Venkatasubramanian (Venkat) Viswanathan
Associate Professor (without tenure), Carnegie Mellon University

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Employment

Carnegie Mellon University Mechanical Engineering, Materials Science, Chemical Engineering, Physics (courtesy)	Associate Professor (without Tenure)	July 2019-Present
Carnegie Mellon University	Assistant Professor	2014-2019
Massachusetts Institute of Technology Post-doc Advisor: Martin Z. Bazant	Postdoctoral Researcher	2013-'14

External Consulting and Advisory Board Memberships

QuantumScape Corp. (NYSE: QS) — Consultant, Scientific Advisory Board — 2015-Present
Role: Provide technical consulting for new material design for next generation batteries.

Aionics Inc. — Chief Scientist — 2020-Present
Role: Guide the scientific efforts on machine learning and materials informatics.

Pratt & Whitney — Technical Consultant — 2018-Present
Role: Provide technical consulting for batteries for electric flight.

Educational Qualifications

Year	Degree	Institute	CGPA	Rank
2008-2013	Ph.D. Advisor: Jens K. Nørskov	Stanford University	4.1/4.0	
2003-08	B.Tech/M.Tech Mechanical Engineering	Indian Institute of Technology, Madras	9.18/10.0	**1**

Awards

2020 MIT Technology Review: Innovators Under 35
2019 Office of Naval Research **(ONR)**: **Young Investigator** Award
2018 **Alfred P. Sloan Fellow** in Chemistry
2018 George Tallman Ladd Award in College of Engineering, Carnegie Mellon 2 awardees in College of Engineering
2018 Faculty Fellow, Scott Institute for Energy innovation, Carnegie Mellon University
2017 Pittsburgh Magazine "40 under 40" award: 40 awardees in all areas
2016 National Science Foundation: **CAREER** award
2014 American Chemical Society: Petroleum Research Fund: New Investigator
2010 ECS Daniel Cubicciotti Award for electrochemistry research
2009 United Technologies Fellow for Sustainable Energy research, Stanford University
2009 ECS Herbert H. Uhlig Summer Fellow
2008 Best All-rounder (Institute Blues) award at IIT Madras
2008 Institute Merit prize at IIT Madras: Awarded for the best academic record in Mechanical Engineering
2003 Gold Medalist, Indian National Chemistry Olympiad

Publications

Google Scholar page: Citation Metrics: h-index: 36, i10-index: 66
ORCID: 0000-0003-1060-5495
As Corresponding author (at CMU) [List classified into categories]
Solid-State Electrolytes

1. C. Fu, V. Venturi, J. Kim, Z. Ahmad, A. W. Ells, V. Viswanathan, B. A. Helms, Universal Chemomechanical Design Rules for Solid-Ion Conductors to Prevent Dendrite Formation in Lithium Metal Batteries, **Nature Materials**, (2020) 19, 758–766.
2. Z. Hong, Z. Ahmad, V. Viswanathan, Design Principles for Dendrite Suppression with Porous Polymer/Aqueous Solution Hybrid Electrolyte for Zn Metal Anodes, **ACS Energy Lett.**, (2020) 5, 2466–2474.
3. K. B. Hatzell, X. C. Chen, C. L. Cobb, N. P. Dasgupta, M. B. Dixit, L. E. Marbella, M. T. McDowell, P. P. Mukherjee, A. Verma, V. Viswanathan, A. S. Westover, W. G. Zeier, Challenges in Lithium Metal Anodes for Solid-State Batteries, **ACS Energy Letters**, 5, 922–934.
4. Z. Hong, V. Viswanathan, Prospect of Thermal Shock Induced Healing of Lithium Dendrite, **ACS Energy Lett.**, (2019) 4, 1012-1019.
5. Z. Hong, V. Viswanathan, Phase-Field Simulations of Lithium Dendrite Growth with Open-Source Software, **ACS Energy Lett.**, (2018) 3, 1737-1743.
6. Z. Ahmad, V. Viswanathan, Stability of electrodeposition at solid-solid interfaces and implications for metal anodes, **Phys. Rev. Lett.**, (2017) 119, 056003.
7. Z. Ahmad, V. Viswanathan, Role of anisotropy in determining stability of electrodeposition at solid-solid interfaces, **Phys. Rev. Materials**, (2017) 1, 055403.
8. K. Kerman, A. Luntz, V. Viswanathan, Y.-M. Chiang, Z. Chen, Practical Challenges Hindering the Development of Solid State Li Ion Batteries, **J. Electrochem. Soc.** (2017) 164, A1731-A1744.
9. S. Li, A. Mohamed, V. Pande, H. Wang, J. Cuthbert, X. Pan, H. He, Z. Wang, V. Viswanathan, J. F. Whitacre, K. Matyjaszewski, Single-Ion Homopolymer Electrolytes with High Transference Number Prepared by Click Chemistry and Photoinduced Metal-Free Atom-Transfer Radical Polymerization, **ACS Energy Lett.**, (2017) 3, 20-27.

