SWAPNIL SURYAKANT SALVI

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To get an engineering internship/co-op position where I can fully utilize my analytical and experimental ability. Experimental hands-on 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. Proficient in numerical and computational programming in MATLAB. Team player with leadership, innovative problem-solving skills and ability to work independently with influencing communication skills.

TECHNICAL SKILLS

Scientific Programming Tools: MATLAB, Mathematica, Vivado – Verilog/VHDL (FPGA Programming)
Finite Element/CFD Software: COMSOL, ANSYS Fluent, ANSYS Icepak
Experiment Design Software: NI LabVIEW, SIMULINK.
Mechanical Design Tools: SolidWorks, Creo/ProE, AutoCAD
Thermal Property measurement: Thermal characterization- Light Flash Apparatus (LFA), Transient Plane Source (TPS), Two thickness method (Fox50), Differential Scanning Calorimetry (DSC), Thermal Imaging / Infrared (IR) Camera
Semiconductor fabrication processes: Microfabrication process development and specification, cleanroom fabrication techniques, lithography, thin film chemical vapor deposition, rapid thermal anneal, surface resistance measurement, dry/wet etching, furnace oxidation, Ellipsometry, hands-on chemical training.
Data Analysis / Statistical Process Control Tools: Excel, SAS, JMP
Other: Word, Excel, PowerPoint, Polymer 3D Printer.

EDUCATION

Ph.D. Mechanical Engineering	**Expected - May 2021**
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 into the integrated circuit using Verilog/VHDL.
- Detecting its thermal behavior under various operational conditions, varying its nature and intensity.

Effect of Pre-Post Heater Temperature & Print Speed on % Void Area in Polymer 3D Printing   Jan 2020 – June 2020
- Implemented Design of Experiments (DoE), planned and performed the customized experiment.
- Collected and analyzed data, prepared reports for the effects of preselected set of contrasts.

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.

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 to measure the thermal properties successfully.

Effect of copper nanoparticles on the thermal characterization of additive manufacturing products April 2019 – May 2020
- Using extruded ABS filaments infused with the copper nanoparticles in customizable concentrations
- Measured thermal conductivity of the polymer filaments using the concept of fins

- Measured thermal conductivity of additively manufactured parts using one dimensional heat flux method (Fox50)

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.
- 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.
- Measured temperature distribution data utilizing Infrared Camera.
- Derived a model for thermal conductivity measurement based on the theory of heat transfer in extended surfaces (fins).
- Applying the developed experimental technique to measure thermal conductivity of composite solder wires.

Numerical Analysis of Phase Change Materials (PCM) for use in Energy Efficient Buildings   **June 2017 - May 2018**
- Derived a multiphase heat transfer model of a composite wall with PCM in COMSOL.
- Analyzed various Phase Changing Materials (PCMs) as a working medium for latent heat thermal storage systems.

RELEVANT GRADUATE-LEVEL COURSEWORK

Design of Experiments (DoE), Silicon Integrated Circuit Fabrication Technology, Convection Heat Transfer, Thermal Conduction, Advanced Classical Thermodynamics, Analytic Methods in Engineering, Fluid Dynamics

PROFESSIONAL WORK EXPERIENCE

Research Assistantship   **August 2018 - Present**
Microscale Thermophysics Laboratory, The University of Texas at Arlington.
- Capable of measuring the thermal conductivity of wires of different materials.
- 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, etc.) and used MATLAB for post-processing the collected data.
- Experienced in hands on skills of fabrication tools in the lab environment (Polymer 3D Printer, Vacuum Drying Oven, Fume Hood, Glovebox, etc.).
- Equipment development – customized FDM equipment in order to characterize the thermal aspects of printing.
- Experienced in operating 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 (DoE).

PUBLICATIONS

- Salvi, S. S., Jain, A., " Heat Transfer in Three-Dimensional Integrated Circuits: A Critical Review", *[In preparation]*.
- Salvi, S. S., Jain, A., " Analysis of Simulated Hardware Trojan in FPGA with IR Thermography ", *[In preparation]*.
- Salvi, S. S., Jain, A., "Measurement of thermal conductivity of millimeter-sized wires using the fin effect", *Applied Thermal Engineering*, 177, pp. 2020. [DOI: 10.1016/j.applthermaleng.2020.115482]
- Salvi, S. S., Jain, A., "Detection of unusual thermal activities in a semiconductor chip using backside infrared thermal imaging", *ASME Journal of Electronic Packaging*, 2020, *[Accepted]*.
- 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. [DOI: 10.1115/1.4041219]

ACCOMPLISHMENTS

Mechanical and Aerospace Engineering STEM fellowship (August 2018 – Present).