

Kyler J. Carroll, Ph.D.
Battery Scientist

Wildcat Discovery Technologies
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Research Interests

My research interests expand across materials for electrochemical, electromagnetic and photoelectrochemical energy storage and conversion. Major focus areas have included in-situ X-ray photoelectron and X-ray absorption spectroscopy techniques to determine the influence of surface chemistry in lithium-ion, sodium-ion, and metal-air cathode materials during electrochemical cycling. Other areas of interest are in the synthesis of novel rare earth free permanent magnets with the goal of creating more commercially viable alternatives without the reliance on rare earth minerals. While at MIT, my research focused on the synthesis of electrocatalysts for heterogeneous CO₂ reduction with the goal of engineering more efficient and durable systems by utilizing microfluidics. Currently I am a battery scientist at Wildcat Discovery Technologies working on the advancement of battery systems, specifically on the synthesis of novel high-capacity cathodes for lithium-ion batteries. My future research goals are to utilize my background in synthetic chemistry to continue to pursue novel materials for energy systems.

Work Experience

Current	Wildcat Discovery Technologies Scientist
Current	Research Affiliate @ MIT Brushett Research Group
2013-2014	Oak Ridge National Laboratories Contracted for X-ray Absorption Spectroscopy of advanced battery systems
2006-2007	Surefil Technologies Research assistant

Education and Training

2013-2015	Massachusetts Institute of Technology Senior Postdoctoral Associate Advisor: Fikile Brushett, Ph.D. cheme.scripts.mit.edu/brushett-group
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- 2012-2013 University of California, San Diego
Assistant Project Scientist
Laboratory for Energy Storage and Conversion
Advisor: Shirley Meng, Ph.D.
- 2010-2012 University of California, San Diego
Postdoctoral Associate
Laboratory for Energy Storage and Conversion
Advisor: Shirley Meng, Ph.D.
- 2007-2010 Virginia Commonwealth University
Ph.D. in Inorganic Chemistry
*Dissertation Title: Core-Shell Nanoparticles:
Synthesis, Design, and Characterization*
Advisor: Everett E. Carpenter, Ph.D.
- 2007 University of Toledo
Summer UROP
Advisor: Cora Lind
- 2002-2007 Aquinas College
B.S. in Chemistry

Technical Skills

- Electrochemical Methods (impedance, cyclic voltammetry, battery cycling, coin cell preparation, microfluidic cell design, corrosion testing, electrodeposition)
- Magnetometry (SQUID, VSM, PPMS)
- Microscopy (TEM, STEM, EELS, EDAX, SEM)
- Elemental Analysis (ICP-MS/OES, XPS, Auger Spectroscopy)
- Optical Spectroscopy (UV-Vis, FTIR, Raman)
- *In-situ* Techniques (XAFS, XRD, Raman)

Synergistic Activities

- DOE-Office of Energy Efficiency & Renewable Energy (EERE) peer reviewer
- Advanced Research Project Agency-Energy (ARPAE) peer reviewer
- Regular peer reviewer – Journal of Power Sources, The Journal of the Electrochemical Society, Journal of Applied Physics, Chemistry of Materials, Langmuir, Scientific Reports, Nature Asia Materials, Energy and Environmental Science, and RSC Advances
- Operations team organizer for the 2015 MIT Energy Conference (<http://mitenergyconference.org>)

Professional Memberships

- Electrochemical Society Member (2011-present)
- Royal Society of Chemistry Member (2010-present)
- American Associate for the Advancement of Science Member (2009-present)
- Materials Research Society Member (2009-present)
- Phi Kappa Phi Honors Society Member (2008-present)
- American Chemical Society Member (2005-present)

