SRINIVASAN RAMAKRISHNAN

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EDUCATION

- PhD in Chemistry **12/2017**

Stanford University, USA

Thesis: Design of Molecular Catalysts for the Electrocatalytic Reduction of CO_2 to Liquid Fuels.
Advisor: Prof. Christopher E. D. Chidsey, Co-advisor: Prof. Robert M. Waymouth (CGPA: 3.70/4.00)

- MSc in Chemistry **05/2012**

Indian Institute of Technology (IIT) Madras, India

Thesis: Hyper-Spectral Imaging of Gold Nanoparticle Growth in *L. acidophilus*
Advisor: Prof. T. Pradeep (CGPA: 9.32/10.00)

- BSc (Hons.) in Chemistry **03/2010**

Sri Sathya Sai Institute of Higher Learning (SSSIHL), Bangalore, India (CGPA: 5.00/5.00)

RESEARCH EXPERIENCE

Postdoctoral Scholar, McCloskey Lab, Dept. of Chemical Engineering, UC Berkeley **Feb 2018 - present**

- Studying interfacial degradation in high-energy lithium ion batteries using differential electrochemical mass spectrometry (DEMS) and a variety of electrochemical and spectroscopic methods to understand mechanisms of voltage and capacity fading in Li-rich and Ni-rich NMC (Ni, Mn, Co) oxide cathodes at high voltages.
- Developed methodologies for cathode surface passivation to suppress high voltage interfacial instabilities through (a) the controlled etching of the oxide cathode surface with acidic treatments and (b) atomic layer deposition of Li-conductive oxides such as MoO_x and TiO_x.
- Demonstrated the role of gradient Al_2O_3 coatings on nanoscale $LiCoO_2$ in suppressing electrolyte degradation.

PhD Candidate, Dept. of Chemistry, Stanford University **2012 - 2017**

- Developed a catalyst design methodology for the electrochemical reduction of CO_2 with transition metal complexes, utilizing experimental free energy calibrations of state-of-the-art computational methods.
- Employed density functional theory (DFT) as a predictive tool for molecular electrocatalyst discovery. Mapping of the free energies of key catalytic intermediates enabled the large scale computational screening of metals and ligands.
- Unraveled a new pattern of reactivity in a singly reduced Ru-bipyridine complex towards CO_2 fixation.
- Offered new insights on engineering two-electron reductions in first row transition metal complexes.
- Highlighted a key drawback in using transition metal hydrides as alcohol-oxidation catalysts in fuel cells.

MSc Research, Indian Institute of Technology Madras **2011 - 2012**

- Applied hyper-spectral imaging and electron microscopy to study the growth of gold nanoparticles in *L. acidophilus* bacteria isolated from whey.

Summer Research Fellow, Indian Institute of Science, Bangalore **2011**

- Studied the disparity in the low temperature microwave spectra between that of the benzene-H_2O dimer and the benzene-H_2S dimer in the lab of Prof. E. Arunan. Explored the effect of the van Vleck contact transformation to the Vibrational-Rotational-Translational (VRT) Hamiltonian to rationalize this spectral difference.

TEACHING EXPERIENCE

Head Teaching Assistant, Electrochemical Measurements Laboratory, Stanford University **2014**
- Developed a first-of-its-kind course for chemistry and material science graduate students with Prof. Chidsey. Designed and assembled a custom 'open-box' potentiostat with tunable circuit elements connected to a data acquisition device controlled by MATLAB™. All the electrochemical experiments were performed with this device, including potentiometry, voltammetry and electrochemical impedance spectroscopy.

Guest Lecturer, Advanced Inorganic Chemistry, Stanford University **2017**
- Delivered a guest lecture on density functional theory for organometallic chemists.

Lecturer, Science Circle High School Program, Stanford University **2016**
- Delivered a three-part lecture series titled 'Discovering the World of Batteries'.

TA Trainer, Department of Chemistry, Stanford University **2014**
- Trained first-year graduate students for taking on teaching roles in the chemistry department.

Teaching Assistant, Department of Chemistry, Stanford University **2012-13**
- Taught organic chemistry courses, both lecture as well as laboratory-based (CHEM 33, 134, 36).

FELLOWSHIPS AND AWARDS

- Rising Environmental Leaders Program (RELP) Fellowship, Woods Institute, Stanford University, 2016-17
- Center for Molecular Analysis and Design (CMAD) Fellowship, Stanford University, 2015-2017
- Institute Silver Medal for Best Academic Performance in MSc Chemistry, IIT Madras, 2012
- Ratna Rao Memorial Award for Best Academic Performance in MSc Chemistry, IIT Madras, 2012
- Institute Merit Scholarship, IIT Madras, 2010-2012
- University Gold Medal for BSc (Hons.) Chemistry, SSSIHL, 2010

