

SWAPNIL SURYAKANT SALVI, Ph.D.

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Summary

Hands-on experience in battery performance, safety/abuse & reliability testing. Skilled in experimental heat transfer measurements of li-ion cells, microelectronic packaging, and engineering materials. Solid technical understanding of thermal and fluid transport principles. Proficient in thermal design and system solutions to improve the performance of lithium-ion battery packs via testing and simulations, along with hands-on skills of fabrication tools in the lab environment. Team player with leadership, project management and problem-solving skills. Proficient in verbal and written communication.

TECHNICAL SKILLS

4+ years of experience with Scientific Programming Tools: MATLAB, Python

4+ years of experience with Finite Element/CFD Software: COMSOL Multiphysics, ANSYS Fluent, ANSYS Icepak

3+ years of experience with Experiment Design Software: NI LabVIEW, MATLAB Simulink

3+ years of experience with Mechanical Design Tools: SolidWorks

1+ years of experience with Li-ion Cell/Battery Testing: Performance, Safety/Abuse & Reliability Testing, compiling SOW, designing experiments, statistical data analysis & performing cell, module, pack-level teardowns (post mortem analysis)

1+ years of experience in Data Analysis / Statistical Process Control Tools: Excel, SAS, JMP, Minitab

EDUCATION

Ph.D. Mechanical Engineering

University of Texas at Arlington – Arlington, TX

August 2018 – August 2022

GPA: 4.00/4.00

Master of Technology, Mechanical Engineering

Indian Institute of Technology Ropar

July 2016 - May 2018

GPA: 3.46/4.00

Bachelor of Engineering, Mechanical Engineering

University of Mumbai

July 2013 - April 2016

GPA: 3.58/4.00

PROFESSIONAL WORK EXPERIENCE

Research Engineer

September 2022 - Present

Electrified Powertrain, Southwest Research Institute

Research and development in Electric Vehicles - focused on Electrified Powertrains.

- Project Management: Resource planning, scheduling, budget/cost management, etc.
- Thermal management of battery pack
- Safety & Abuse testing - Li-ion Cell/Brick/Module/Pack level
 - Mechanical Abuse Testing - Nail Penetration, Drop, Crush, etc.
 - Electrical Abuse Testing - Short Circuit, Overcharge, Over-discharge, etc.
 - Thermal Abuse Testing - Thermal Stability, Overheating, High-Temperature Hazard, etc.
 - SAE J2464, IEC62660, UL 2580, DO-160G, DO-311A, UN 38.3, etc.
- Immersion Cooling - Design, development & troubleshooting - Heat transfer fluid testing, Abuse Testing
- Cell Benchmarking - DCIR, static capacity, HPPC, cranking power, energy efficiency
- Cycle/Calendar life testing - competitive charge profiles & extreme environments with Taguchi L9 approach
- Electrostatic Impedance Spectroscopy (EIS) analysis of Li-ion cells
- Destructive Physical Analysis (DPA) of batteries – Teardown/Postmortem Analysis
- Electric Vehicle Benchmarking - Instrumented powertrain and thermal management system, e-Axle benchmarking
- GT-AutoLion battery performance and degradation simulations

Student Engineer

June 2021 - August 2021

Electrified Powertrain, Southwest Research Institute

- Developed an analytical heat transfer model of a lithium-ion battery pack focusing on thermal gradient across the cell.
- Conducted cell and module-level experiments as well as data analysis for a customized thermal management system.
- Design, manufacturing, and validation of a specialized test rig focusing on the immersed cooling as well as core temperature measurement for a 21700 Li-ion 7PS1 Brick.

Research Assistantship

August 2018 – August 2022

Microscale Thermophysics Laboratory, The University of Texas at Arlington

- Designed VIs in LabVIEW using National Instruments Data Acquisition (NI DAQ) Systems to collect the high-frequency experimental data (voltage fluctuations, temperature readings, heat flux data, serial communication, etc.)
- Experienced in Thermal Characterization Equipment: Light Flash Apparatus (LFA), Transient Plane Source (TPS), Two thickness method (Fox50), Differential Scanning Calorimetry (DSC), Thermal Imaging / Infrared (IR) Camera, etc.
- Capable of conducting design and analysis of multi-factor experiments (Design of Experiments – DOE).
- Designed and developed customizations to an FDM equipment to characterize the thermal/structural aspects of printing.
- Experienced in hands on skills of fabrication tools as well as performing inspections in the lab environment (Polymer 3D Printer, EOS M290 Metal 3D Printer, Vacuum Drying Oven, Fume Hood, Glovebox, etc.).

