

Nathan Fonseca (1214719636)

2nd Year Ph.D. candidate, Manufacturing Systems Network

The Polytechnic School, Arizona State University

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EDUCATION

Doctor of Philosophy, Manufacturing Systems Network *	Arizona State University, Mesa, AZ, 2026*	3.78/4.0
Masters in Passing, Manufacturing Engineering*	Arizona State University, Mesa, AZ, 2024*	3.78/4.0
Bachelor of Engineering, Mechanical Engineering	Arizona State University, Mesa, AZ, 2022	3.72/4.0

AWARDS

NSF GRFP Fellowship | Dean's Fellowship | TPS/MSN Travel Award | IRES NSF Japan Scholarship | SURI Award | FURI Award | Vex U World 2019 Championship

CERTIFICATIONS

SolidWorks on Additive Manufacturing, CITI Program on Responsible Conduct of Research (RCR), Completed Training on radiation safety for X-ray generating devices.

GRADUATE COURSEWORK COMPLETED

Polymer Science and Additive Manufacturing, Batteries, and Fuel Cells, Advanced Simulation, Complex Engineering Systems, Engineering Computing with Python, Advanced Project Management, Engineering Analysis I, Statistics Quality Control Manufacturing, Principles of Independent Engineering.

TECHNICAL PROFICIENCIES

Instruments	BioLogic Instruments, DIW, FDM, SLA, TGA, DCS, XRF, XRD, EIS, SEM, Rheometer
Analysis	Python, ANSYS, MATLAB, MS Excel, SPSS, Autodesk Fusion 360, Automation Studio
Software	Granta Edupack, AutoCAD, SolidWorks, MS Office, Adobe Creative Cloud

PROFESSIONAL EMPLOYMENT HISTORY

Arizona State University, Mesa, AZ 2022–2024

Research Assistant, Advanced Materials Advanced Manufacturing Laboratory

Pioneering nanoparticle technology for additive manufacturing materials development by efficiently improving the physical, electrical, and thermal properties of conventional lithium-ion battery technology.

- Produced DIW printable inks with novel LLZTO ceramic and polymeric fillers to tune the rheology and porosity to achieve highly dense porous structures
- Analyzed the topology and morphology of the composite solid electrolytes through (SEM & XRD) in addition to testing the conductivity and cyclability performance through electrochemical impedance spectroscopy (PEIS & GEIS)
- First authored on “3D printing-enabled design and manufacturing strategies for batteries” - SMALL journal 2023

Arizona State University, Mesa, AZ May–Aug 2023

Kyoto Institute of Technology, Kyoto, Japan

International Research Internship, NSF IRES Japan

- Analyzed the spherulite growth of PLLA and PDLA polymer blends via POM (Polarized Optical Microscopy), studied the purity of these polymer blends at different ratios through NMR (Nuclear Magnetic Resonance) characterization, and determined the thermal profiles through DSC (Differential Scanning Calorimetry) characterization.
- Attained a multicultural and multidisciplinary knowledge of Japanese traditions, history, cuisine, and customs.
- Facilitated and aided the study of WAXD (Wide-angle x-ray diffraction) for polymer blends while providing feedback on poster presentations for symposiums and contributed as a peer-reviewed.
- Explored the deposition of pullulan with non-water solvent surfactants as material A and PEG as material B for co-axial electrospinning and the potential to be used in direct electro-writing techniques for scaffolds applications.

Arizona State University, Mesa, AZ 2021–2022

Lab Manager, Alternative Energies Lab

Organizing and providing assistance for smoothly conducting daily laboratory activities in a safe and efficient manner while setting standard operating procedures.

- Performed lab inventory, lab registration and met EHS regulations and guidelines
- Established laboratory safety protocols, hazardous waste management systems, and fire safety instructions
- Supervised master's and bachelor's thesis students on research experiments, provided guidance on DOE and trained on various machines for material analysis, characterization, data collection, reporting, and publishing
- Facilitated research collaborations between Honeywell, ZeroEV, and Nicola Corp

Arizona State University, Mesa AZ
Research Assistant for Nikola Corporation

2021–2022

Assisted in the establishment of Nikolas's test bed station where multiple characterizations, polarization, and cyclability of multi-stack cells are tested.