Awards/Scholarships/Honors

- Altria Outstanding Graduate Student Fellowship (2009 and 2010)
- GRC Carl Storm Underrepresented Minority Fellowship (2009)
- ACA Small Molecule X-ray Crystallography Scholarship (2008)
- Phillip Morris First Year Graduate Research Fellowship (2008)
- Poje Senior Undergraduate Chemistry Scholarship (2007)
- Michigan Competitive Scholarship (2002)
- Michigan Educational Assessment Program Scholarship (2002)

Teaching Experience

- 2015 MIT Kaufman (KCTP) Teaching Certificate
- Research Advisor for course 10.26 in Chemical Engineering at MIT
- Guest Lecturer for graduate/undergraduate students in NanoEngineering (3 courses)
- Graduate student teaching assistant for general chemistry and labs, Analytical chemistry, and inorganic chemistry
- Undergraduate lab assistant and tutor in chemistry, math, and physics

Publications

2015

- 38 **K.J. Carroll**, T. Burger, L. Laggenecker, S. Chavez, S. Hunt, Y. Roman-Leshkov, F.R. Brushett, Electrocatalytic hydrogenation of oxygenates using earth abundant transition metal nanoparticles under mild conditions, **ChemSuChem**, Submitted
- 37 L. Su, A. Kowalski, **K.J. Carroll**, F.R. Brushett, Recent development and trends in redox flow batteries – Book Chapter in Rechargeable Batteries: Materials, Technologies and new Trends (2015)

- 36 H.D. Liu, D. Qian, M.G. Verde, M. Zhang, L. Baggetto, K. An, Y. Chen, **K.J. Carroll**, D. Lau, M. Chi, G.M. Veith, and Y.S. Meng, Understanding the role of NH₄F and Al₂O₃ surface co-modification on lithium excess layered oxide Li_{1.2}Ni_{0.2}Mn_{0.6}O₂, **ACS Appl. Mater. Interfaces**, 7 (34), (2015)
- 35 A. Saracibar, Z. Wang, **K.J. Carroll**, Y.S. Meng, M.E. Arroyo-de Dompablo, New insight into the electrochemical performance of Li₂MnSiO₄: effect of cationic substitutions, **Journal of Materials Chemistry A**, (2015)
- 34 ** H. Yoon, A. Xu, G.E. Sterbinsky, D.A. Arena, Z. Wang, P.W. Stephens, Y.S. Meng and **K.J. Carroll**, In situ non-aqueous nucleation and growth of next generation rare-earth-free permanent magnets, **Physical Chemistry Chemical Physics**, 17, 1070 (2015)
- ** Corresponding author

2014

- 33 L. Baggetto, C.A. Bridges, J.C. Jumas, D. Mullins, **K.J. Carroll**, R.A. Meisner, E. Crumlin, X. Liu, W. Yang, G.M. Veith, The Local Atomic Structure and Chemical Bonding in Sodium Tin Phases, **Journal of Materials Chemistry A.**, 2, 18959-18973 (2014)
- 32 A. K. Kercher, J. O. Ramey, **K. J. Carroll**, J. O. Kiggans, N. J. Dudney, R. A. Meisner, L. A. Boatner, G. M. Veith, Mixed polyanion glass cathodes: Iron phosphate vanadate glasses, **Journal of The Electrochemical Society**, 14, 161, A2210-A2215 (2014)
- 31 M. Verde, H. Lu, **K.J. Carroll**, L. Baggetto, G.M. Veith, Y.S. Meng, Effect of Surface Composition and Morphology on Li-excess Li[Li_{2/12}Ni_{3/12}Mn_{7/12}]O₂ Mn-activity, **ACS Applied Materials & Interfaces**, 6, 18868 (2014)
- 30 L. Baggetto, **K.J. Carroll**, H.Y. Hah, C.E. Johnson, D.R. Mullins, R.R. Unocic, J.A. Johnson, Y.S. Meng, G.M. Veith, Probing The Mechanism of Sodium Ion Insertion into Copper Antimony Cu₂Sb Anodes, **Journal of Physical Chemistry C**, 118, 7856-7864 (2014)
- 29 L. Baggetto, **K.J. Carroll**, R.R. Unocic, C.A. Bridges, Y.S. Meng, G.M. Veith, Sodium Manganese Oxide Thin Films as Cathodes for Na-Ion Batteries, **ECS Transaction**, 12, 47-57 (2014)