Liquid Electrolytes

10. Y. Zhu, V. Pande, L. Li, S. Pan, B. Wen, D. Wang, V. Viswanathan, Y.-M. Chiang, Design Principles for Self-forming Interfaces Enabling Stable Lithium Metal Anodes, **Proceedings of the National Academy of Sciences**, (2020), 117 27195-27203.
11. Z. Ahmad, Z. Hong, V. Viswanathan, Dendrite suppression of metal electrodeposition with liquid crystalline electrolytes, **Proceedings of the National Academy of Sciences**, (2020), 117 26672-26680.
12. R. May, Y. Zhang, S. Denny, V. Viswanathan, L. Marbella, Leveraging Cation Identity to Engineer Solid Electrolyte Interphases for Rechargeable Lithium Metal Anodes, **Cell Reports Physical Science**, (2020) 1, 100239.
13. S. Sripad, D. Korff, S. C. DeCaluwe, V. Viswanathan, Kinetics of lithium electrodeposition and stripping, **J. Chem. Phys.**, (2020) 153, 194701.
14. R. Kurchin, V. Viswanathan, Marcus-Hush-Chidsey kinetics at electrode–electrolyte interfaces, **J. Chem. Phys.**, (2020) 153, 134706.
15. Y. Zhang, V. Viswanathan, Not All Fluorination Is the Same: Unique Effects of Fluorine Functionalization of Ethylene Carbonate for Tuning Solid-Electrolyte Interphase in Li Metal Batteries, **Langmuir** (2020) 36, 11450-11466
16. Y. Zhang, D. Krishnamurthy, V. Viswanathan, Engineering Solid Electrolyte Interphase Composition by Assessing Decomposition Pathways of Fluorinated Organic Solvents in Lithium Metal Batteries, **Journal of The Electrochemical Society** 167, 070554.