- Performed leak tests for fuel, oxidant, and coolant in a five-stack fuel cell system
- Tested multiple half and full-catalyst-coated membranes for fuel cells using X-ray fluorescence spectroscopy
- Designed and fabricated MEA plates to facilitate and precisely punch holes for alignment purposes
- Carried out polarity tests in a single and multi-stack fuel cell system using different high-compressed gasses

Arizona State University, Mesa, AZ

2021–2022

Fatigue Analyst for Able Aerospace Services Inc.

Determined if cold spray and shot peen are viable solutions for repairing worn/damaged aluminum lug joints while still meeting the Federal Aviation Administration (FAA) regulations.

- Researched manufacturing strategies such as cold spray and shot peen for fatigue testing
- Modeled stress and strain analysis with FEA using SolidWorks
- Analyzed fatigue testing using the INTRON 8801 machine with result analysis and modeling validation
- Predicted the service life that limits aluminum lugs for spherical bearing applications

Arizona State University, Mesa, AZ

2021–2022

Financial and Statistical Analysis on SSE Batteries, Senior Thesis

- Conveyed a manufacturing schematic model, with hypothetical capital investments for equipment, labor, terrain, and materials.
- Quantified potential cash flows and depreciation values to be used for NPV & IRR in Excel.
- Evaluated data to determine the investment feasibility in manufacturing SSE batteries.

PUBLICATIONS [Google Scholar](#) (selected)

- **Fonseca, N.**, Thummalapalli, V., Jambhulkar, S., Ravichandran, D., Zhu, Y., Patil, D., Thippanna, V., Ramanathan, A., Xu, W., Guo, S., Ko, H., Fagade, M., Kannan, A. M., Nian, Q., Asadi, A., Miquelard-Garnier, G., Dmochowska, A., Hassan, M. K., Al-Ejji, M., ... Engineering, M. (2023). 3D Printing-Enabled Design and Manufacturing Strategies for Batteries: A Review. *Small*, 2302718. doi: 10.1002/SMLL.202302718.
- Thummalapalli, V., Patil, D., **Fonseca, N.**, Zhu, Y., Ravichandran, D., Kannan, A. M., Song, K. Enhanced Thermal Responsive Behavior in the Binary Polymer Composite with Spiky Copper Particles Via Direct Ink Writing. In *processing* 2023-2024.
- Bawareth, M., Xu, W., Ravichandran, D., Zhu, Y., Jambhulkar, S., **Fonseca, N.**, Miquelard-Garnier, G., Camille, V., Matthew, L., Campbell, W., & Song, K. (2022). Crosslinked Polyethylene (XLPE) Recycling via Foams. *Polymers* 2022, Vol. 14, Page 2589, 14(13), 2589. doi: 10.3390/POLYM14132589.
- Ravichandran, D., Kakarla, M., Xu, W., Jambhulkar, S., Zhu, Y., Bawareth, M., **Fonseca, N.**, Patil, D., & Song, K. (2022). 3D-printed in-line and out-of-plane layers with stimuli-responsive intelligence. *Composites Part B: Engineering*, 247, 110352. doi: 10.1016/J.COMPOSITESB.2022.110352.
- Thummalapalli, V., **Fonseca, N.**, Nazir, H., Song, K., Kannan, A. M. (2023). Insights on Sulfide and Oxide Electrolytes for All-Solid-State Li-Ion Batteries. *Materials Today Sustainability*. doi.org/10.1016/j.mtsust.2023.100614.
- Xu, W.; **Fonseca, N.**; Ravichandran, D.; Jambhulkar, S.; Zhu, Y.; Kannan, A.; Song, K. (2021). Innovative fiber spinning for energy storage, submitted to *Advanced Composites and Hybrid Materials*.

