

Curriculum Vitae

Gisuk Hwang, Ph.D.

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EDUCATION

Ph.D. in Mechanical Engineering, University of Michigan	09/06 – 08/10
• Thesis Topic: Molecular Simulation and Bimodal Network Model of Nanoscale Water/Proton Transport in Polymer Electrolyte of Fuel Cells, Advisor: M. Kaviani	Ann Arbor, MI
M.S.E. in Mechanical Engineering, University of Michigan	09/04 – 04/06
• Thesis Topic: Modeling of a Modulated Wick Heat Pipe, Advisor: M. Kaviani	Ann Arbor, MI
B.E. in Mechanical Engineering and Electronic Engineering (Double Major), Handong University	03/97 – 08/02
• Thesis Topic: Electrical Capacitance Tomography Using Genetic Algorithm, Advisor: J.Y. Lee	Pohang, Korea
• Computer Engineering (Minor), Early Graduation	

PROFESSIONAL APPOINTMENT

Associate Professor, Department of Mechanical Engineering, Wichita State University	08/19 – Present Wichita, KS
Assistant Professor, Department of Mechanical Engineering, Wichita State University	09/13 – 07/19 Wichita, KS
Post-doctoral Fellow, Environmental Energy Technologies Division, Lawrence Berkeley National Laboratory, Supervisor: A.Z. Weber	09/10 – 08/13 Berkeley, CA

RESEARCH INTERESTS

Phase-change heat transfer in micro-/nanoscale porous media; advanced thermal and water management; optimal porous material design; additive manufacturing, X-ray image-based pore-scale modeling; waste heat recovery; Lattice Boltzmann method; advanced porous structure manufacturing; molecular dynamics simulation; fuel cell and flow battery electrodes; polymer electrolyte membrane

RESEARCH EXPERIENCE

Assistant/Associate Professor, Wichita State University	09/13 – Present Wichita, KS
• Measurement of High Flux Two-Phase Thermal Management System using Novel 3D Microporous Structures	
• Development of Novel Thermal Diode and Transistor using Heterogeneous Nanoporous Structures using Molecular Dynamics Simulations and Grand Canonical Monte Carlo Simulations	
• Development of Ultrasound-Assisted Deicing System	
• X-ray Image-based Modeling of Partially-Saturated Gas Diffusion Layer for Polymer Electrolyte Membrane Fuel Cell	
• Multiscale Modeling of Coolability of Molten Core for Loss of Coolant Accident in Nuclear Power Plant	
• Fundamental Understandings of Enhanced Water Diffusivity in Graphene Nanoporous Structures using Molecular Dynamics Simulations	
• Measurement of Enhanced Proton Conductivity of Graphene-based Polymer Electrolyte Membrane	
Post-doctoral Fellow, Lawrence Berkeley National Laboratory (Supervisor: A.Z. Weber)	09/10 – 08/13 Berkeley, CA
• Elucidation of Water Transport in Polymer Electrolyte Membrane using X-ray Micro Tomography (at Advanced Light Source)	
• Measurement of Effective Gas Diffusivity of Multiphase Porous Electrodes	

- Measurement of Phase-Change Driven Degradation of Membrane Electrode Assembly of Fuel Cells
- Demonstration and Optimal Design of a Non-noble Metal, Molecular Catalyst for Fuel Cells
- Measurement of Surface Area of Acid/Thermal Treated Porous Carbon

Doctoral Research Assistant, University of Michigan

09/06 – 08/10

- **Thermal Sciences and Engineering in Advanced Thermal Management Systems**

Ann Arbor, MI

- ✓ Molecular Simulations of Tailored Two-Phase Heat Transfer in Nanoporous Structures, demonstrating Novel Nano Heat Pipe Design
- ✓ Optimal Design of a Novel 3D Microporous Evaporator for High Heat Flux and Low Thermal Resistance Heat Spreader, resulting in 600 W/cm² and 0.05 K/(W/cm²)
- ✓ Optimal Design of a Multistage Thermoelectric Micro Cooler, achieving State-of-the-Art Cooling Performance at Microscale

- **Thermofluid Transport in Polymer Electrolyte Membrane of Fuel Cells**

- ✓ Multiscale Models of Water/Proton Transport in Polymer Electrolyte Membrane, explaining Water-State-Related Proton Conducting Mechanism
- ✓ Nanoscopic Modeling of Capillary-Water Behavior in Fuel Cells, explaining the Role of Capillary Water in Polymer Electrolyte Membrane on Proton Conductivity

