

Roseanne Warren, Ph.D., P.E.

Advanced Energy Innovations Laboratory, University of Utah
1495 E 100 S (2553 MEK), Salt Lake City, UT 84112

Phone: (801) 585-1758 Email: roseanne.warren@utah.edu

Web: <http://advancedenergy.mech.utah.edu>

EDUCATION

Institution	Location	Major	Degree, Year
University of California, Berkeley	Berkeley, CA	Mechanical Engineering	Ph.D., 2015
<i>Dissertation:</i> High Energy Density Metal Oxide and Conducting Polymer Supercapacitors <i>Advisor:</i> Liwei Lin, Ph.D.			
Stanford University	Stanford, CA	Mechanical Engineering	M.S., 2009
Stanford University	Stanford, CA	Mechanical Engineering	B.S., 2008

APPOINTMENTS

01/16 – Present Assistant Professor, Dept. of Mechanical Engineering, University of Utah

RESEARCH INTERESTS

My research investigates new nanomaterial structures and advanced nanofabrication techniques for electrochemical energy storage and microfluidic applications. Areas of expertise include: supercapacitors (carbon double layer capacitors; conducting polymer and metal-oxide based pseudocapacitors); sodium-and lithium-ion batteries; battery life cycle assessment; top-down and bottom-up nanofabrication processes (carbon nanotube synthesis, atomic layer deposition, nanosphere lithography, two-photon direct write laser lithography).

SCIENTIFIC AND PROFESSIONAL SOCIETIES

ECS The Electrochemical Society (Energy Technology Division Member, Battery Division Member-at-Large)

PUBLICATIONS

(Underlined indicates student advisees)

1. Tim Kowalchik, Fariha Khan, Paige Leland, Katrina Le, Shad Roundy, and **Roseanne Warren**, “Effect of Pore Structure on the Piezoelectric Properties of Barium Titanate-Polyvinylidene Fluoride Composite Films,” Under review with *Smart Materials and Structures*.
2. Fariha Khan, Tim Kowalchik, Tanner Nelson, Aaron Atnip, Johnathon Johnson, Jeremiah Young, Connor Siri, Adam Dallon, and **Roseanne Warren**, “Design of Heated Cells for *In-situ* Absorption and Reflectance UV-Vis Spectroelectrochemistry,” Under review with *Journal of The Electrochemical Society*.
3. Douglas Pedersen, Michael Lybbert, and **Roseanne Warren**, “Life Cycle Analysis of LiCoO₂/Graphite Batteries with Cooling using Combined Electrochemical-Thermal Modeling,”