ORAL TALKS

- **Fonseca, N.**; Jambhulkar, S.; Ravichandran, D.; Xu, W.; Zhu, Y.; Kannan, A.; Song, K.* 3D printed all-solid-state batteries, AIChE 2022 Annual Meetings, Composite Sessions, Phoenix, AZ.
- Jambhulkar, S.; Xu, W.; Ravichandran, D.; Zhu, Y.; Bawareth, M.; **Fonseca, N.**; Kannan, A.; Song, K.* Hybrid Printing of Layered Composites, ACS 2022 Spring Annual Meetings & Expos, 3D Printing-enabled Composites and Hybrid Systems Session, San Diego, CA.
- Zhu, Y.; Xu, W.; Ravichandran, D.; Jambhulkar, S.; Bawareth, M.; **Fonseca, N.**; Song, K.* One step, 3D Printed Stimuli-Responsive Polymeric Composites for Shape-morphing Applications, ACS 2022 Annual Meeting, Composites Sessions, Tempe, AZ.
- Ravichandran, D.; Xu, W.; Zhu, Y.; Jambhulkar, S.; Bawareth, M.; **Fonseca, N.**; Song, K.* A Biodegradable Polymer for 3D Printable Tissue Scaffold in Pelvic Floor Prolapse (POP) Applications, ACS 2022 Spring Annual Meetings & Expo, 3D Printing-enabled Composites Sessions, Phoenix, AZ.

CONFERENCE POSTERS

- Thummalapalli, V., **Fonseca, N.**, Kamavaram V., Kumar Arumugam, G., Kannan, A. M., Song, K. 2023 Annual International Solid Freeform Fabrication (SFF) – An Additive Manufacturing Conference, Austin, TX.
- **Fonseca, N.**; Thummalapalli, S.; Jambhulkar, S.; Ravichandran, D.; Zhu, Y.; Patil, D.; Thippanna, V.; Ramanathan, A.; Nianc A.; Kannan M.; Song, K.* 3D Printable Structures for All-Solid-State Batteries, GRC conference, Ventura, CA.
- **Fonseca, N.**; Bawareth, M.; Jambhulkar, S.; Ravichandran, D.; Xu, W.; Zhu, Y.; Kannan, A.; Song, K.* 3D printing and its role in battery manufacturing, MSEC conference, West Lafayette, IN.
- Zhu, Y.; Xu, W.; Jambhulkar, S.; Ravichandran, D.; **Fonseca, N.**; Kannan, A.; Song, K.* 3D Printing-facilitated, conjugated polymer-based bio-inspired thermoelectric generator, ACS 2022 Spring Annual Meetings & Expos, PMSE/POLY Poster Session, San Diego, CA.
- Ravichandran, D.; Xu, W.; Jambhulkar, S.; Zhu, Y.; Bawareth, M.; **Fonseca, N.**; Kannan, A.; Song, K.* In-Plane and Out-of-Plane Multilayered Composite 3D Printing for Enhanced Mechanical Property, ACS 2022 Annual Meeting & Expos, PMSE/POLY Poster Session, Tempe, AZ.
- Xu, W.; Jambhulkar, S.; Ravichandran, D.; Zhu, Y.; Bawareth, M.; **Fonseca, N.**; Kannan, A.; Song, K.* Microstructural control in fiber composites through additive manufacturing, ACS 2022 Annual Meeting & Expos, PMSE/POLY Poster Session, Tempe, AZ.

SYNERGISTIC ACTIVITIES

Arizona State University, Mesa, AZ

2021–2022

SAE Formula EV: Structures Sub-team

- Taught incoming members CAD software through SolidWorks as well as created challenges and projects.
- Examined and evaluated the chassis to meet SAE regulations and rulebook for competition.
- Researched and developed alternative designs for suspension and steering.

Arizona State University, Mesa, AZ

2021–2022

President of TRIO Sun Devils

- Oversee and give final approval of all event plans, marketing, and outreach.
- Appointed leadership for the E-Board committee.
- Developed and coordinated events for community service and service learning.

Arizona State University, Mesa, AZ

Jan – April 2021

Famic Technologies, Barrett

- Investigated Automation Studio v6.4 and applied Programmable Logic Controller concepts (PLC).
- Worked with Famic Technologies Inc. to generate a step-by-step procedure via YouTube for configuring a virtual system and animating PLC schematics.
- Research the extensive lingo that Automation Studio uses for animating sketches and schematics.