17. V. Pande, V. Viswanathan, Descriptors for Electrolyte-Renormalized Oxidative Stability of Solvents in Lithium-Ion Batteries, **J. Phys. Chem. Lett.**, (2019) 10, 7031-7036.
18. A. Khetan, D. Krishnamurthy, V. Viswanathan, Towards Synergistic Electrode-Electrolyte Design Principles for Nonaqueous Li-O_2 batteries, **Top. Curr. Chem.**, (2018) 376, 11.
19. A. Khetan, H. R. Arjmandi, V. Pande, H. Pitsch, V. Viswanathan, Understanding Ion Pairing in High Salt Concentration Electrolytes using Classical Molecular Dynamics Simulations and its Implications for Nonaqueous Li-O_2 Batteries, **J. Phys. Chem. C**, (2018) 122, 8094-8101.
20. A. Khetan, H. Pitsch, V. Viswanathan, Effect of Dynamic Surface Polarization on the Oxidative Stability of Solvents in Nonaqueous Li-O_2 Batteries, **Phys. Rev. Materials**, (2017) 1, 045401.
21. C. M. Burke, V. Pande, A. Khetan, V. Viswanathan, and B. D. McCloskey, Enhancing electrochemical intermediate solvation through electrolyte anion selection to increase nonaqueous Li-O_2 battery capacity, **Proc. Natl. Acad. Sci. U S A**, (2015) 112, 9293-9298.
22. N.B. Aetukuri, B. D. McCloskey, L. Krupp, V. Viswanathan, and A. Luntz, Solvating Additives Drive Solution-mediated Electrochemistry and Enhance Toroid Growth in Non-aqueous Li-O_2 Batteries, **Nature Chemistry**, (2015) 7, 50-56.
23. V. Pande, V. Viswanathan, Criteria and Considerations for the Selection of Redox Mediators in Nonaqueous Li-O_2 Batteries, **ACS Energy Lett.**, (2016) 2, 60-63.
24. A. Khetan, A. Luntz, V. Viswanathan, Trade-offs in Capacity and Rechargeability in nonaqueous Li-O_2 Batteries: Solution-driven Growth vs Nucleophilic Stability. **J. Phys. Chem. Lett.**, (2015) 6, 1254-1259.
25. A. Khetan, H. Pitsch, V. Viswanathan, Identifying Descriptors for Solvent Stability in Nonaqueous Li-O_2 Batteries. **J. Phys. Chem. Lett.**, (2014) 5, 1318-1323.
26. A. Khetan, H. Pitsch, V. Viswanathan, Solvent Degradation in Nonaqueous Li-O_2 Batteries: Oxidative Stability versus H-abstraction. **J. Phys. Chem. Lett.**, (2014) 5, 2419-2424.
27. O. Sapunkov, V. Pande, A. Khetan, C. Choomwattana, V. Viswanathan, Quantifying the promise of 'beyond' Li-ion batteries, **Transl. Mater. Res.** (2015) 045002.
28. V. Viswanathan, Fundamental Challenges Facing Next-Generation Li-ion batteries, **J. Phys. Chem. Lett.**, (2015) 6, 4673-4674.
29. C. Schutter, T. Husch, V. Viswanathan, S. Passerini, A. Balducci, M. Korth, Rational design of new electrolyte materials for electrochemical double layer capacitors, (2016) **J. Power Sources**, 326, 541-548.

Autonomous Experimentation

30. A. Dave, J. Mitchell, K. Kandasamy, S. Burke, B. Paria, B. Poczos, J. Whitacre, V. Viswanathan, Autonomous discovery of battery electrolytes with robotic experimentation and machine-learning, **Cell Reports Physical Science**, (2020) 1, 100264.
31. J. F. Whitacre, J. Mitchell, A. Dave, S. Burke, V. Viswanathan, An Autonomous Electrochemical Test stand for Machine Learning Informed Electrolyte Optimization, **J. Electrochem. Soc.**, (2020) 166, A4181-4187.
32. A. Dave, K. L. Gering, J. Mitchell, J. Whitacre, V. Viswanathan, Benchmarking conductivity predictions of the Advanced Electrolyte Model (AEM) for aqueous systems, **J. Electrochem. Soc.**, (2020) 167, 013514.

Electrode and Material Design

33. H. Hafiz , K. Suzuki , B. Barbiellini , N. Tsuji , N. Yabuuchi, K. Yamamoto , Y. Orikasa , Y. Uchimoto, Y. Sakurai , H. Sakurai, A. Bansil, V. Viswanathan, Tomographic reconstruction of non-bonding oxygen orbitals in Li-rich battery materials, **Nature** (under revision) (2020).
34. P. Guan, R. J. Hemley, and V. Viswanathan, $\mathcal{P}^2$: Combining pressure and electrochemistry to synthesize superhydrides, arXiv preprint arXiv:2007.15613, PNAS (submitted).
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36. R. Park, C. Eschler, C. Fincher, A. Badel, Pin-wen Guan, M. Pharr, B. Sheldon , W. C. Carter, V. Viswanathan, Y-M. Chiang, Semi-Solid Alkali Metal Electrodes Enabling High Critical Current Densities in Solid Electrolyte Batteries, **Nature Energy** (under revision)
37. G. Houchins, V. Pande, V. Viswanathan, Mechanism for Singlet Oxygen Production in Li-Ion and Metal-Air Batteries, **ACS Energy Letters**, (2020), 5, 1893–1899.
38. V. Pande, V. Viswanathan, Computational Screening of Current Collectors for Enabling Anode-Free Lithium Metal Batteries, **ACS Energy Lett.**, (2019) 4, 2952-2959.
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40. O. Sapunkov, V. Pande, A. Khetan, V. Viswanathan, Role of Disorder in NaO_2 and Its Implications for Na-O_2 Batteries,**J. Phys. Chem. C**, (2018) 122, 18829-18835.
41. A. Lee, D. Krishnamurthy, V. Viswanathan, Exploring MXenes as Cathodes for Non-Aqueous Lithium-Oxygen Batteries: Design Rules for Selectively Nucleating Li_2O_2, **ChemSusChem**, (2018) 11, 1911-1918.
42. D. Steingart, V. Viswanathan, Comment on "Alternative strategy for a safe rechargeable battery", **Energy Environ. Sci.**, (2018) 11, 221-222.
43. C. Xu, Z. Ahmad, A. Aryanfar, V. Viswanathan, J. Greer, Enhanced strength and temperature dependence of mechanical properties of Li at small length scales and its implications for Li metal anodes, **Proc. Natl. Acad. Sci. U S A**, (2017) 114 (1), 57-61.
44. V. Viswanathan, V. Pande, K. M. Abraham, A. Luntz, B. D. McCloskey, D. Addison, Comment on "Cycling Li-O_2 batteries via LiOH formation and decomposition", **Science**, (2016) 352, 667.
45. D. Krishnamurthy, H. Hansen, V. Viswanathan, Universality in Nonaqueous Alkali Oxygen reduction on Metal Surfaces: Implications for Li-O_2 and Na-O_2 Batteries, **ACS Energy Lett.**, (2016) 1, 162-168.