Master's Thesis Research, University of Michigan

09/04 – 04/06

- Optimal Design of a Modulated Wick Heat Pipe, resulting in 2-fold Cooling Performance Improvement
- Experimental Study of Critical Heat Flux Enhancement using Surface-Modulated Porous Coatings, achieving 2-fold Critical Heat Flux Improvement

Ann Arbor, MI

Research Assistant, Dept. of Nuclear Engineering, KAIST

08/02 – 04/03

- Experimental Study of Two-Phase Flow for the Safety Evaluation of Canadian Deuterium Uranium (CANDU) Reactors (Advisor: H.C. No)

Daejeon, Korea

Undergraduate Research Assistant, Dept. of Mechanical/Electrical Engineering, Handong University

09/98 – 08/02

- Developed Reconstruction Algorithm of Capacitance Computer Tomography for Safety Analysis in Nuclear Reactors (Undergraduate Thesis, advised by J.Y. Lee)
- Experimental Study of the Two-phase Flow Measurement using Electrical Resistance Probe Method

Pohang, Korea

Programmer for Commercial Computer Code, Handong University

06/98 – 08/98

- Developed Application Software for Settop Box for Online Video Service

Pohang, Korea

TEACHING EXPERIENCE

Primary Instructor, Wichita State University

09/13-Present

- **Numerical Methods for Engineers (ME 325)**: 42 Students (2020F), 49 (2020 S), 77 (2019 F), 49 (2019 S), 70 (2018 F), 72 (2018 S), 75 (2017 F), 79 (2017 S), 51 (2016 F), 102 (2016 S), 63 (2015 F)
- **Thermodynamics I (ME 398)**: 29 Students (2017 S), 58 (2016 F), 71 (2015 S), 88 (2014 F), 73 (2013 F)
- **Modeling of Engineering Systems (ME 730)**: 22 Students (2020F), 23 (2019 F), 27 (2018 F), 10 (2017 F), 13 (2016 S), 12 (2014 S)
- **ME Graduate Seminar (ME 777)**: 23 Students (2019 F), 21 (2019 S), 18 (2018 F), 15 (2018 S), 14 (2017 F)
- **Introduction to Molecular Simulations (ME 859)**: 12 Students (2015 S)
- **Two-Phase Flow Heat Transfer (ME 854)**: 3 Students (2020 S)

Wichita, KS

Teaching Assistant, University of Michigan

09/06 – 12/07

- **Undergraduate Heat Transfer (ME 335)**: Review Lecture and Office Hour for 140 Students

Ann Arbor, MI

Teaching Assistant, Handong University

03/99 – 12/99

- **Undergraduate Fluid Mechanics**: Lecture of Computer Simulation for 15 Students (in Korean)
- **Introduction to Information Processing and Lab**: Lecture of Computer Lab. for 60 students (in Korean)

Pohang, Korea

STUDENT ADVISING

Graduate Student: As a Committee Chair

Ph.D. Dissertations:

09/13-Present

- [1] Munonyedi Egbo, Ph.D., Department of Mechanical Engineering, WSU, "Tailored Flow Boiling using Heterogeneous Capillary Evaporator", 08/2018-12/2021 (expected).
- [2] Mohammad Borumand, Ph.D., Department of Mechanical Engineering, WSU, "Multiphase Heat and Fluid Flow for High Heat Flux Thermal Management Systems using Lattice Boltzmann Method", 08/2018-12/2021 (expected).
- [3] Yahya Nasersharifi, Ph.D., Department of Mechanical Engineering, WSU, "3D Engineered Capillary Evaporators for Enhanced Critical Heat Flux and heat Transfer Coefficient in Pool Boiling and Vapor Chamber", 01/2015-07/2020.
- [4] Tadeh Avanesian, Ph.D., Department of Mechanical Engineering, WSU, "Adsorption and Capillary Transition-Controlled Thermal Diodes and Switches using Heterogeneous Nanostructures", 08/2014-12/2017.

Wichita, KS

M.S. Theses:

- [1] Kapot Kallol Tarafder, M.S., Department of Mechanical Engineering, WSU, "Optimal Design of Capillary-Wick for High Heat Flux Thermal Management System", 05/2015.
- [2] Aamer Khan, M.S., Department of Mechanical Engineering, WSU, "Development of Graphene-Nafion-based Catalyst Layer for Polymer Electrolyte Membrane Fuel Cells", 08/2015.

M.S. Project:

- [1] Athul Pai, M.S., Department of Mechanical Engineering, WSU, "Porosity Measurement of Single-Layer and Multi-layer Wick with Uniform and Non-Uniform Particle Sizes", 05/2019.