- Resources, Conservation & Recycling*, Vol. 180, pp. 106204, 2022, DOI: 10.1016/j.resconrec.2022.106204.
4. Talha Razaulla, Olivia M. Young, Abdullah Alsharhan, Ryan D. Sochol, and **Roseanne Warren**, “Deterministic lateral displacement using hexagonally arranged, bottom-up-inspired micropost arrays,” *Analytical Chemistry*, 2022, DOI: 10.1021/acs.analchem.1c03035.
 5. Jaron Moon, Virginia Diaz, Dhruv Patel, Robert Underwood, and **Roseanne Warren**, “Dissolvable conducting polymer supercapacitor for transient electronics,” *Organic Electronics*, Vol. 101, pp. 106412, 2022.
 6. Talha Razaulla, Michael Bekeris, Haidong Feng, Michael Beeman, Ugochukwu Nze, and **Roseanne Warren**, “Multiple Linear Regression Modeling of Nanosphere Self-Assembly via Spin Coating,” *Langmuir*, Vol. 47, no. 42, pp.12419-12428, 2021.
 7. Michael Lybbert, Zahra Ghaemi, A.K. Balaji, and **Roseanne Warren**, “Integrating life cycle assessment and electrochemical modeling to study the effects of cell design and operating conditions on the environmental impacts of lithium-ion batteries,” *Renewable & Sustainable Energy Reviews*, Vol. 144, pp. 111004, 2021.
 8. Fariha Khan, Timothy Kowalchik, Shad Roundy, and **Roseanne Warren**, “Stretching-induced phase transitions in barium titanate-poly(vinylidene fluoride) flexible composite piezoelectric films,” *Scripta Materialia*, Vol. 193, pp. 64-70, 2021.
 9. Michael Bekeris, Takara Truong, Stephen Carron, Zahra Karimi, Haidong Feng, Ugochukwu Nze, Michael Beeman, Ryan D. Sochol, and **Roseanne Warren**, “Rapid Quantification of Nanosphere Lithography Packing Defects Using Scanning Electron Microscopy Edge Effects,” *physica status solidi (RRL) - Rapid Research Letters*, Vol. 14, pp. 20032, 2020.
 10. Abdullah T. Alsharhan, Anthony J. Stair, Ruben Acevedo, Talha Razaulla, **Roseanne Warren**, and Ryan D. Sochol, “Direct Laser Writing for Deterministic Lateral Displacement of Submicron Particles,” *Journal of Microelectrochemical Systems*, Vol. 29, pp. 906-911, 2020.
 11. Abdullah T. Alsharhan, Ruben Acevedo, **Roseanne Warren**, and Ryan D. Sochol, “3D microfluidics via cyclic olefin polymer-based *in-situ* direct laser writing,” *Lab on a Chip*, Vol. 19, pp. 2799-2810, 2019. DOI: 10.1039/C9LC00542K (*Featured on the front cover of Lab on a Chip and in American Scientist, November-December 2019*).
 12. Nolan Ingersoll, Zahra Karimi, Dhruv Patel, Robert Underwood, and **Roseanne Warren**, “Metal Organic Framework-Derived Carbon Structures for Sodium-Ion Battery Anodes,” *Electrochimica Acta*, Vol. 297, pp. 129-136, 2019. DOI: 10.1016/j.electacta.2018.11.140.
 13. Xining Zang, Caiwei Shen, Emmeline Kao, **Roseanne Warren**, Ruopeng Zhang, Kwok Siong Teh, Junwen Zhong, Minsong Wei, Buxuan Li, Yao Chu, Mohan Sanghadasa, Adam Schwartzberg, and Liwei Lin, "Titanium Disulfide Coated Carbon Nanotube Hybrid Electrodes Enable High Energy Density Symmetric Pseudocapacitors," *Advanced Materials*, Vol. 30, pp. 1704754, 2018. DOI: 10.1002/adma.201704754.

14. Casey Glick, Mitchell Srimongkol, Aaron Schwartz, William Zhuang, Joseph Lin, **Roseanne Warren**, Dennis Tekell, Panitan Satamalee, and Liwei Lin, "Rapid Assembly of Multilayer Microfluidic Structures via 3D Printed Transfer Molding and Bonding," *Microsystems & Nanoengineering*, Vol. 2, pp. 16063, 2016. DOI: 10.1038/micronano.2016.63.
15. Emmeline Kao, Chen Yang, **Roseanne Warren**, Alina Kozinda, and Liwei Lin, "ALD Titanium Nitride on Vertically Aligned Carbon Nanotube Forests for Electrochemical Supercapacitors," *Sensors and Actuators A: Physical*, Vol. 240, pp. 160-166, 2016. DOI: 10.1015/j.sna.2016.01.044.
16. Guoqing Chang, Xuefeng Zhu, Aike Li, Weiwei Kan, **Roseanne Warren**, Ruiguo Zhao, Xiaoliang Wang, Gi Xue, Jianyi Shen, and Liwei Lin, "Formation and self-assembly of 3D nano fibrous networks based on oppositely charged jets," *Materials & Design*, Vol. 97, pp. 126-130, 2016. DOI: 10.1016/j.matdes.2016.02.069.
17. **Roseanne Warren**, Firas Sammoura, Fares Tounsi, Mohan Sanghadasa and Liwei Lin, "Highly Active Ruthenium Oxide Coating via ALD and Electrochemical Activation in Supercapacitor Applications," *Journal of Materials Chemistry A*, Vol. 3, pp. 15568-15575, 2015. DOI: 10.1039/C5TA03742E.
18. **Roseanne Warren**, Firas Sammoura, Kwok Siong Teh, Alina Kozinda, Xining Zang, and Liwei Lin "Electrochemically Synthesized and Vertically Aligned Carbon Nanotube-Polypyrrole Nanolayers for High Energy Storage Devices," *Sensors and Actuators - A Physical*, Vol. 231, pp. 65-73, 2015. DOI: 10.1016/j.sna.2014.07.010.
19. Guoqing Chang, Zhen Cheng, **Roseanne Warren**, Guoxia Song, Jianyi Shen, and Liwei Lin, "Highly Efficient Photocatalysts of Surface Hybridization of TiO₂ Nanofibers with Carbon Films," *ChemPlusChem*, Vol. 80, pp. 827-831, 2015. DOI: 10.1002/cplu.201402427.
20. Guoqing Chang, Xuefeng Zhu, **Roseanne Warren**, Xu Wang, Tianzhen He, Liwei Lin, and Jianyi Shen, "Electrospinning of Micro Spiral Fibers," *Materials Research Express*, Vol. 1, 015302, 2014. DOI: 10.1088/2053-1591/1/1/015302.