Electrocatalysis

46. L. Kavalsky, V. Viswanathan, Robust Active Site Design of Single Atom Catalysts for Electrochemical Ammonia Synthesis,**J. Phys. Chem. C** (2020) 124, 23164–23176.
47. D.S. Roman, D. Krishnamurthy, R. Garg, H. Hafiz, N. Nuhfer, V. Viswanathan, T. Cohen-Karni, Engineering Three-Dimensional (3D) Out-of-Plane Graphene Edge Sites for Highly-Selective Two-Electron Oxygen Reduction Electrocatalysis, **ACS Catal.** (2020) 10, 3, 1993–2008.
48. R. Garg, D. P. Gopalan, S. C. de la Barrera, H. Hafiz, N. Nuhfer, V. Viswanathan, B. M. Hunt, T. Cohen-Karni, Electron Transport in Multidimensional Fuzzy Graphene Nanostructures, **Nano Lett.** (2019), 19, 5335-5339.
49. D. Krishnamurthy, V. Sumaria, V. Viswanathan, Maximal predictability approach for identifying the right descriptors for electrocatalytic reactions,**J. Phys. Chem. Lett.**, (2018) 9, 588-595.
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Restructuring of Nickel Sulfide Generates Optimally-Coordinated Active Sites for ORR Catalysis, **Joule**, (2017) 1, 600-612.

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53. V. Viswanathan, H. A. Hansen J. K. Nørskov, Selective Electrochemical Generation of Hydrogen Peroxide from Water Oxidation, **J. Phys. Chem. Lett.**, (2015) 6, 4224-4228.
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Machine Learning and Uncertainty quantification