Graduate Students: As a Committee Member

Ph.D. Dissertations:

- [1] Elaheh Shahryari, Ph.D., Department of Chemistry, WSU, "Molecular Modeling of Cofactors", 05/2021 (expected).
- [2] Farshad Houtaham, Ph.D., Department of Mechanical Engineering, WSU, "Investigation of Surface Facilitation for Upgrading Natural Gas to Value-Added Liquids under Ambient Conditions", 07/2020.
- [3] Mahmood Bashire, Ph.D., Department of Mechanical Engineering, WSU, "Additive and Subtractive Laser Pulsed Nano/Micro Machining of Metal Alloys for Enhanced Material Properties and Numerical Validation", 05/2020.
- [4] Aneesha Gonineni, Ph.D., Department of Mechanical Engineering, WSU, "Flow Dynamics and Wall Shear Stresses in Partially Blocked Stented Artery under Comorbid Conditions", 12/2015.

M.S. Theses:

- [1] Ramya B. Pampala, M.S., Department of Aerospace Engineering, WSU, "Numerical Estimation of Slipstream Characteristics for Propellers Operating at Low Reynolds Numbers", 07/2019.
- [2] Nidhi Sathyanarayana, M.S., Department of Aerospace Engineering, WSU, "Numerical Simulation of Flat Plate Trajectory Using Coupled Computational Fluid Dynamics-Rigid Body Dynamics with Dynamic Meshing", 07/2019.

- [3] Rajan Shrestha, M.S., Department of Mechanical Engineering, WSU, "Three-dimensional Structured Superhydrophobic Electrospun Nanofiber Mats for Environmental Remediations", 05/2019.
- [4] Krishna Sit, M.S., Department of Mechanical Engineering, WSU, "Effects of Laser Interface Sintering on Monolayer Copper Micro-Particles Using a Carbon Dioxide Pulsed Laser System", 12/2018.
- [5] Tyler Alexander, M.S., Department of Mechanical Engineering, WSU, "The Effects of Porosity and Micro-scale Sodium Chloride Inclusions on the Figure of Merit of Bismuth Telluride", 05/2017.
- [6] Teja Swaroop Naik Mudiki, M.S., Department of Mechanical Engineering, WSU, "Study of Pressure Drop and Heat Transfer in Micro Channel Branch with Varying Bifurcation Angle, Aspect Ratio, and Temperature", 05/2017.
- [7] Azhar Hussain Mohammed, M.S., Department of Mechanical Engineering, WSU, "Tuning the Energy Bands of Sol-Gel Based TiO₂ Nanoparticles via C₆₀, SWCNT and ITO as Dopants", 07/2016.
- [8] Salahuddin Mohammad, M.S., Department of Mechanical Engineering, WSU, "Investigating Superhydrophobic Behaviors of Carbonized PAN Nanofibers on Gas Diffusion Layers of PEM Fuel Cells", 12/2015.
- [9] Gopinath Jayakumar, M.S., Department of Biomedical Engineering, WSU, "Patent Specific Fluid Structure Interaction (FSI) Modeling: Anticipating the Growth of Abdominal Aortic Aneurysm (AAA) by Considering the Effects of Hypertension and Aorta Wall Material Properties with Intraluminal Thrombus (ILT)", 08/2015.
- [10] Daniel Calvario, M.S., Department of Mechanical Engineering, WSU, "Effects of Material Surface Characteristics on Thermal-hydraulics in Microchannel Flow of Newtonian Fluids", 05/2015.
- [11] Tewodros Fiseha Wondimu, M.S., Department of Mechanical Engineering, WSU, "Numerical Study of Nanoparticle Concentration Effect on Heat Transfer Enhancement in Mini-Channel Flow", 12/2014.

M.S. Project:

- [1] Annie Ma, M.S. Project, Department of Mechanical Engineering, WSU, "Investigating the Physical Properties of 3D Printed Titanium Ti-6Al-4V (Grade 23) Alloys of Various Shapes Before and After Heat Treatment Process", 12/2019.
- [2] Anuruddaha Ransilu Pattiyage Peiris, M.S. Project, Department of Mechanical Engineering, WSU, "Characterization of Polyvinylidene Fluoride and Boron Nitride Nanocomposites", 05/2015.

