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: Polymer 3D Printer – Simplify3D, EOS M290 Metal 3D Printer – Materialise Magics, EOSPRINT 2.

EDUCATION

Ph.D. Mechanical Engineering   **Expected - December 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 and temperature sensor 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 conducted the customized experiment.
- Performed experimental validation data analysis and 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 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.
- 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.

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.
- Hands on experience for metal additive manufacturing – printing samples on EOS M290 Metal 3D Printer.
- 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).