28 D.H Lee, **K.J. Carroll**, K.W. Chapman, O.J. Borkiewicz, S. Calvin, E.E Fullerton, Y.S. Meng, Understanding Improved Electrochemical Properties of NiO-doped NiF₂/C Composite Conversion Materials by X-ray Absorption Spectroscopy and Pair Distribution Function Analysis, **Physical Chemistry Chemical Physics**, 16, 3095-3102 (2014)

2013

27 **K.J. Carroll**, C. Fell, M. Chi, B. Xu, G.M. Veith, N.J. Dudney, Y.S. Meng, Probing the electrode/electrolyte interface in the lithium excess layered oxide Li_{1.2}Mn_{0.6}Ni_{0.2}O₂, **Physical Chemistry Chemical Physics**, 15, 11128-11138 (2013)

26 M. Verde, **K.J. Carroll**, Y.S. Meng, Achieving high efficiency and cyclability in inexpensive soluble lead flow batteries, **Energy & Environmental Science**, 6, 1573-1581, (2013)

25 C.R. Fell, D. Qian, **K.J. Carroll**, M. Chi, J.L. Jones, Y.S. Meng, Correlation between oxygen vacancy, microstrain, and cation distribution in Lithium-excess layered oxides during the first electrochemical cycle, **Chemistry of Materials**, 25, 1621-1629 (2013)

2012

24 D. Qian, B. Xu, H.M. Cho, T. Hatsukade, **K.J. Carroll**, Y.S. Meng, Lithium Lanthanum Titanium Oxides: A Fast Ionic Conductive Coating for Lithium-Ion Battery, **Chemistry of Materials**, 24, 14, 2744-2751, (2012)

23 D. Qian, Y. Hinuma, H. Chen, L.S. Du, **K.J. Carroll**, G. Cedar, C.P. Grey, Y.S. Meng, Electronic Spin Transition in Nano-size Stoichiometric Lithium Cobalt Oxide, **Journal of the American Chemical Society**, 14, 134, 6096-6099, (2012)

22 D. Qian, Y. Hinuma, H. Chen, L.S. Du, **K.J. Carroll**, G. Cedar, C.P. Grey, Y.S. Meng, Electronic Spin Transition in Nano-size Stoichiometric Lithium Cobalt Oxide, **Journal of the American Chemical Society**, 14, 134, 6096-6099, (2012)

21 **K.J. Carroll**, Z. Huba, M. Qian, S.N. Khanna, D.M. Hudgins, E.E. Carpenter, Synthesis of Highly coercive cobalt carbide nanoparticles as a substitute to rare earth permanent magnets, **Applied Physics Letters**, 101, 012409, (2012)

20 M. Zamanpour, Y. Chen, B. Hu, **K.J. Carroll**, Z. Huba, E.E. Carpenter, L.H. Lewis, V. Harris, Large-scale synthesis of high moment FeCo nanoparticles using modified polyol synthesis, **Journal of Applied Physics**, 7, 111, 07B528-3, (2012)

19 **K.J. Carroll**, M.C. Meng, G.M. Veith, Y.S. Meng, *Intrinsic Surface Stability in $\text{LiMn}_{2-x}\text{Ni}_x\text{O}_{4-\delta}$ ($x = 0.45, 0.5$) High Voltage Spinel Materials for Lithium Ion Batteries*, **Electrochemical and Solid State Letters**, 5, 15, A72-A75, (2012)

18 D. Lee, **K.J. Carroll**, S. Calvin, S. Meng, *Conversion Mechanism of Nickel Fluoride and NiO-Doped Nickel Fluoride in Li Ion Batteries*, **Electrochimica Acta**, 59, 213-221, (2012)