CONFERENCE PROCEEDINGS & PRESENTATIONS

1. Adira Colton, Olivia Young, Talha Razaulla, **Roseanne Warren**, and Ryan D. Sochol, "Toward Deterministic Lateral Displacement-Based Continuous-Flow Microfluidic Particle Reactors via Direct Laser Writing," *Proceedings of the 20th Solid-State Sensors, Actuators and Microsystems Workshop (Hilton Head 2022)*, Hilton Head Island, SC, USA. (Accepted)
2. Talha Razaulla, Olivia Young, Abdullah T. Alshahran, Ryan D. Sochol, and **Roseanne Warren**, "Deterministic Lateral Displacement via Self-Assembly-Based Hexagonally Arranged Triangular Posts," *Proceedings of the 25th International Conference on Miniaturized Systems for Chemistry and Life Sciences (μ TAS 2021)*, Palm Springs, October 2021 (Poster Presentation).

3. Douglas Pedersen, Michael Lybbert, and **Roseanne Warren**, “Life Cycle Assessment of LiCoO₂/Graphite Batteries with Cooling Using Dualfoil Simulations and Simulink Modeling,” *Proceedings of the 240th ECS Meeting*, Online meeting, October 2021 (Oral presentation).
4. Tanner Nelson, Aaron Atnip, Johnathon Johnson, Jeremiah Young, Connor Siri, Adam Dallon, Fariha Khan, Timothy Kowalchik, and **Roseanne Warren**, "Design of a Spectroelectrochemical Cell with Rapid Heating and Temperature Control for Battery Applications," *Proceedings of the 239th ECS Meeting*, Online meeting, May 2021 (Oral presentation).
5. Zahra Karimi, Jaron Moon, Chanel Van Ginkel, Douglas Pedersen, Joshua Malzahn, Eric Eddings, and **Roseanne Warren**, “Bituminous coal char-derived hard carbon as a low-cost anode material for sodium-ion batteries,” *Proceedings of the 239th ECS Meeting*, Online meeting, May 2021 (Oral presentation).
6. Zahra Karimi, Jaron Moon, Chanel Van Ginkel, Douglas Pedersen, Joshua Malzahn, Eric Eddings, and **Roseanne Warren**, “Effect of electrolyte composition on the performance of coal char-derived carbon supercapacitors,” *Proceedings of the 239th ECS Meeting*, Online meeting, May 2021 (Oral presentation).
7. Nolan Ingersoll, Robert Underwood, and **Roseanne Warren**, “MOF-Derived Carbons As Ordered Isoreticular Structures for High-Performance Sodium-Ion Battery Anode,” *Proceedings of the 233rd ECS Meeting*, Seattle, Washington, May 2018 (Oral presentation).
8. Virginia Diaz and **Roseanne Warren**, “Dissolvable Conducting Polymers for Electrochemical Energy Storage,” *Proceedings of the 231st ECS Meeting*, New Orleans, Louisiana, May 2017 (Oral presentation).
9. Casey C. Glick, Mitchell T. Srimongkol, William Zhuang, Joseph Lin, Aaron Schwartz, **Roseanne Warren**, Dennis Tekell, Panitan Satimalee, Judy Kim, Caroline Su, Kyungna Kim, and Liwei Lin, "Fabrication of Double-sided Microfluidic Structures via 3D Printed Transfer Molding," *Proceedings of the Hilton Head Workshop 2016: A Solid-State Sensors, Actuators and Microsystems Workshop*, June 5-9, Hilton Head Island, SC, 2016.
10. **Roseanne Warren**, and Liwei Lin, “Performance Limitations in Resistive-Capacitive Porous Super capacitor Electrodes,” *Proceedings of 29th IEEE Micro Electro Mechanical Systems Conference*, pp. 1208-1211, Shanghai, China, Jan. 2016 (Poster presentation).
11. Emmeline Kao, Chen Yang, **Roseanne Warren**, Alina Kozinda, and Liwei Lin, “ALD Titanium Nitride Coated Carbon Nanotube Electrodes for Electrochemical Supercapacitors,” *18th International Conference on Solid-State Sensors, Actuators and Microsystems Transducers 2015*, pp. 498-501, Anchorage Alaska, June 2015 (Oral presentation).
12. **Roseanne Warren**, Firas Sammoura, Alina Kozinda, and Liwei Lin, “ALD Ruthenium Oxide-Carbon Nanotube Electrodes for Supercapacitor Applications,” *Proceedings of 27th IEEE*

