

SWAPNIL SURYAKANT SALVI

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Summary

Hands-on experimental experience in 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.

TECHNICAL SKILLS

3+ years of experience with Scientific Programming Tools: MATLAB, Python
2+ years of experience with Finite Element/CFD Software: COMSOL Multiphysics, ANSYS Fluent, ANSYS Icepak
2+ years of experience with Experiment Design Software: NI LabVIEW, MATLAB Simulink
1+ years of experience with Mechanical Design Tools: SolidWorks, Creo/ProE, AutoCAD
3+ years of experience with Thermal Characterization Equipments: Light Flash Apparatus (LFA), Transient Plane Source (TPS), Two thickness method (Fox50), Differential Scanning Calorimetry (DSC), Thermal Imaging / Infrared (IR) Camera
6+ months of experience in Semiconductor Processing: lithography manufacturing processes, thermal anneal, ellipsometry
6+ months 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
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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
- Cell Benchmarking - Internal resistance, static capacity, pulse power capacity, cranking power, energy efficiency
- Electric Vehicle Benchmarking - Instrumented powertrain and thermal management system, e-Axle benchmarking
- Immersion Cooling - Design, development & troubleshooting - Heat transfer fluid testing
- Safety & Abuse testing - Li-ion Cell/Brick/Module/Pack level
- Cycle life testing - competitive charge profiles
- Calendar life testing - extreme environments with Taguchi L9 approach
- Combustibility test of Immersive Coolant Fluid
- Electrostatic Impedance Spectroscopy (EIS) analysis of Li-ion cells
- Destructive Physical Analysis (DPA) of batteries
- GT-AutoLion battery performance and degradation simulations
- FTIR spectroscopy analysis: Li-ion abuse testing - post-test emissions
- Cycling and Abuse testing induced strain analysis for Li-ion batteries

Student Engineer

June 2021 - August 2021

Electrified Powertrain, Southwest Research Institute

- Developed a physics-based thermal 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 imaging using Infrared (IR) camera customized with various IR-Optical tools.
- Capable of conducting design and analysis of multi-factor experiments (Design of Experiments – DOE).
- 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.

Thermal mapping of prismatic and cylindrical li-ion cells with fluorescent thermal imaging

December 2021 – Jan 2023

- Designed a non-invasive fluorescent method for thermal mapping of li-ion cells using a digital camera.
- Detecting thermal performance in li-ion cell under various operational conditions, using a charge-discharge cyclers.

Measurement of Thermal Properties of Heat-spreader and Thermal Interface Materials (TIM)

May 2019 – July 2019

- Strategically planned and prepared the required sample geometry from the supplied material for subsequent tests.
- Performed the steady state as well as transient heat transfer measurement techniques successfully.

Detection of unusual thermal activities in 3D-IC using Infrared Camera

August 2018 – March 2020

- Designed a fixture and carried out experiments to detect unusual thermal activity in a multi-die integrated circuit packaging and recorded thermal signatures of the transistor plane using infrared camera.
- Analyzed trade-offs in detection accuracy and speeds, as well as false positives and negatives for various machine learning algorithms, to detect anomalous thermal activity on the chip.

Thermal conductivity measurement of thin wires using the fin effect

August 2018 – October 2019

- Designed an experiment to measure the thermal conductivity for different wires of similar/dissimilar diameters.
- Derived a model for thermal conductivity measurement based on the theory of heat transfer in extended surfaces.
- Measured infrared thermal distribution data and validated the experimental data with analytical model using MATLAB.

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

RECENT PATENT & PUBLICATIONS

[Google Scholar Profile](#)

- Jain, A., Ravoori, D., Prajapati, H., **Salvi, S. S.**, “Systems and Methods for Void Reduction in Additive Manufacturing”, *U.S. Patent 20220161490A1*, May 26, 2022. [\[PDF\]](#)
- **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., Alger, T., Sarlashkar, J., Smith, I., Jain, A., “Experimental and Theoretical Analysis of Immersion Cooling of a Li-Ion Battery Module and the Impact on Accelerated Cell Aging”, *[Under review]*.
- 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)
- Ravoori, D., **Salvi, S. S.**, Prajapati, H., Qasaimeh, M., Adnan, A., Jain, A., “Void Reduction in Fused Filament Fabrication (FFF) through in situ Nozzle-Integrated Compression Rolling of Deposited Filaments”, *Virtual and Physical Prototyping*, 16(2), pp. 146-159, 2021. [\[PDF\]](#)
- Prajapati, H., **Salvi, S. S.**, Ravoori, D., Jain, A., “Measurement of the in-plane temperature field on the build plate during polymer extrusion additive manufacturing using infrared thermometry”, *Polymer Testing*, 92, p. 106866, 2020. [\[PDF\]](#)

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).