2011

17 L. Wang, K. Yang; C. Clavero, A.J. Nelson, **K.J. Carroll**, E.E. Carpenter, R.A. Lukaszew, *Localized surface plasmon resonance enhanced magneto-optical activity in core-shell Co/Ag nanoparticles*, **Nano Letters**, 3, 11, 1237-1240, (2011)

16 S.H. Naik, **K.J. Carroll**, E.E. Carpenter, *Characterization of oxidation resistant Fe@M (M = Cr, Ni) core@shell nanoparticles prepared by a modified reverse micelle reaction*, **Journal of Applied Physics**, 7, 109, 07B519-3, (2011)

15 Z. Huba, **K.J. Carroll**, E.E. Carpenter, *Synthesis of High Magnetization FeCo Alloys Prepared by a Modified Polyol Process*, **Journal of Applied Physics**, 7, 109, 07b514-3, (2011)

2010

14 **K.J. Carroll**, J. Reveles, M.D Shultz, S. Khanna, E.E. Carpenter, *Preparation of elemental Cu and Ni nanoparticles by the Polyol method: An experimental and theoretical approach*, **Journal of Physical Chemistry C**, 6, 115, 2656-2664, (2010)

13 **K.J. Carroll**, D.M. Hudgins, S. Spurgeon, K.M. Kemner, B. Mishra, M.I. Boyanov, L.W. Brown III, M.L. Taheri, E.E. Carpenter, *One-Pot Aqueous Synthesis of Fe and Ag Core/Shell Nanoparticles*, **Chemistry of Materials**, 23, 22, 6291-6296, (2010)

12 C.R. Fell, **K.J. Carroll**, M. Chi, Y.S. Meng, *Synthesis--Structure--Property Relations in Layered, "Li-excess" Oxides Electrode Materials $\text{Li}[\text{Li}_{1/3 - 2x/3}\text{Ni}_x\text{Mn}_{2/3 - x/3}]\text{O}_2$ ($x = 1/3, 1/4, \text{ and } 1/5$)*, **Journal of the Electrochemical Society**, 11, 157, A1202-A1211, (2010)

11 F.N. Radwan, **K.J. Carroll**, E.E. Carpenter, *Dual mode nanoparticles: CdS coated iron nanoparticles*, **Journal of Applied Physics**, 9, 107, 09B515-3, (2010)

