly appreciate JGP-CPIER program for the financial support and the assistance for all the paperworks.

