

TAREK GEBRAEL

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Education

University of Illinois at Urbana-Champaign

Ph.D., Mechanical Engineering
Advisor: Prof. Nenad Miljkovic

Urbana, IL

Jan 2018 – Exp. Jun 2022

American University of Beirut

Bachelor of Engineering (BE), High Distinction
Major: Mechanical Engineering / Minor: Applied Mathematics

Beirut, Lebanon

Sep 2013 – May 2017

Technical Experience

University of Illinois at Urbana-Champaign

Measured the thermal and electrical characteristics of water immersion cooling of Gallium Nitride power transistors. Developed and characterized conformal copper coating heat spreaders for the thermal management of GaN transistors, power electronics and GPU modules. Developed and characterized novel electrical insulation coatings made of high thermal conductivity Silicon Dioxide and Aluminum Nitride.

Urbana, IL

Jan 2018 - Present

University of Illinois at Urbana-Champaign

Studying the effect of tribocharging and electrostatic forces on the refrigerant-oil separation in HVAC&R systems.

Urbana, IL

Jan 2021 - Present

Nokia Bell Labs

Measured the pool boiling characteristics of dielectric fluids on sapphire and liquid infused surfaces using optical metrology. Fabricated Fluorosilane-patterned glass surfaces infused with Squalane and tested their effect on droplet boiling.

Dublin, Ireland

May 2019 – Aug 2019

King Abdullah University of Science and Technology

Developed a C++/MATLAB code to downscale coarse ensembles of the Rayleigh-Bénard problem. Analyzed the results using statistical decomposition methods.

Thuwal, KSA

May 2016 – Sep 2016

American University of Beirut

Developed a reduced order model to calculate the forces in a micro pyroelectric energy harvester. Implemented the model in a MATLAB code that predicted well the device motion compared to Ansys simulations.

Beirut, Lebanon

Sep 2015 – Dec 2017

Skills

Software: Solidworks, Creo, AutoCAD, Ansys Icepak, Ansys Fluent, Comsol Multiphysics, Linux, Bash, C++, MATLAB, Simulink, LabVIEW, KICAD, Allegro, Latex, Inkscape, Microsoft Office.

Laboratory equipment: Sputtering, thermal evaporation, chemical vapor deposition, atomic layer deposition, Parylene deposition, E-beam evaporation, electroless deposition, electroplating, 3D laser scanning microscopy, photolithography, thermal measurement, electrical measurement.

Languages: Written and spoken Arabic, English, and French.

Publications

Peer-Reviewed Journals

- T. Gebrael, J. Li, J. Schaadt, L. Horowitz, R. Pilawa-Podgurski, N. Miljkovic, "Monolithic Integration of Copper with Electronics for High Efficiency Cooling". In review at Nature Electronics.
- T. Gebrael, A. R. Gamboa, A. Joseph, R. Pilawa-Podgurski, N. Miljkovic, "Monolithically Integrated Heat Spreaders, Heat Routers, and Heat Shields for Electronics Thermal Management". In review at the International Journal of Heat and Mass Transfer.
- P. Birbarah*, T. Gebrael*, T. Foulkes, A. Stillwell, A. Moore, R. Pilawa-Podgurski, N. Miljkovic, "Water Immersion Cooling of High Power Density Electronics". International Journal of Heat and Mass Transfer, 147, 118918, 2020.
- T. Gebrael, A. Kanj, D. Farhat, M. Shehadeh, I. Lakkis, "Self sustained thermally induced gas-damped oscillations of bimetal cantilevers with application to the design of a new pyroelectric micro energy harvester". Journal of Physics D: Applied Physics 53 (19), 195501, 2020.
- M. U. Altaf, E. S. Titi, T. Gebrael, O. M. Knio, L. Zhao, M. F. McCabe, I. Hoteit, "Downscaling the 2D Bénard convection equations using continuous data assimilation". Computational Geosciences, 21(3), 393-410, 2017.

Refereed Conference Proceedings

- T. Gebrael, J. Li, J. Schaadt, L. Horowitz, R. Pilawa-Podgurski, N. Miljkovic, "Monolithic Integration of Copper with Electronics for High Efficiency Cooling", Thermal Materials, Modeling and Technoeconomic Impacts for Thermal Management and Energy Application Symposium of the 2021 MRS Fall Meeting, November 29 – December 2, 2021.
- A.-C. Iradukunda, D. Huitink, T. Gebrael, N. Miljkovic, "Performance and Durability Validation of Voltage Blocking Technologies to Enable Direct Cooled High-Voltage, High-Power Modules," Proceedings of the ASME International Technical Conference and Exhibition on Packaging and Integration of Electronic and Photonic Microsystems, InterPACK 2021, October 26 - 28, 2021.
- D. Chou, Z. Liao, K. Fernandez, T. Gebrael, G. Popovic, R. Mahony, N. Miljkovic, R.C.N. Pilawa-Podgurski, "An Interleaved 6-Level GaN Bidirectional Converter With an Active Energy Buffer for Level II Electric Vehicle Charging," Proceedings of the IEEE Applied Power Electronics Conference, APEC2021, Phoenix, AZ, June 14-17, 2021.
- T. Gebrael, P. Birbarah, T. Foulkes, A. Stillwell, A. Moore, R. Pilawa-Podgurski, N. Miljkovic, "Water Immersion Cooling of High Power Density Electronics", ASME 2019 International Technical Conference and Exhibition on Packaging and Integration of Electronic and Photonic Microsystems, InterPACK2019, Anaheim, CA, October 7-9, 2019.
- T. Gebrael, P. Birbarah, T. Foulkes, R. Pilawa, N. Miljkovic, "Water Immersion Cooling of Nanoengineered Electronics", Proceedings of the Micro and Nanoscale Phase Change Heat Transfer Gordon Research Conference – The Effects of Hydrodynamic, Interfacial and Intermolecular Forces on Phase Change Processes, Lucca, Italy, February 3-8, 2019.

Book Chapters

H. Cha, S. Sett, P. Birbarah, T. Gebrael, J. Oh, N. Miljkovic, "Recent advances in structured surface enhanced condensation heat transfer," Nanoscale Energy Transport, Emerging Phenomena, Methods and Applications, Chapter 15, IOP Publishing, 2020.

Mentorship and Leadership Experience

- Fellow of the Power Optimization of Electro-Thermal Systems (POETS) Future Technical Leaders program (<http://poets-erc.org/FTL>), class of 2021. *Sep 2021 – Apr 2022*
- Guided a group of Wiley Elementary School students in performing science experiments during outreach events – Urbana, IL. *Feb 2021 – May 2021*
- Completed the Illinois Mentoring Excellence Program. *May 2018 – Aug 2018*
- Coordinated the webinar series organized by the student leadership council of the Center for Power Optimization of Electro-Thermal Systems (POETS). *Sep 2018 – Aug 2019*