55. M. Aykol, S. Babinec, D. Beck, B. Blaiszik, B-R. Chen, G. Crabtree , V. De Angelis , P. Dechent, M. Dubarry, E. Dufek, E. Eggleton, I. Foster, C. Gopal, P. Herring, D. Howey , V. Hu , J. Kubal, N. Paulson, Y. Preger, D. U. Sauer, K. Smith, S. Snyder, S. Sripad , T. Tanim , Q. Teo, V. Viswanathan*, L. Ward, Principles of a Battery Data Genome, Nature (under review) * denotes corresponding author.
56. D. Krishnamurthy, N. Lazouski, M. L Gala, K. Manthiram, and V. Viswanathan, Closed-Loop Design of Proton Donors for Lithium-Mediated Ammonia Production with Interpretable Models and Molecular Machine Learning, arXiv preprint arXiv:2008.08078, PNAS (submitted).
57. M. Babar, H. L. Parks, G. Houchins, V. Viswanathan, An accurate machine learning calculator for the lithium-graphite system, J. Phys. Energy, (2020) DOI: 10.1088/2515-7655/abc96f.
58. Z. Hong, V. Viswanathan, Open-sourcing phase-field simulations for accelerating energy materials design and optimization, **ACS Energy Lett.**, (2020) 5, 3254-3259.
59. V. Venturi, H. L. Parks, Z. Ahmad, V. Viswanathan, Machine learning enabled discovery of application dependent design principles for two-dimensional materials **Machine Learning: Science and Technology**, (2020) 1, 035015.
60. G. Houchins, V. Viswanathan, An accurate machine-learning calculator for optimization of Li-ion battery cathodes, **J. Chem. Phys.** (2020) 153, 054124.
61. H. L. Parks, H-Y. Kim, V. Viswanathan, A. McGaughey, Uncertainty quantification in first-principles predictions of phonon properties and lattice thermal conductivity, **Physical Review Materials** (2020) 4, 083805.
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63. G. Houchins, D. Krishnamurthy, V. Viswanathan, The role of uncertainty quantification and propagation in accelerating the discovery of electrochemical functional materials, **MRS Bulletin**, (2019) 44, 204-212.
64. H. L. Parks, A. McGaughey, V. Viswanathan, Uncertainty Quantification in First-Principles Predictions of Harmonic Vibrational Frequencies of Molecules and Molecular Complexes, **J. Phys. Chem.**, (2019) 123, 4072-4084.
65. D. Krishnamurthy, V. Sumaria, V. Viswanathan, Quantifying Robustness of DFT Predicted Pathways and Activity Determining Elementary Steps for Electrochemical Reactions, **J. Chem. Phys.**, (2019)

150 (4), 041717.

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69. O. Vinogradova, D. Krishnamurthy, V. Pande, V. Viswanathan, Quantifying Confidence in Density Functional Theory Predicted Surface Pourbaix Diagrams at Solid-Liquid Interfaces and its Implications for Electrochemical Processes, **Langmuir**, (2018) 34, 12259-12269.
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Electrification: System Analysis

73. A. Mohan, S. Sripad, P. Vaishnav, V. Viswanathan, Trade-offs between automation and light vehicle electrification, **Nature Energy**, (2020) 5, 543–549.
74. V. Viswanathan, A. Epstein, Y.-M. Chiang, E. Takeuchi, M. Bradley, J. Langford, M. Winter, Flying High on Batteries: The Daunting Electric Aircraft Challenge, Nature (2020) Invited Perspective (under review).
75. A Bills, S Sripad, WL Fredericks, M Singh, V Viswanathan, Performance metrics required of next-generation batteries to electrify commercial aircraft, **ACS Energy Letters** (2020) 5, 663-668.
76. S. Sripad, T. Mehta, A. Srivastava, V. Viswanathan, The Future of Vehicle Electrification in India May Ride on Two Wheels, **ACS Energy Lett.**, (2019) 4, 2691-2694.
77. S. Sripad, V. Viswanathan, Quantifying the Economic Case for Electric Semi-Trucks, **ACS Energy Lett.**, (2019) 4, 149-155.
78. V. Viswanathan, B. M. Knapp, Potential for Electric Aircraft, **Nature Sustainability**, (2019), 2, 88-89.
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Biomaterials

85. O. Sapunkov, A. Khetan, V. Pande, V. Viswanathan, Theoretical Characterization of Structural Disorder in the Tetramer Model Structure of Eumelanin, **Phys. Rev. Materials**, (2019) 3, 105403.

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87. Y. J. Kim, A. Khetan, W. Wu, S-E. Chun, V. Viswanathan, J. Whitacre, C. J. Bettinger, Evidence of Porphyrin-like Structures in Natural Melanin Pigments Using Electrochemical Fingerprinting, **Adv. Mater.**, (2016) 28, 3173-3180.

Prior to CMU

88. V. Viswanathan, K. Pickrahn, A. Luntz, S. Bent and J. K. Nørskov, Nano-scale limitations in metal oxide electrocatalysts for oxygen evolution, **Nano Letters**, (2014) 14, 5853-5857.

89. H. S. Casalongue, S. Kaya, V. Viswanathan, D. J. Miller, D. Friebel, H. A. Hansen, J. K. Nørskov, A. Nilsson, H. Ogasawara, Direct observation of the oxygenated species during oxygen reduction on a platinum fuel cell cathode, **Nature Communications**, (2013) 4, 2817.