Undergraduate Research:

- [1] Casey Reyes, Department of Mechanical Engineering, WSU, "Machine Learning Assisted Image Analysis", 06/2019 - Present 09/13-Present
Wichita, KS
- [2] Evan Waddell, Department of Mechanical Engineering, WSU, "Ultrasound-Assisted Deicing Systems", 06/2019 - Present
- [3] Jacob Keese, Department of Mechanical Engineering, WSU, "Porosity Measurement of Thin Capillary Evaporator", 01/2019 - Present
- [4] Moriah Ausherman, Department of Mechanical Engineering, WSU, "Additively Manufactured Wick for Two-Phase Cooling Systems", 01/2019 - 12/2019
- [5] Nathan Albu, Department of Mechanical Engineering, WSU, "Permeability Measurement of Heterogeneous Wick", 04/2018 - 05/2019
- [6] Evan Boutz, Department of Mechanical Engineering, WSU, "Molecular Simulations of Thermal Diode", 02/2018 - 05/2019
- [7] Kian Hong Er, Department of Mechanical Engineering, WSU, "Porosity and Permeability Measurement of Monolayer Wick", 09/2016 - 12/2017.
- [8] Nisal N. Habakkala Kankanage, Department of Mechanical Engineering, WSU, "Water Capture using Biphilic Surfaces", 05/2016 - 12/2017.
- [9] Dilanki Terrenska Webita Vidanalage Dona, Department of Mechanical Engineering, WSU, "Enhanced Water Condensation using Microporous Structures", 05/2016 - 12/2017.

- [10] Qi Heng Weng, Department of Mechanical Engineering, WSU, "Development of Heterogeneously Surface Treated Gas Diffusion Layer of High Performance and Low Cost Proton-Exchange-Membrane Fuel Cells", 01/2015 – 12/2015.
- [11] Yatharsana Manickavasagar, Department of Mechanical Engineering, WSU, "Development of Thin Sample Thermal Conductivity Measurement", 01/2015 – 12/2015.
- [12] Aneek Noor, Department of Mechanical Engineering, WSU, "Development of Optimal Water Management System for a Proton Exchange Membrane Fuel Cell (PEMFC)", 01/2015 – 12/2015.

Undergraduate Projects:

- [13] Christian Swift, Walter Agbor, Keith Carlin, and Matt Klenda, Capstone Design, Department of Mechanical Engineering, WSU, "Portable Water Distillery", 09/2017 - 12/2017.
- [14] Wade Hughes, Bernardo Gaspar, Chad Giles, and Levi Ehram, Capstone Design, Department of Mechanical Engineering, WSU, "Solar-Powered, Portable Water Desalination System: Solar-Electrochemical System", 01/2016 – 05/2016.
- [15] Keaton Kristner, Andrew Heinrich, and Matthaw Kornfeld, Capstone Design, Department of Mechanical Engineering, WSU, "Solar-Powered, Portable Water Desalination System: Solar-Thermal System", 09/2015 – 12/2015.
- [16] Gregory Trigub (2013) at LBNL: Measurement of surface area of acid/thermal treated porous media. 09/12 – 08/13
- [17] Joseph Grant (2013) at LBNL: Measurement of effective diffusivity through porous media. Results: Obtained experimental results presented in *ECS Meeting*, Oct., 2014 Berkeley, CA
- [18] Benoit Carne (2010) at University of Michigan: Modeling of capillary meniscus recess in a thin evaporator monolayer wick. Results: Predicted results published in *Int. J. Heat Mass Transfer*, 2011 06/08 – 09/10 Ann Arbor, MI
- [19] Amélie Saint-Germain (2008) at University of Michigan: Modeling of liquid water saturation and capillary pressure in gas diffusion layer of fuel cells. Results: Predicted results published in *J. Electrochem. Soc.*, 2009

PROFESSIONAL EXPERIENCE

Journal and Conference Reviews

- Nanoscale and Microscale Thermophysical Engineering 09/13 – Present
- Electrochemical Society Journal/Transaction, Journal of Mechanical Science and Technology 09/10 - Present
- ASME Journal/Transaction, Journal of Microelectromechanical Systems 06/07 - Present
- International Journal of Heat and Mass Transfer, and Journal of Thermophysics and Heat Transfer 06/07 – Present

