SWAPNIL SURYAKANT SALVI

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To get an engineering internship position where I can fully utilize my analytical and experimental ability. Hands-on experimental experience in heat transfer measurements of microelectronic packaging, devices, and engineering materials. Solid technical understanding of thermal and fluid transport principles. Competent in thermal property measurement of solids/liquids and 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

Scientific Programming Tools: MATLAB, Vivado – Verilog/VHDL (FPGA Programming)
Finite Element/CFD Software: COMSOL Multiphysics, ANSYS Fluent, ANSYS Icepak
Experiment Design Software: NI LabVIEW, SIMULINK
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: Microfabrication process development and specification, wafer processing (RCA cleanup), use of strong acids like HF and piranha, cleanroom device fabrication techniques, lithography manufacturing processes, rapid thermal anneal, surface resistance measurement, dry/wet etching, thin film chemical vapor deposition, sputtering, Lithography equipment – furnace oxidation, patterning techniques, Ellipsometry
6+ months of experience in Data Analysis / Statistical Process Control Tools: Excel, SAS, JMP, Minitab

EDUCATION

Ph.D. Mechanical Engineering — **Expected – July 2022**
University of Texas at Arlington – Arlington, TX — *GPA: 4.00/4.00*
Master of Technology, Mechanical Engineering — **July 2016 - May 2018**
Indian Institute of Technology Ropar — *GPA: 3.46/4.00*
Bachelor of Engineering, Mechanical Engineering — **July 2013 - April 2016**
University of Mumbai — *GPA: 3.58/4.00*

PROJECTS

Analysis of Simulated Hardware Trojan in FPGA with IR Thermography — **December 2019 – Present**
- Coded a simulated hardware trojan and temperature sensor into the integrated circuit using Verilog/VHDL.
- Detecting its thermal behavior under various operational conditions, varying its nature and intensity.

Analysis of in-plane temperature field during Polymer Extrusion Additive Manufacturing — **September 2019 – May 2020**
- Measured the in-plane (x-y) temperature field on the build plate during printing of the first layer using infrared thermography in conjunction with an IR-transparent window and mirror.
- Evaluated the key thermal aspects of filament-to-bed interactions.

Fabrication of MOSCAP in a cleanroom environment using various IC fabrication processes — **August 2019 – December 2019**
- Gained knowledge of basic limitations and challenges of new materials as well as 3D CMOS devices for lithography.
- Developed an understanding of the standard processes like Wafer Cleaning (RCA Cleanup), Thermal Oxidation, Ellipsometric measurements, Diffusion, Photolithography, Capacitance and Layer Resistance measurements, etc.

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.
- Carried out image processing using various machine learning algorithms such as Structural Similarity Index Method (SSIM), 2D Correlation Coefficient Method, etc. to detect anomalous thermal activity on the chip.
- Analyzed trade-offs in detection accuracy and speeds, as well as false positives and negatives.

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 temperature distribution data utilizing Infrared Camera and validated the experimental data with analytical model using MATLAB.
- Applying the developed experimental technique to measure thermal conductivity of composite solder wires.

RELEVANT GRADUATE-LEVEL COURSEWORK

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

PROFESSIONAL WORK EXPERIENCE

Student Engineer **June2021 - 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 7P1S Brick.

Research Assistantship **August 2018 - Present**

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 operating and responsible for maintaining the lab equipments - Light Flash Apparatus (LFA), Transient Plane Source (TPS), Two thickness method (Fox50), Differential Scanning Calorimetry (DSC).
- 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).
- 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.).

PUBLICATIONS

- **Salvi, S. S.**, Jain, A., "Analysis of Simulated Hardware Trojan in FPGA with IR Thermography", *[In preparation].*
- **Salvi, S. S.**, Jain, A., "Measurement of Tangential Thermal Conductivity of Orthotropic Cylinders", *[In preparation].*
- **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**)
- 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]
- **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]
- **Salvi, S. S.**, Bhalla, V., Taylor, R. A., Khullar, V., Otanicar, T. O., Phelan, P. E., and Tyagi, H., "Technological Advances to Maximize Solar Collector Energy Output: A Review", *ASME Journal of Electronic Packaging*, Vol. 140(4), p. 040802. [PDF]

ACCOMPLISHMENTS

- Mechanical and Aerospace Engineering STEM fellowship (August 2018 – Present).
- NSF Supplemental Funding: Non-Academic Research Internships for Graduate Students (May 2021 – August 2021).