PROJECTS

Electrified Vehicle and Energy Storage Evaluation (EVESE) Consortium

September 2022 – Present

- Benchmarking EVs and testing to understand performance, efficiency, and overall vehicle powertrain control strategies
- Planning research activities in lithium-ion batteries to improve fast charging, safety, life/durability, and performance.

Analysis of li-ion battery pack with immersed cooling method focusing on accelerated cell aging June 2021 – August 2022

- Developed a physics-based thermal model for a lithium-ion battery pack equipped with immersed cooling thermal management system, focusing on thermal gradient across the cell.
- Conducted cell and module level experiments for validation of analytical thermal model.

RELEVANT GRADUATE-LEVEL COURSEWORK

Design of Experiments (DOE), Silicon Integrated Circuits Fabrication Technology, Advanced Metal Additive Manufacturing, Convection Heat Transfer, Thermal Conduction, Advanced Classical Thermodynamics, Fluid Dynamics, Analytical Methods in Engineering

PUBLICATIONS [[Webpage](#), [Google Scholar](#)]

- **Salvi, S. S.**, Swarts, A., "Fluid Flow Influence on Thermal Propagation in Immersion-Cooled Nail Penetration Tests", [*In preparation*].
- **Salvi, S. S.**, Swarts, A., "Stress Generation in Large Pouch Cells Under Cycling and Abuse Conditions", *WCX SAE Technical Paper*, 2024. [*Accepted*]
- **Salvi, S. S.**, Karam, P., Jain, A., "Thermal mapping of Li-Ion cells using Fluorescent Thermal Imaging", [*In preparation*].
- **Salvi, S. S.**, Surampudi, B., Swarts, A., Sarlashkar, J., Smith, I., Alger, T., and Jain, A., "Experimental and Theoretical Analysis of Immersion Cooling of a Li-Ion Battery Module.", *ASME Journal of Electrochemical Energy Conversion Storage*, 21(4), pp. 041001:1-10, 2024. [[PDF](#)]
- **Salvi, S. S.**, Jain, A., "A Review of Recent Research on Heat Transfer in Three-Dimensional Integrated Circuits (3D ICs)", *IEEE Transactions on Components, Packaging and Manufacturing Technology*, Vol. 11(5), pp. 802-821, 2021. [[PDF](#)]
- Prajapati, H.¹, **Salvi, S. S.**¹, Ravoori, D., Jain, A., "Improved in print quality in Fused Filament Fabrication through Localized Dispensing of Hot Air around the Deposited Filament", *Additive Manufacturing*, 40, pp. 101917:1-9, 2021. [[PDF](#)] (¹: equal contribution)
- **Salvi, S. S.**, Jain, A., "Measurement of thermal conductivity of millimeter-sized wires using the fin effect", *Applied Thermal Engineering*, 177, pp. 2020. [[PDF](#)]
- **Salvi, S. S.**, Jain, A., "Detection of unusual thermal activities in a semiconductor chip using backside infrared thermal imaging", *ASME Journal of Electronic Packaging*, Vol. 143(2), pp. 020901:1-8, 2021. [[PDF](#)]

PATENT

- Ravoori, D., **Salvi, S. S.**, Prajapati, H., Jain, A., "Systems and Methods for Void Reduction in Additive Manufacturing", *U.S. Patent 20220161490A1*, May 26, 2022. [[PDF](#)]

ACCOMPLISHMENTS/AWARDS

- Doctoral Dissertation Fellowship – Summer 2022 (June 2022 – August 2022).
- Mechanical and Aerospace Engineering STEM fellowship (August 2018 – May 2022).
- NSF Supplemental Funding: Non-Academic Research Internships for Graduate Students (May 2021 – August 2021).