The Sierra Nevada Section of the American Chemical Society presents

“The Role of Aqueous Phase Catalysis on CO₂ Reduction and Hydrogen Storage”

Professor Hongfei Lin
Department of Chemical Engineering
University of Nevada, Reno
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Social Gathering 5:30 p.m.; Dinner 6:00 p.m., Presentation ca. 7:00 p.m.
Dandelion Deli & Cafe, 1170 S. Wells #2 (at Wonder St.)
$15 members & guests, $10 students

Dinner includes small salad and dessert with choice of entrée:
Sherry Chicken or Vegetarian Lasagna

Reservations required by Wednesday, February 26 to Kent Ervin at ervin@unr.edu
Please specify choice of entree with your RSVP
Catalytic reduction of carbon dioxide (CO$_2$) with hydrogen to value added chemicals is a “Holy Grail” paradigm that may ease two major concerns, “Climate Change” and “Energy Crisis”, caused by anthropic releasing an overwhelming amount of CO$_2$ into atmosphere by combusting and depleting fossil fuels. However, two techno-economic challenges have to be overcome: how to activate CO$_2$ with low external energy input and how to maintain sustainable hydrogen supply. We propose a novel approach of combining the oxidation of biomass derived alcohols or polyols with the reduction of CO$_2$ in a “one-pot” process through aqueous-phase hydrogen transfer (APHT), which conveys hydrogen from biomass molecules to reduce bicarbonates over palladium nano-catalysts in hydrothermal media and can potentially mitigate the abovementioned two challenges. We demonstrate that glycerol is oxidized to lactic acid while bicarbonate is reduced to formic acid at high yields in the APHT process. Moreover, we also report for the first time the highly efficient reversible hydrogen storage-evolution process based on the ammonium bicarbonate/formate redox equilibrium over the supported palladium catalyst in low-temperature aqueous solutions. Such an efficient hydrogen storage system may benefit the utilization of remote renewable hydrogen resources to centralized carbon capture and conversion (CCC) facilities.

BioSketch: Dr. Hongfei Lin is an Assistant Professor in the Materials Engineering at the University of Nevada, Reno. He has over ten years of experience in both academia and industry on heterogeneous catalysis and reaction engineering. He received his B.E and M.S. degrees in Chemical Engineering from Tsinghua University, China, in 1996 and 2000, respectively. Chemical Engineering from Louisiana State University, Baton graduation, he became a postdoctoral fellow for two years at Santa Barbara. He then worked in industry for three years catalytic conversion of natural gas and biomass to liquid senior research scientist at Gas Reaction Technologies, Inc. Inc. Dr. Lin has published 22 peer-reviewed journal papers and has over ten years of catalysis and reaction Chemical Engineering from and his Ph.D. degree in Rouge in 2005. After the University of California, conducting research on hydrocarbon fuels. He was a and a researcher at Virent, is funding one patent and focus on coupling chemical and clean fuel production. His research grants. His research is funded by government agencies including National Science Foundation (NSF), U.S. Department of Agriculture (USDA), Nevada Department of Transportation (NDOT), as well as industry settings such as GE Energy and ZERE Biofuels.