- 10 **K.J. Carroll**, G.P. Glaspell, N.B. McDowall, L.W. Brown III, K. Zhang, A.K. Pradhan, J. Anderson, E.E. Carpenter, Surface Enhanced Raman Utilizing Magnetic Core Gold Shell Nanoparticles, **CRC Press**, 1, 395-397, (2010)
- 9 **K.J. Carroll**, D.M. Hudgins, L. Brown, E.E. Carpenter, Annealing studies of Fe_xCo_{100-x} Nanoparticles synthesized by aqueous reduction of Metal Salts, **Journal of Applied Physics**, 9, 107, 09A303-3, (2010)
- 8 N.B. McDowall, J.R. Wilkins, **K.J. Carroll**, J.D. Edwards, J.D. Nelson, E.E. Carpenter; G.P. Glaspell, Spectrally tunable magnetic nanoparticles designed for distribution/recollection applications, **Journal of Applied Physics**, 9, 107, 09B327-3, (2010)
- 7 L. Wang, K. Yang, C. Clavero, A.J. Nelson, **K.J. Carroll**, E.E. Carpenter, R.A. Lukaszew, Localized surface plasmon resonance enhanced magneto-optical activity in core-shell Fe-Ag nanoparticles, **Journal of Applied Physics**, 9, 107, 09B303-3, (2010)
- 6 **K.J. Carroll**, M.D. Shultz, P.P. Fatouros, E.E. Carpenter, High magnetization aqueous ferrofluid: A simple one-pot synthesis, **Journal of Applied Physics**, 9, 107, 09B304-3, (2010)
- 5 **K.J. Carroll**, J.A. Pitts, E.E. Carpenter, K. Zhang, A.K. Pradhan, E.E. Carpenter, Non-classical Crystallization of Amorphous Iron Nanoparticles by Radio Frequency Methods, **Journal of Applied Physics**, 9, 107, 09A302-3, (2010)
- 4 Y. Zheng, W. Zhang, M. Gupta, S. Kankanala, C. Marks, **K.J. Carroll**, E.E. Carpenter, K. Wynne, Poly(bis-2,2,2-trifluoroethoxymethyl oxetane): Multiple Crystal Phases, Crystallization-Induced Surface Topological Complexity and Enhanced Hydrophobicity, **Journal of Polymer Science Part B: Polymer Physics**, 10, 48, 1022-1034, (2010)
- 3 V.G. Harris, Y. Chen, A. Yang, S. Yoon, Z. Chen, Anton Geiler, C.N. Chinnasamy, L.H. Lewis, C. Vittoria, E.E. Carpenter, **K.J. Carroll**, R. Goswami, M. A. Willard, L. Kurihara, M. Gjoka, O. Kalogirou, High Coercivity Cobalt Carbide Nanoparticles processed via Polyol Reaction: A New Permanent Magnet Material, **Journal of Physics part D: Applied Physics**, 16, 43, 165003, (2010)
- 2 **K.J. Carroll**, T. Ekiert, K.M. Unruh, S. Calvin, E.E. Carpenter, Selective Nucleation and Growth of Cu and Ni Core/Shell Nanoparticles, **Chemistry of Materials**, 7, 22, 2175-2177, (2010)

- 1 J. Rivers, **K.J. Carroll**, R.A. Jones, E.E. Carpenter, *A copper-polyol complex: [Na₂(C₂H₆O₂)₆][Cu(C₂H₄O₂)₂]*, *Acta Crystallographica*, 3, 66, m83-m85, (2010)

Presentations/Invited Talks

1. A. Kercher, J. Ramey, **K.J. Carroll**, L. Boatner, D. Shin, R. Meisner, J. Kiggans, G. Veith, N. Dudney, *Mixed Polyanion Glasses as Lithium Ion Battery Cathode Materials*, Poster Presentation, ECS Spring Conference 2014
2. D.A. Arena, G.E. Sterbinsky, **K.J. Carroll**, H Yoon, Y.S. Meng, Z.H. Huba, E.E. Carpenter, *Spin and orbital Moments of Co-carbide nanoparticles for permanent magnet applications*, Oral Presentation, Bulletin of the American Physical Society, 2014
3. D.H. Lee, **K.J. Carroll**, S. Calvin, K. Chapman, P. Chupas, Y.S. Meng, *Understanding improved electrochemical properties in nickel fluoride conversion electrode materials by X-ray absorption spectroscopy and pair distribution function*, Oral presentation, ACS conference, 2013
4. M. Verde, **K.J. Carroll**, Y.S. Meng, *Identifying and Suppressing Side Reactions in Soluble Lead Flow Batteries to Achieve High Efficiency and Cyclability*, Oral Presentation, ECS Fall Conference, 2013
5. D. Qian, C. Fell, **K.J. Carroll**, M. Chi, J.L. Jones, Y.S. Meng, *STEM EELS study on Lithium-excess layered material Li_{1.2}Ni_{0.2}Mn_{0.6}O₂ – A Mechanism study on the first electrochemical cycling*, Poster Presentation, Microscopy and Microanalysis, 2013
6. G. Sterbinsky, **K.J. Carroll**, H. Yoon, Y.S. Meng, Z. Huba, E.E. Carpenter, D.A. Arena, *Magnetic and electronic structure of high-coercivity cobalt carbide nanoparticles for permanent magnet applications*, Poster Presentation, Bulletin of the American Physical Society, 2013
7. H. Yoon, A. Xu, G. Sterbinsky, D.A. Arena, Z. Huba, E.E. Carpenter, Y.S. Meng, **K.J. Carroll**^{*}, *In-situ Mechanistic Study of Cobalt Carbide Nanoparticles by Quick-XAFS*, Poster Presentation, Bulletin of the American Physical Society, 2013
8. D.A. Arena, G. Sterbinsky, P.W. Stephens, **K.J. Carroll**, H. Yoon, Y.S. Meng, Z. Huba, E.E. Carpenter, *Atomic Structure of High-coercivity cobalt carbide nanoparticle ensembles*, Poster Presentation, Bulletin of the American Physical Society, 2013