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108. V. Viswanathan, V. Rai, and H. Pitsch, First-principles-based reaction kinetics model for oxygen reduction reaction on $Pt_3Ni(111)$, **ECS Trans.** 25 (1), 1353 (2009).

Patents

1. Y.-M. Chiang, L. Li, D. Wang, V. Viswanathan, V. Pande, Electrolytes for Lithium Metal Electrodes and Rechargeable Batteries using Same, U.S. Patent Application No. 16/430,803.
2. M. Guttenberg, S. Sripad, V. Viswanathan, Placement of electric vehicle chargers and skyports., Provisional Application No. 62/973,541.
3. V. Pande, Y.-M. Chiang, V. Viswanathan, Current Collectors for Enabling Anode-free Lithium Metal Batteries, Provisional Application No. 62/922,648.
4. Y.-M. Chiang, P. Guan, Z. Hong, R. Park, S. Sripad, V. Viswanathan, High Performance Solid Electrolyte Batteries, Provisional Application No. 62/863,144.
5. G. Houchins, V. Viswanathan, Electrochemical Synthesis of Cementitious Compounds, Provisional Application Filed.
6. D. Krishnamurthy, Z. Schiffer, K. Manthiram, V. Viswanathan, Ionic Liquid Based Materials and Catalysts for Hydrogen Release, Provisional Application Filed.
7. Y.-M. Chiang, V. Viswanathan, L. Li, V. Pande, D. Krishnamurthy, Z. Ahmad, W.H. Woodford, Lithium Metal Electrodes and Batteries Thereof, US Patent 20170288281, WO Patent 2017176936. **Licensed by 24M Technologies Inc.**

8. P. Bai, M. Bazant, V. Viswanathan, “A lithium-bromine rechargeable electrochemical system and applications thereof”, U.S. Patent , WO 2016191551
9. P. Albertus, V. Viswanathan, J. Christensen, B. Kozinsky, R. Sanchez-Carrera, T/ Lohmann, High specific-energy Li/O_2-CO_2 battery, US Patent 20120094193, WO Patent 2013077870, EP Patent EP2792015 (Granted).

External Funding (Active) (Award amounts are the PI portion)

1. Title: **High-fidelity Accelerated Design of High-performance Electrochemical Systems**
    - Source: ARPA-E DIFFERENTIATE.
    - Award Amount: $1,581,103
2. Title: **CAREER**: **Engineering electrode-electrolyte interfaces through electrolyte selection for improved performance in lithium-air batteries and fuel cell electrocatalysis**
    - Source: National Science Foundation.
    - Award Amount: $500,000
3. Title: **Fast-Discharge Capable Batteries**
    - Source: Aurora Flight Sciences.
    - Award Amount: $250,000
4. Title: **Large-Area Lithium Electrode Sub-Assemblies (LESAs) Protected by Self-Forming Microstructured Polymer-inorganic Single-ion Conducting Composites**
    - Source: ARPA-E IONICS.
    - Award Amount: $613,312+$110,000
5. Title: **Metal Hydrides**
    - Source: Google
    - Award Amount: $50,000
6. Title: **Design Principles for Tunable Electrode-Electrolyte Interfaces**
    - Source: Alfred P. Sloan Foundation
    - Award Amount: $65,000
7. Title: **Towards a Comprehensive Understanding through Coupled Theoretical-Experimental Analysis of Dendrite Nucleation and Mitigation in Current and Next-Generation Li-Ion Battery Anodes**
    - Source: Office of Naval Research
    - Award Amount: $500,000
8. Title: **Machine Learning Unified Synchronous Experimentation (MUSE): Autonomous Experimental Discovery/Optimization of Novel Electrode and Electrolyte Materials**
    - Source: Toyota Research Institute.
    - Award Amount: $1,132,915
9. Title: **Advanced PGM-free Cathode Engineering for High Power Density and Durability**
    - Source: DOE Energy Efficiency and Renewable Energy.
    - Award Amount: $211,388
10. Title: **Platooning for Improved Safety and Efficiency of Semi-trucks (PISES)**
    - Source: Department of Transportation, Mobility21 National University Transportation Center.
    - Award Amount: $280,000
11. Title: **Electric and Hybrid Electric Flights**
    - Source: Zunum Aero Inc.
    - Award Amount: $100,000
12. Title: **SEED**: **System for Electrolyte Exploration and Discovery**
    - Source: Quantumscape Corp.
    - Award Amount: $10,000