Service and Leadership Activities

- **Executive Committee Member**, ASME Process Industry Division (PID) 09/14 – Present
- **Award Committee Member**, College of Engineering, WSU 09/15 – Present
- **Mentor for Junior Faculty**, College of Engineering, WSU 07/19 – 12/19
- **Track Organizer**, 2020 ASME ICNMM, Orlando, FL 09/04 – Present
- **Topic Organizer**, 2018 AIAA/ASME Joint Thermophysics and Heat Transfer Conference 08/17 – 06/18
- **Topic Organizer**, 2017/2018 ASME InterPACK, San Francisco, CA 01/17 – 07/17
- **Topic Organizer**, 2017 ASME Power and Energy Conference, Charlotte, NC 12/16 – 06/17
- **Topic Organizer**, 2016 ASME ICNMM, Washington DC 01/16 – 07/16
- **Topic Organizer**, 2015 ASME InterPACK&ICNMM, San Francisco, CA 02/15 – 07/15
- **Topic Organizer**, 2014 ASME IMECE, K10, Montreal, Canada 01/14 – 11/14
- **Session Chair** (Thermofluid Session), the 2009 Engineering Graduate Student Symposium, University of Michigan 11/09
- Vice-President of the Student Union, Mechanical Engineering, Handong University 03/99 - 12/99

Service on Proposal Review Panels for Granting Agencies

- Review Panel, National Science Foundation, Chemical, Bioengineering, Environmental, and Transport Systems 03/17
- Reviewer, Stanford Synchrotron Radiation Lightsource (SSRL) 01/17
- Reviewer, Energy Market Authority Research and Development of Singapore 08/16, 09/15

Military Service

- Compulsory Military Service** in Training and Doctrine Command 12/99 – 02/02
- Served in a Computer Administration Branch for Programming and Computer System Management Daejeon, Korea

AWARDS and HONORS

- **3rd Place, Oral Presentation (coauthor with a student, Yahya Nasersharifi) at Graduate Research and Scholarly Projects (GRASP) Symposium**, “Enhanced Critical Heat Flux in Pool Boiling Using Canopy-Capillary Evaporator Wick”, 2016, Wichita State University, Prize \$250.
- **Kansas NSF EPSCoR, First Award**: Adsorption-Controlled, Thermal diode and Switch (ACTS)”, 2015, Wichita State University
- **ASEE Outstanding Student Instructor Award**, 2007, University of Michigan
- **First Prize** (Heat Transfer Poster Session), 2006 Engineering Graduate Student Symposium, University of Michigan
- **Second Prize** (Fluid Mechanics and Heat Transfer Poster Session), 2005 Engineering Graduate Student Symposium, University of Michigan
- Tennis: **Championship**, 2006/Finalist, 2007 at Ann Arbor City Tournament
- **Academic Excellence Scholarship**, 1997 – 2002, Handong University

PATENT

- R. Nair and **G. Hwang**, System and Method for Forming Wick Structure (Provisional Patent Application, 20TECH007, 0803808.0059), 01/23/2020.
- J.B. Kerr, X. Zhu, **G. Hwang** and et al., Membrane-Electrode Structures for Molecular Catalyst for Use in Fuel Cells and other Electrochemical Devices, US Patent No. 9455451, 09/27/2016.

CERTIFICATIONS

- Certificate in University Teaching, University of Michigan (attended learning and teaching related seminars and produced reflective essays, and subjected to observation and critical evaluation of multiple teaching events, improvement targets set)
- National Technical Qualification Certificate for Computer Programming, Korea
- Tae-Kwon-Do, Black-belt

PROFESSIONAL AFFILIATIONS

- Member of American Society for Mechanical Engineers (ASME)
- Member of Electrochemical Society (ECS)
- Korean-American Scientists and Engineers Association (KSEA)

PROFESSIONAL PRESENTATIONS (Underlined for Presenter)**Presentations at Conferences:**

- [1] M. Borumand, T. Lee, and G. Hwang “Enhanced Wickability of Thin Non-uniform Sintered Particle Wicks using Lattice Boltzmann Method (IMECE2020-24311)”, *ASME International Mechanical Engineering Congress and Exposition (IMECE)*, Portland, OR, USA, 11/15/2020.
- [2] M.K. Egbo, Y. Nasersharifi, and **G. Hwang**, “(Poster Presentation) Thermal Performance of Capillary-Controlled Thin Sintered-Particle Wick (IMECE2019-13057)”, *ASME International Mechanical Engineering Congress and Exposition (IMECE)*, Salt Lake City, Utah, USA, 11/13/2019.
- [3] E. Norouzi, C. Park, and **G. Hwang**, “Nano Heat Pipe using Surface-Diffusion-Driven Condensate Return”, American Society of