Micro Electro Mechanical Systems Conference, pp. 167-170, San Francisco, Jan. 2014 (Oral presentation).

13. Vishnu Jayaprakash, Ryan D. Sochol, **Roseanne Warren**, Kosuke Iwai and Liwei Lin, “Graphene Electrodes Enhance Performance for Micro-Liter Scale Microbial Fuel Cells,” *Proceedings of 27th IEEE Micro Electro Mechanical Systems Conference*, pp. 393-396, San Francisco, Jan. 2014 (Poster presentation).
14. Vishnu Jayaprakash, Ryan D. Sochol, **Roseanne Warren**, Alina Kozinda, Kosuke Iwai and Liwei Lin, “Stackable Cow Dung Based Microfabricated Microbial Fuel Cells,” *Proceedings of 26th IEEE Micro Electro Mechanical Systems Conference*, pp. 881-884, Taipei, Taiwan, Jan. 2013 (Poster presentation).
15. **Roseanne Warren**, John Reifenberg, and Kenneth Goodson, “Compact Thermal Model for Phase Change Memory Nanodevices,” *Proceedings of the 11th Intersociety Conference on Thermal and Thermomechanical Phenomena in Electronic Systems*, pp. 1018-1045, Orlando, FL, May 2008 (Oral Presentation).

PATENTS

Roseanne Warren, Firas Sammoura, and Liwei Lin, “Fabrication of enhanced supercapacitors using atomic layer deposition of metal oxide on nanostructures,” US Patent Application No. 14/602,104 (publication number: US20150303001 A1).

RESEARCH GRANTS

National Science Foundation, CMMI, Advanced Manufacturing, “*CAREER: Roll-to-Roll Fabrication of Porous Materials Using Nanobubble Templates*,” Award #1943907, 08/15/20-08/14/25, \$500,000, Role: PI.

National Science Foundation, CCSS, Nanomanufacturing, “*Pyroelectrochemical Cell: Enabling Intelligent Self-Powered Systems via Direct Conversion of Thermal Energy to Stored Electrochemical Energy*,” Award #1936636, 09/15/19-08/31/22, \$350,000. Role: PI

University of Utah Vice President for Research, Research Instrumentation Fund Award, “*Electrochemistry package for in-situ TEM*”, 11/01/18-10/31/19, \$12,613.67. Role: PI.

National Science Foundation, “*MRI: Acquisition of a 3-D Nanolithography System*”, Award #1828480, 10/01/18-09/30/21, \$615,815. Role: Co-PI.