External Funding (Past) (Award amounts are the PI portion)

1. Title: **Batteries for electric vertical take-off and landing aircraft**
   - Source: Airbus A^3
   - Award Amount: $270,000
2. Title: **Defending Cyberattacks on Electric, Hybrid, and AV Battery Systems**
   - Source: Department of Transportation, University Transportation Center.
   - Award Amount: $127,500
3. Title: **Electrolyte Design through Physics Driven Machine Learning**.
   - Source: Commonwealth of Pennsylvania PITA program.
   - Award Amount: $105,000
4. Title: **Analyzing and Defending CyberAttacks on Electric & Autonomous Vehicle Battery Systems**
   - Source: Commonwealth of Pennsylvania PITA program.
   - Award Amount: $122,803
5. Title: **Identification of electrocatalysts and reaction mechanisms for electrochemical conversion of methane to methanol using density functional theory**
   - Source: ACS Petroleum Research Fund.
   - Award Amount: $110,000
6. Title: **Data-driven discovery of Resilient Energy Storage for Grid Applications**
   - Source: Siebel Energy Institute.
   - Award Amount: $50,000
7. Title: **Enhancing the Oxygen Reduction Reaction for Polymer Electrolyte Membrane (PEM) Fuel Cells**
   - Source: Volkswagen.
   - Award Amount: $450,000

Postdoctoral Scholars

1. Pinwen Guan (Ph.D., Materials Science, Penn State University) 2018-
2. Rachel Kurchin (Ph.D., Materials Science, MIT) 2019-
3. Lei Zhang (Ph.D., Materials Science, Georgia Tech), 2020-
4. Dong Zhang (Ph.D., UC Berkeley), 2020-
5. Gregory Houchins (Ph.D., Carnegie Mellon), 2020-

PhD Students

1. Dilip Krishnamurthy (MechE) 2015-
2. Olga Vinogradova (ChemE) 2016-
3. Matthew Guttenberg (MechE) 2017-
4. Victor Venturi (MechE) 2017-
5. Holden Parks (MechE) 2017-
6. Adarsh Dave (MechE) 2017-
7. Yumin Zhang (MS&E) 2017-
8. Shashank Sripad (MechE) 2018-
9. Alexander Bills (MechE) 2018-
10. Varun Shankar (MechE) 2018-
11. Venkatesh Krishnamurthy (MS&E) 2018-

12. Aniruddh Mohan (EPP) 2018-
13. Mgcini Keith Phuthi (MechE) 2019-
14. Lance Kavalsky (MechE) 2019-
15. Mohd Babar (MechE) 2019-
16. Shang Zhu (MechE) 2019-
17. Alexius Wadell (MechE) 2020-
18. Jiankun Pu (MechE) 2020-
19. Lydia Maria Tsiverioti (MechE) 2020-
20. Mingze Yao (MechE), 2020-

Research Staff

1. Vedant Puri, 2020-
2. Paul Shen, 2020-
3. Ernest Zhang, 2020-

Masters Students

1. Hongyi Lin 2019-
2. Xiaoyu Sun 2020-

Former Post-docs

1. Zijian Hong (Ph.D., Materials Science, Penn State University) 2017-2020, Currently Faculty, Zhejiang University
2. Abhishek Khetan (Ph.D. RWTH Aachen) 2017-2018, Tenure-track faculty, RWTH Aachen (2021).
3. Hasnain Hafiz (Ph.D., Physics, Northeastern University) 2018-2020, Currently Post-doc at Los Alamos National Laboratory

Graduated Students (PhD)

1. Vikram Pande 2014-2019 (currently Research Engineer at Bosch RTC, USA)
2. Oleg Sapunkov 2014-2019 (currently at U.S. Army TARDEC)
3. Zeeshan Ahmad (MechE) 2015-2020 (currently postdoc at U. Chicago)
4. Gregory Houchins (Physics) 2015-2020 (currently Swartz Innovation Fellow at Carnegie Mellon, Co-Founder, Chement)

Graduated Students (Masters and Undergraudate)