- Mechanical Engineers (ASME) Summer Heat Transfer Conference (SHTC), Bellevue, WA, 07/14-17, 2019.
- [4] N. Albu, J. Keese, and **G. Hwang**, “Bimodal, Thin Wick Structures for High Heat Flux Two-Phase Thermal Control Systems (ICES-2019-206)”, International Conference of Environmental Systems (ICES), Boston, MA, 07/07-11, 2019.
- [5] Mohammad Borumand, and **G. Hwang**, “High Heat Flux Two-Phase Thermal Control System using Non-Uniform Capillary Evaporator (ICES-2019-176)”, International Conference of Environmental Systems (ICES), Boston, MA, 07/07-11, 2019.
- [6] Mahmood Bashir, Krishna Sit, Rajeev, and **G. Hwang**, “Additive Manufacturing of Thin Wick Structures using Microsecond Pulse Laser (ICES-2019-234)”, International Conference of Environmental Systems (ICES), Boston, MA, 07/07-11, 2019.
- [7] G. A. Riley, N. Doughramaji, A.J. Pai, M. Egbo, **G. Hwang**, M. Derby, “Steam Flow Condensation in Mini-Channels With Sintered Copper Structures (ICNMM-2019-4329)”, American Society of Mechanical Engineers (ASME) International Conference on Nanochannels, Microchannels, and Minichannels, St. John’s, Newfoundland and Labrador, Canada, 06/24/2019.
- [8] S. Dahariya, A.J. Pai, **G. Hwang**, and A.R. Betz, “Pool Boiling Heat Transfer Enhancement using Sintered Particle Wick Structure (TFEC-2019-27387)”, 4th Thermal and Fluids Engineering Conference (TFEC), Las Vegas, NV, USA, 04/16/2019.
- [9] T. Avanesian, **G. Hwang**, and E. Boutz, “Capillary-Controlled Thermal Diode in Heterogeneous Nanoporous Structures (IMECE2018-89713)”, ASME International Mechanical Engineering Congress and Exposition (IMECE), Pittsburgh, Pennsylvania, USA, 11/14/2018.
- [10] N. Albu, A. Pai, and **G. Hwang**, “(Poster Presentation) Heterogeneous Monolayer Wick Structures for High Heat Flux Thermal Management Systems (IMECE2018-89957)”, ASME International Mechanical Engineering Congress and Exposition (IMECE), Pittsburgh, Pennsylvania, USA, 11/13/2018.
- [11] A. Pai, Y. Nasersharifi, and **G. Hwang**, “(Poster Presentation) Enhanced Flow Boiling using Columnar-Post Wick (IMECE2018-89971)”, ASME International Mechanical Engineering Congress and Exposition (IMECE), Pittsburgh, Pennsylvania, USA, 11/13/2018.
- [12] M. Al Bashir, K. Sit, A. Pai, R. Nair, and **G. Hwang**, “Fabrication of Microscale Single Layer Wick Structure using Pulsed Microsecond Laser”, International Congress on Applications of Lasers & Electro-Optics (ICALEO), Orlando, Florida, USA, 10/15/2018.
- [13] T. Avanesian and **G. Hwang**, “Nanostructure-driven Thermal Switch Using Molecular Simulations”, ASME International Mechanical Engineering Congress and Exposition (IMECE), Tampa, Florida, USA, 11/08/2017.
- [14] T. Avanesian and **G. Hwang**, “Adsorption and Capillary Condensation in Nanogap with Nanoposts”, ASME Summer Heat Transfer Conference, Bellevue, Washington, USA, 07/11/2017.
- [15] T. Avanesian and **G. Hwang**, “Adsorption-Controlled Thermal Switch using Nonequilibrium Molecular Dynamics Simulation”, ASME International Mechanical Engineering Congress and Exposition (IMECE), Phoenix, Arizona, USA, 11/16/2016.
- [16] M. Moulod and **G. Hwang**, “Nano Heat Pipe: Nonequilibrium Molecular Dynamics Simulation”, ASME International Mechanical Engineering Congress and Exposition (IMECE), Phoenix, Arizona, USA, 11/15/2016.
- [17] Y. Nasersharifi and **G. Hwang**, “Critical Heat Flux Enhancement in Pool Boiling: Canopy-Capillary Evaporator Wick”, ASME International Conference On Nanochannels, Microchannels, and Minichannels (ICNMM), Washington DC, 7/10-7/14, 2016.
- [18] M. Moulod and **G. Hwang**, “Comparative Studies on Water Self-Diffusivity Confined in Graphene Nanogap: Molecular Dynamics Simulation,” ASME International Conference On Nanochannels, Microchannels, and Minichannels (ICNMM), Washington DC, 7/10-7/14, 2016.
- [19] J.T. Gostick, P.A. Garcia-Salaberri, **G. Hwang**, M. Vera, and A.Z. Weber, “On the Mass-Transfer Properties of Partially-Saturated Carbon-Paper Gas Diffusion Layers: Global Vs. Local Effective Diffusivity”, 227th Electrochemical Society (ECS) Meeting, Chicago, IL, 5/24/2015.