9. **K.J. Carroll**, C. Fell, M. Chi, G. Veith, S. Calvin, N. Dudney, Y.S. Meng, *Quasi in-situ surface characterization of the high voltage Li-excess $\text{Li}[\text{Li}_x\text{Ni}_{1/3-2x/3}\text{Mn}_{2/3-x/3}]\text{O}_2$ cathode materials: An investigation of the first cycle irreversible capacity loss*, Oral Presentation, ECS Spring Conference, 2012
10. M. Verde, **K.J. Carroll**, D. Keogh, A. Sathrum, Y.S. Meng, *Elucidating Failure Mechanisms in the Soluble Lead-Acid Flow Battery – Form*
11. **Invited Talk: Synthesis and Characterization of Nanomaterials**, Department of Chemical Engineering, Northeastern University, March, 2012
12. **K.J. Carroll**, C.R. Fell, T. Yang, M. Chi, Y.S. Meng, *Quasi in-situ XPS characterization of layered li-excess high voltage cathode materials*, Oral Presentation Spring MRS conference, 2011
13. D. Qian, B. Xu, **K.J. Carroll**, Y.S. Meng, *Performance Improvement of lithium lanthanum titanate (LLT) coated LiNiCoAlO – A combination of first-principles calculations and experimental studies*, Oral Presentation, Spring ECS conference, 2011
14. Y.S. Meng, **K.J. Carroll**, Y. Hinuma, *Characterization of Nano-LiCoO₂*, Spring MRS Conference, Oral Presentation, March 2011
15. D. Keogh, **K.J. Carroll**, Y.S. Meng, *Soluble Lead-Acid Flow Battery*, 2nd Annual Flow Battery Forum, Edinburgh, UK, Oral Presentation, April 2011
16. C.R. Fell, **K.J. Carroll**, M. Chi, Y.S. Meng, *Synthesis-structure-property relations in layered li-excess oxide electrode materials*, Oral Presentation, ECS Fall Conference, 2010
17. **K.J. Carroll**, E.E. Carpenter, *Core-Shell Nanoparticles: Design, Synthesis and Characterization*, Oral Presentation, Ph.D. Defense, Virginia Commonwealth University, 2010
18. F.R. Radawan, **K.J. Carroll**, E.E. Carpenter, *Prussian Blue Coated Nanoparticles for biomedical Applications*, 11th Joint MMM-Intermag Conference, 2010
19. F.R. Radawan, **K.J. Carroll**, E.E. Carpenter, *Dual-mode Nanoparticles: CdS coated Iron Oxide Nanoparticles*, Poster Presentation, 11th Joint MMM-Intermag Conference, 2010
20. **K.J. Carroll**, M.D. Shultz, E.E. Carpenter, *High Magnetization Aqueous Ferrofluid: A simple one-pot Synthesis*, Poster Presentation, 11th Joint MMM-Intermag Conference, 2010