PUBLICATIONS

1. Ramakrishnan, Park, Wu, Yang, McCloskey "Extended Interfacial Stability Through Simple Acid Rinsing in a Li-rich Oxide Cathode Material", submitted. (Pre-print at https://doi.org/10.26434/chemrxiv.9962471.v1)
2. Li, Ramakrishnan, McCloskey, Cabana "Definition of Redox Centers in Reactions of Lithium Intercalation in Li_3RuO_4 polymorphs" submitted.
3. Ramakrishnan, Moretti, Chidsey "Mapping Free Energy Regimes in Electrocatalytic Reductions to Screen Transition Metal-Based Catalysts", *Chem. Sci.* **2019**, 10, 7649-7658.
4. McLoughlin, Waldie, Ramakrishnan, Waymouth "Protonation of a Cobalt Phenylazopyridine Complex at the Ligand Yields a Proton, Hydride, and Hydrogen Atom Transfer Reagent", *J. Am. Chem. Soc.* **2018**, 140(41), 13233-13241.
5. Ramakrishnan, Chidsey "Initiation of Electrochemical Reduction of CO_2 by a Singly Reduced Ruthenium(II) Bipyridine Complex", *Inorg. Chem.* **2017**, 56(14), 8326-8333.
6. Waldie, Ramakrishnan, Kim, Maclaren, Chidsey, Waymouth "Multi-Electron Transfer at Cobalt: Influence of the Phenylazopyridine Ligand" *J. Am. Chem. Soc.* **2017**, 139(12), 4540-4550.
7. Ramakrishnan, Chakraborty, Brennessel, Jones, Chidsey **"**Rapid Oxidative Hydrogen Evolution from a Family of Square–Planar Nickel Hydride Complexes" *Chem. Sci.* **2016**, 7, 117-127.
8. Ramakrishnan, Waldie, Warnke, de Crisci, Batista, Waymouth, Chidsey "Experimental and Theoretical Study of CO_2 Insertion into Ruthenium Hydride Complexes" *Inorg. Chem.* **2016**, 55(4), 1623-1632.
9. Ramakrishnan, Asundi, Oyakhire, Park, Bent, McCloskey "Effective Interface Passivation of Li, Mn-rich high energy cathodes with Atomic Layer Deposited Molybdenum Oxide" *in prep.*
10. Ramakrishnan, Hu, McCloskey, Cabana "Improved Interfacial Stability with Gradient Al_2O_3 Coatings on $LiCoO_2$ Nanoplates" *in prep.*

TALKS

1. 236th Electrochemical Society Meeting, Atlanta, 2019
   Talk Title: Interfacial Origins of Degradation in High Energy Li-rich NMC Cathodes Probed by Differential Electrochemical Mass Spectrometry
2. Department of Materials, University of Oxford, UK, 2019
   Talk Title: Probing Interfacial Degradation in Advanced Lithium Ion Batteries
3. Department of Chemistry, University of Utah, Salt Lake City, UT, 2017
   Talk Title: Design of Homogeneous Transition Metal Electrocatalysts CO_2 Reduction
4. Stanford Student Summer Seminar, Department of Chemistry, 2017, Stanford University, CA
   Talk Title: Design of Selective Molecular Catalysts for the Electro-reduction of CO_2 to Liquid Fuels
5. Gordon Research Seminar on Electrochemistry 2016, Ventura, CA
   Talk Title: Proton-Electron Transfers with Transition Metal Hydrides for Electrocatalytic CO_2 Reduction
6. 248th American Chemical Society Meeting, San Francisco, 2014
   Talk Title: Electro-Dehydrogenation of Chemical Fuels with Molecular Catalysts

POSTER PRESENTATIONS

1. Gordon Research Seminar on Electrochemistry 2018, Ventura, CA
Title: Design of Molecular Electrocatalysts for CO_2 Reduction

2. 32nd William S. Johnson Symposium, Stanford University, 2017
Title: Electrocatalytic CO_2 Reduction with Transition Metal Complexes

3. Theory and Applications of Computational Chemistry, University of Washington Seattle, 2016
Title: Thermodynamic Descriptors for Electrocatalytic CO_2 Reduction with Transition Metal Hydrides

4. Center for Molecular Analysis and Design Symposium, Stanford University, 2016
Title: Thermodynamic Descriptors for Electrocatalytic CO_2 Reduction with Transition Metal Hydrides

5. Global Climate and Energy Project Symposium, Stanford University, 2015-16
Title: Optimizing Transition Metal Hydrides for Electrocatalytic CO_2 Reduction to Formate

6. Gordon Research Seminar on Electrochemistry 2014, Ventura, CA
Title: Electro-Dehydrogenation of Chemical Fuels

SERVICE

1. Elected Conference Chair, Gordon Research Seminar on Electrochemistry 2020
2. Reviewer for *J. Am. Chem. Soc., Chemistry of Materials, Inorganic Chemistry, Organometallics, ACS Energy Letters*
3. Built a high-performance computing cluster at the Dept. of Chemistry at Stanford University and served as its administrator from 2013 to 2017.

EXTRACURRICULARS

1. Vice President Journal, Stanford Energy Club (SEC), 2015-2016
   - Played a lead role in one of the largest student-run clubs on campus, comprising of over 1500 members, focusing on technology, policy and finance issues related to energy.
   - Established a collaboration between *The Wall Street Journal* and the Stanford Energy Journal.
   - Launched a branding team within the SEC and presented at the MIT Energy Conference, Boston 2016.
2. Volunteer, Habitat for Humanity

REFERENCES

1. Prof. Christopher E. D. Chidsey
   Department of Chemistry
   Stanford University, CA 94305
   Email: chidsey@stanford.edu

2. Prof. Robert M. Waymouth
   Department of Chemistry

Stanford University, CA 94305
Email: waymouth@stanford.edu

3. Prof. Bryan D. McCloskey
Department of Chemical and Biomolecular Engineering
University of California Berkeley
Email: bmcclosk@berkeley.edu

4. Prof. William D. Jones
Department of Chemistry
University of Rochester
Email: jones@chem.rochester.edu

5. Prof. Jordi Cabana
Department of Chemistry
University of Illinois at Chicago
Email: jcabana@uic.edu