- [20] P.A. Garcia-Salaberri, J.T. Gostick, **G. Hwang**, M. Vera, and A.Z. Weber, "Pore-Scale Calculations of Effective Diffusivity in Partially-Saturated GDLs: Application to PEFC Continuum Models," *12th Symposium on Fuel Cell and Battery Modeling and Experimental Validation*, Schloss Reinach, Freiburg-Munzingen, German, 3/27/2015.
- [21] J. Gostick, **G. Hwang**, and A.Z. Weber, "Understanding invasion mechanisms in fibrous gas diffusion media: Direct comparison of simulations with tomographic visualization", *223rd Electrochemical Society (ECS) Meeting*, Toronto, Ontario, Canada, 05/12-05/16, 2013.
- [22] **G. Hwang**, D. Parkinson, A. Kusoglu, A. MacDowell, and A.Z. Weber, "Understanding Water Uptake and Transport in Nafion® using X-ray Micro-Tomography", *245th American Chemical Society (ACS) National Meeting*, New Orleans, Louisiana, USA, 04/07 - 04/11, 2013.
- [23] Q. He, **G. Hwang**, A. Z. Weber, R. Kostecki, and J. B. Kerr, "Electroreduction of Molecular Oxygen by Water-Soluble Metal Porphyrins in Trifluoromethane Sulfonic Acid Solution", *220th Electrochemical Society (ECS) Meeting*, Boston, Massachusetts, USA, 10/09-10/14, 2011.

Presentations at Universities/National Laboratories as an Invited Guest Speaker

- [1] **G. Hwang**, "3D Wicks for High Heat Flux Two-Phase Cooling Systems", Graduate Seminar at Department of Industrial, Systems, and Manufacturing Engineering, Wichita State University, Wichita, Kansas, 03/13/2020.
- [2] **G. Hwang**, "Heterogeneous Capillary Evaporators for High Heat Flux Thermal Management Systems", Graduate Seminar at Department of Mechanical Engineering, The City College of New York, New York City, New York, 09/26/2019.
- [3] **G. Hwang**, "Nano Thermal Diode and Switch using Nonuniform Porous Structures", Graduate Seminar at Department of Mechanical Engineering, Stevens Institute of Technology, Hoboken, New Jersey, 09/25/2019.
- [4] **G. Hwang**, "Tailored Thermal Transport Phenomena in Gas-Filled Heterogeneous Nanostructures for Nano Thermal Diode and Switch", Chemistry Colloquium at Department of Chemistry, Wichita State University, Wichita, Kansas, 09/12/2018.
- [5] **G. Hwang**, "Tailored Two-Phase Heat Transfer for Advanced Thermal Management Systems", Graduate Seminar at Department of Mechanical Engineering, University of Kansas, Lawrence, Kansas, 10/23/2017.
- [6] **G. Hwang**, "Nano Thermal Diode/Switch using Gas-Filled Heterogeneous Nanostructures", Graduate Seminar at School of Mechanical Engineering, Chungnam National University, Daejeon, Korea, 06/08/2017.
- [7] **G. Hwang**, "Controlled Two-phase Flow for Advanced Thermal Management Systems", Colloquium at Department of Mechanical Engineering, Korea Advanced Institute of Science and Technology, Daejeon, Korea, 06/08/2017.
- [8] **G. Hwang**, "Nanoscale Thermal Management Systems," Graduate Seminar at School of Mechanical Engineering, University of Ulsan, Ulsan, Korea, 05/22/2017.
- [9] **G. Hwang**, "Multiscale Engineered Surfaces for Advanced Thermal Management Systems", Graduate Seminar at Division of Advanced Nuclear Engineering, Pohang University of Science and Technology, Pohang, Korea, 05/15/2017.
- [10] **G. Hwang**, "Nanoscale-Interfacial-Resistance-Controlled Thermal Diode and Switch", Graduate Seminar at Department of Mechanical Engineering, Kyunghee University, Suwon, Korea, 06/07/2017.
- [11] **G. Hwang**, "Capillary-Artery Evaporator for High Heat Flux Thermal Control System," Seminar at Fluid Physics and Transport Branch, NASA Glenn Research Center (GRC), Cleveland, Ohio, 01/11/2017.
- [12] **G. Hwang**, "Advanced Two-Phase Thermal Management Systems," Seminar at Thermal Hardware and Fluid Systems Engineering Group, NASA Jet Propulsion Laboratory (JPL), Pasadena, California, 12/06/2016.
- [13] **G. Hwang**, "Advanced Thermal Management Systems," Seminar at Department of Applied Photonic Microsystems, Sandia National Laboratories, Albuquerque, New Mexico, 9/22/2016.