21. **K.J. Carroll**, D.M. Hudgins, L. Brown, E.E. Carpenter, *Annealing Studies of Fe_xCo_{100-x} Nanoparticles synthesized by aqueous reduction of metal salts*, Poster Presentation, 11th Joint MMM-Intermag Conference, 2010
22. N.B. McDowell, J. Watkins, **K.J. Carroll**, E.E. Carpenter, G.P. Glaspell, *Magnetic Upconverters*, Poster Presentation, 11th Joint MMM-Intermag Conference, 2010
23. L. Wang, K. Yang, C. Clavero, A. Nelson, **K.J. Carroll**, E.E. Carpenter, R.A. Lukaszew, *Localized Surface Plasmon Resonance Enhanced Magneto-optical Activity in Core-Shell Ag-Fe Nanoparticles*, 11th Joint MMM-Intermag Conference, 2010
24. **K.J. Carroll**, T. Ekeirt, K.M. Unruh, E.E. Carpenter, *Cu-Ni Core-shell Nanoparticles*, Poster Presentation, Oxford University, UK Solid-State Chemistry Gordon Research Conference, 2010
25. T. Ekeirt, **K.J. Carroll**, E.E. Carpenter, K.M. Unruh, *Structural and Magnetic Properties of as-prepared and annealed Ni/Cu Core/Shell nanoparticles*, Oral Presentation, Spring APS, 2010
26. M.D. Shultz, J.R. Martin, S.H. Naik, **K.J. Carroll**, J. Wilkins, J.M. Laza, L.M. Leon, E.E. Carpenter, *Poly(Styrene-co-vinylbenzylchloride-co-divinylbenzene) Coated Iron Oxide Synthesis and Effects on Size and Morphology*, Poster Presentation, 53rd MMM Conference, 2008
27. M.D. Shultz, W. Braxton, **K.J. Carroll**, E.E. Carpenter, *One Parameter Control of the Size of Iron Oxide Nanoparticles Synthesized in Reverse Micelles*, Poster Presentation, 53rd MMM Conference, 2008
28. **K.J. Carroll**, T. Ekeirt, K.M. Unruh, S. Calvin, E.E. Carpenter, *Synthesis and Characterization of Cu-Ni and Ni-Cu Core-shell Nanoparticles*, Poster Presentation, Virginia Commonwealth University, 2008

Patents

- Non-Rare Earth Magnetic Nanoparticles (Patent # WO2013103762A1)

References

- **Dr. Everett E. Carpenter**, Department of Chemistry, Virginia Commonwealth University, Richmond, VA (ecarpenter2@vcu.edu)
- **Dr. Vincent Harris**, Department of Electrical and Computer Engineering, Northeastern University, Boston, MA (harris@ece.neu.edu)
- **Dr. Shirley Meng**, NanoEngineering Department, University of California San Diego, San Diego, CA (shirleymeng@ucsd.edu)
- **Dr. Fikile Brushett**, Chemical Engineering Department, Massachusetts Institute of Technology, Cambridge, MA (brushett@mit.edu)

Collaborators

- **Dr. Yuriy Roman**, Chemical Engineering, Massachusetts Institute of Technology, Cambridge, MA (yroman@mit.edu)
- **Dr. Garry Glaspell**, Department of Chemistry, Virginia Commonwealth University, Richmond, VA (gglaspell@gmail.com)
- **Dr. Cora Lind**, Department of Chemistry, University of Toledo, Toledo, OH (cora.lind@utoledo.edu)
- **Dr. Scott Calvin**, Department of Physics, Sarah Lawrence College, Bronxville, NY (scalvin@sarahlawrence.edu)
- **Dr. Gabriel Veith**, Materials Science and Technology Division, Oak Ridge National Laboratory, Oak Ridge, TN (veithgm@ornl.gov)
- **Dr. Mitra Taheri**, Materials Science and Engineering, Drexel University, Philadelphia, PA (mtaheri@coe.drexel.edu)
- **Dr. Shiv Khanna**, Department of Physics, Virginia Commonwealth University Richmond, VA (Snkhanna@vcu.edu)