National Science Foundation, CMMI, Nanomanufacturing, “*Collaborative Research: Liquid Phase Atomic Layer Deposition of Thin Films on Nanoparticles Using Three-Dimensionally Printed Microfluidics*,” Award #1761273, 07/18-06/21, \$168,737. Role: PI

University of Utah Vice President for Research, Research Incentive Seed Grant Program, “*Metal Organic Framework-Derived Carbons for Sodium-Ion Battery Anodes*,” 07/17-06/18, \$33,245. Role: PI

ADVISING

PhD Graduates (Committee Chair)

Fariha Khan, 05/2018 – 01/2022 (Graduated Spring 2022) (Co-advised with Shad Roundy)

PhD Students

Jaron Moon, 08/2020 – present (*Expected graduation: 05/24*)
Anayet Siddique, 08/2020 – present (*Expected graduation: 05/24*)
Tim Kowalchik, 01/2020 – present (*Expected graduation: 12/23*)
Talha Razauulla, 08/2018 – present (*Expected graduation: 05/22*)
Zahra Karimi, 01/2018 – present (*Expected graduation: 05/22*)

MS-Thesis Graduates

Nolan Ingersoll, 05/2016 – 05/2018 (Graduated Spring 2018)
Virginia Diaz, 05/2016 – 08/2017 (Graduated Fall 2017)

MS-Thesis Students

Douglas Pedersen, 08/2020 – present (*Expected graduation: 05/22*)(Thesis)

Undergraduate Research Students

Jeffrey Perry, 05/2021 – present
Gavin Sultz, 01/2021 – 05/2021
Chanel van Ginkel 10/2020 – present (UROP-funded, SPUR-funded)
Paige Leland, 08/2020 – present (NSF REU-funded)
Katrina Le, 08/2020 – present (NSF REU-funded)
Daniel Wakeham, 08/2020-present
Henry Crandall, 08/2020-present
Misha Bekeris, 08/2018 – 05/2020 (UROP-funded)
Takara Truong, 08/2016 – 05/2020 (UROP-funded)
Samuel Engebretsen, 03/2018 – 12/2019 (UROP-funded)
Robert Underwood, 01/2017 – 04/2019 (UROP-funded)
Katherine Vega, 02/2018-05/2019 (UROP-funded)
Muhammad Mahadzir, 12/2018 – 05/2019
Brian Carlson, 05/2017- 08/2017
Sean Lund, 08/2016 – 12/2016

Senior Design Projects

2020-2021: “Self-Charging Battery” by Aaron Atnip, Adam Dallon, Johnathon Johnson, Tanner Nelson, Connor Siri, and Jeremiah Young.

2019-2020: “Microfluidoscope” by Mohammed Al-Ibrahim, Thomas Barber, David Bore, Rowdy DeJong, Erik Langlo, and Alex Pranger.

2016-2017: “Cradle-to-Cradle Coffee Maker” by Rumal Kaluarachchi, Sierra Krippner, Katie Talda, and Marie VanderVliet.

INSTRUCTION

Engineering Design I First course in the two-semester senior-level capstone design sequence. Lectures on and team assignments leading to the completion of the preliminary design phase including: concept generation and selection, preliminary design, prototype testing, engineering analysis, and project management. Culminates in design review based on formal presentations and a prototype demonstration. *ME EN 4000 at the University of Utah: 42 students Spring 2016, 68 students Spring 2017, 106 students Fall 2017, 97 students Fall 2018, 102 students Fall 2019, 125 students Fall 2020.*

Engineering Design II Second course in the two-semester senior-level capstone design sequence. Lectures on and team assignments leading to the completion of the detailed design phase including: detailed engineering design, application of machine elements, prototype testing, engineering analysis, application of standards, and preliminary economic analyses. Culminates in ME Department Design Day poster presentations of fully documented, detailed engineering drawings and prototype demonstration. *ME EN 4010 at the University of Utah: 125 students Spring 2022.*

Fundamentals of Micromachining Introduction to the principles of micromachining technologies. Topics include photolithography, silicon etching, thin film deposition and etching, electroplating, polymer micromachining, and bonding techniques. A weekly lab and a review of micromachining applications is included. Undergraduate students only. *ME EN 5050/6050, ECE 6221, BIOEN 6421, MSE 6421 at the University of Utah: 42 students Spring 2018, 50 students Spring 2020, 22 students Fall 2021.*