1. Siddharth Deshpande 2014-2015 (currently Ph.D. student at Purdue University)
2. Vaidish Sumaria 2016-2017 (currently Ph.D. student at University of California, Los Angeles)
3. Andrew Lee 2016-2018 (currently Ph.D. student at Northwestern University)
4. Yoolhee Kim, (ESTP) 2016-2017 (currently Data-scientist at Citrine Informatics)
5. Mikael Matossian, (ESTP) 2016-2017 (currently Green Energy Engineer at United Nations Development Programme)
6. Andrew Sams (ESTP) 2016-2017 (currently Consultant at West Monroe Partners)
7. Thomas Alumoottil (MechE) 2016-2017 (currently Safety CAE Integration Engineer at General Motors)
8. Siying Li (ChemE) 2018-2019 (currently Ph.D. student at University of California, Berkeley)

Teaching Highlights

- 24-721, Instructor, Advanced Thermodynamics, Fall 2018, FCE Score 4.45/5.0, Fall 2016, FCE Score 4.43/5.0, Fall 2014, FCE Score 5.0/5.0.
- 24-643, Instructor, Electrochemical Energy Storage Systems, Fall 2019 FCE 4.23/5.0, Fall 2017 FCE 4.18/5.0 Spring 2016 FCE Score 4.46/5.0.
- Statistical Thermodynamics: Molecules to Machines, CMU's first Massive Online Open Course (MOOC) offered through Coursera. Enrollment: 10,000+, Completion rate: ∼20%.
- Teaching Innovation Award, Finalist, Carnegie Mellon University.

Media Discussion of Work and Quotes

WIRED (Semi-Trucks)
Reuters-1 (Semi-Trucks)
Reuters-2 (Semi-Trucks)
Washinton Post (Semi-Trucks)
The Economist (Semi-Trucks)
Fortune (Semi-Trucks)
MIT Tech. Review (Semi-Trucks)
Business Insider (Semi-Trucks)
The Drive (Semi-Trucks)
Real Engineering (Semi-Trucks)
Quartz (EV Batteries)
The Drive (EV Powertrains)
Axios (Pickup Trucks)
The Drive (Electric Hypercars)
Axios (Battery Sizing)
Inverse (Semi-Trucks)
Futurism (Semi-Trucks)
MIT Tech. Review (Electric Flights)
Quartz (Tesla/ Ultracapacitors)
MIT Tech. Review (Electric Flights)
Inside Science (Electric Flights)
Tech Xplore (ML Safer Batteries)
Freight Waves (Semi-Trucks)
MIT Tech. Review (EVs)
Electrek (Jaguar I-Pace)
Quartz (China, Batteries)
Quartz (Batteries)
Quartz (Batteries)
MIT Tech. Review (Batteries)
WIRED (Electric Flights)
Wall Street Journal (Galaxy Note)
Axios (Electric Flights)
Axios (Electric Vehicles)
Inside EVs (Tesla Roadster)
Jalopnik (Tesla Roadster)
Wall Street Journal (Semi-Trucks)
Quartz (Batteries)
Trib. Live (Electric Vehicles)
Cleantechnica (Batteries)
Air & Space Magazine
Quartz (Batteries)
WIRED (Battery Safety)
Inverse (E-Cigarette Fires)
MIT News (Batteries)
The Drive (Electric Vehicle Motors)
MIT News (Batteries)
MIT News (Grid Storage)
Quartz (Batteries)
Chemistry World (Li-air Batteries)
Scientific American (Hype Chart)
Big Think (Batteries)
Phys.org (Water Purification)
Quartz (Batteries)
Design News (Batteries)
Inside EVs (Batteries)
Consumer Reports (Batteries)
Jaloponik (Autonomous Vehicles)

Other media highlights

Appeared on National television CBS This Morning
Appeared on Bloomberg Green

External Service Highlights

- Organizer, Battery Modeling Webinar Series (BMWS): Weekly webinar series promoting early-career researchers
- Organizer, Scientific Machine Learning Webinar Series
- Editorial Advisory Board, ACS Energy Letters
- Executive member of APS Topical Group on Energy Research and Applications (GERA)
- Organized Telluride Meeting on "Molecular Chemistry in Electrochemical Energy Storage" in 2018