Fundamentals of Nanofabrication: Graduate course exploring fundamental processes involved in the fabrication of nanoscale materials, structures, and devices, as well as nanofabrication process scale-up (robustness, throughput, yield, and economic considerations). A lab component provides students with hands-on exposure to several nanofabrication techniques available at the University of Utah Nanofab. *ME EN 6960/7960 at the University of Utah: 12 students Spring 2019, 11 students Spring 2021.*

TEACHING AWARDS

University of Utah College of Engineering Top 15% Teaching Recognition (Undergraduate):

Fall 2020, ME EN 4000 (Engineering Design 1)

Spring 2016, ME EN 4000 (Engineering Design 1)

University of Utah College of Engineering Top 15% Teaching Recognition (Graduate):

Spring 2021 ME EN 6960/7960 (Nanofabrication)

Spring 2019 ME EN 6960/7960 (Nanofabrication)

PROFESSIONAL SERVICE

Conference Symposia

Lead Organizer, 241st ECS Meeting, Symposium L03 “Nanoporous Materials”, Vancouver, Canada, May 29-June 2, 2022.

Co-Organizer, 240th ECS Meeting, Symposium A03 “Battery Life Cycle Sustainability and Recycling”, Orlando, FL, October 10-15, 2021.

Lead Organizer, 237th ECS Meeting with 18th International Meeting on Chemical Sensors, Symposium L04 “Nanoporous Materials 2”, Montreal, Canada, May 10-25, 2020.

Co-Organizer, 235th ECS Meeting, Symposium A05 “Battery Characterization”, Dallas, TX, May 26-31, 2019.

Lead Organizer, 233rd ECS Meeting, Symposium L06 “Nanoporous Materials”, Seattle, WA, May 13-17, 2018.

Co-Organizer, 68th Annual Meeting of the International Society of Electrochemistry, Symposium 7 “Supercapacitors from Materials and Processes to Applications”, Providence, RI, August 27-September 1, 2017.

Reviews

Journal article reviews: Advanced Functional Materials; Advanced Energy Materials; ACS Applied Energy Materials; Electrochimica Acta; Journal of Solid State Science and Technology; Journal of The Electrochemical Society; Journal of The Minerals, Metals & Materials Society; Langmuir; New Journal of Chemistry; Polymer Engineering & Science; RSC Advances; Small; Sensors and Actuators A: Physical. (36 total reviews)

Grant proposal reviews: National Science Foundation (2016, 2019)

Workshops

Invited attendee, National Science Foundation-sponsored “Design of Engineering Materials Workshop”, Texas A&M University, July 18-19, 2016.

Additional Professional Service

Student Poster Session Judge, The Electrochemical Society Meetings (Spring 2016, Fall 2017, Spring 2018).

Research Award Committee, Energy Technology Division, The Electrochemical Society (2016, 2017)

INVITED TALKS

National Science Foundation, 2021 NSF Nanoscale Science and Engineering Grantees Conference, “*Nanomanufacturing for Energy Applications*,” December 7-8, 2021, Internet Meeting.

University of Massachusetts, Dartmouth, Joint Mechanical Engineering and Engineering and Applied Sciences Seminar, “*Nanoscale Self-Assembly: From the Bottom Up*,” November 6, 2020.

University of Nevada, Las Vegas, Mechanical Engineering Department Seminar, “*Nanomaterial Manufacturing and Engineering Explorations of Battery Systems*,” October 14, 2019.

Brigham Young University, Chemical Engineering Department Graduate Seminar, “*Nanomaterials for Batteries and Supercapacitors*,” October 18, 2018.

SERVICE AWARDS

Outstanding Reviewer for the *New Journal of Chemistry*, 2017

UNIVERSITY SERVICE

Department of Mechanical Engineering, University of Utah

Capstone Design Committee (2016-2022; **Chair** for 2020-2021 and 2021-2022)

Micro/Nano Committee (2020-2022)

Systems Engineering Search Committee (2020-2021)

Capstone Search Committee (2019-2020)
Seminar Committee (2016-2018)

OUTREACH AND MENTORING ACTIVITIES

University of Utah

Undergraduate Research Mentoring Program, Spring 2017
“Engineering Day” Volunteer (2016, 2017).

Salt Lake City, UT

Salt Lake Valley Science & Engineering Fair, Secondary Division Judge (2016, 2017)