- [14] **G. Hwang**, "Optimal Designs of Multiscale Porous Structures for Renewable Energy and Thermal Management Systems," Research Slam, College of Engineering, Wichita State University, Wichita, 4/15/2016.
- [15] **G. Hwang**, "Nanoscale Thermal Management Systems: Thermal Diode and Switch, and Heat Pipe," Graduate Seminar, Department of Mechanical and Aerospace Engineering, University of Missouri, Columbia, 3/3/2016.
- [16] **G. Hwang**, "Water Transport Fundamentals in Polymer Electrolyte Membrane and Novel Capillary Wick for High Heat Flux Thermal Management Systems," International Scholar, Center for Urban Energy System Research, Korea Institute of Science and Technology, 6/11/2015.
- [17] **G. Hwang**, "Optimal Designs of Sustainable Energy and Thermal Management Systems using Molecular Dynamics Simulation," Guest Speaker for Graduate Student Seminar, Department of Mechanical and Nuclear Engineering, Kansas State University, 2/24/2015.
- [18] **G. Hwang**, "Optimal Thermal Management Systems: Capillary-Artery Evaporator Wick and Thermal Diode," Guest Speaker for Graduate Student Seminar, Division of Advanced Nuclear Engineering, Pohang University of Science and Technology, Korea, 1/13/2015.
- [19] **G. Hwang**, "Multiscale Water and Proton Transport Phenomena in Polymer Electrolyte Membrane Fuel Cell," Seminar at High Temperature Energy Materials Research Center in Korea Institute of Science and Technology, Korea, 1/9/2015
- [20] **G. Hwang**, "Polymer Electrolyte Membrane Fuel Cell: Technology Trend," Seminar at Green Technology Center, Korea, 1/7/2015.
- [21] **G. Hwang**, "Transport and Degradation Phenomena in Polymer Electrolyte Membrane Fuel Cells at Low Temperatures," Seminar at Research, Fuel Cell Laboratory in Korea Institute of Energy Research, Korea, 1/7/2015.
- [22] **G. Hwang**, "Nanoscale Transport Phenomena in Sustainable Energy and Thermal Management Systems using Molecular Dynamics Simulations," Guest Speaker for Graduate Student Seminar, Department of Mechanical Engineering, University of Nevada at Reno, 4/4/2014.

Presentations at Research Forum

- [1] **M. Ausherman**, M. Sealy, G. Madiraddy, and **G. Hwang** (Poster Presentation), "Additive Manufactured Wick Structures for Two-Phase Cooling", Nebraska Summer Research Symposium, University of Nebraska-Lincoln, 08/07/2019.
- [2] **M. Borumand** and **G. Hwang** (Poster Presentation), "Enhanced Critical Heat Flux of Flow Boiling Using Columnar-Post Wick", Graduate Research and Scholarly Projects (GRASP) Symposium, Wichita State University, 4/26/2019.
- [3] **M. Egbo**, Y. Nasersharifi, and **G. Hwang** (Poster Presentation), "Characterization of Non-uniform Wick Thermal Performance", Graduate Research and Scholarly Projects (GRASP) Symposium, Wichita State University, 4/26/2019.
- [4] **N. Albu**, J. Keese, and **G. Hwang**, "Bimodal, Thin Wick Structures for High Heat Flux Two-Phase Thermal Control Systems", Undergraduate Research Creative Activity Forum (URCAF), Wichita, WSU, 4/19/2019.
- [5] **E. Boutz** and **G. Hwang**, "Understanding of Adsorption-Capillary Transition in Heterogeneous Nanoporous Structures", Undergraduate Research Creative Activity Forum (URCAF), Wichita, WSU, 4/19/2019.
- [6] **T. Avanesian** and **G. Hwang** (Poster Presentation), "Adsorption-controlled Thermal Diode: Nonequilibrium Molecular Dynamics Simulation", Graduate Research and Scholarly Projects (GRASP) Symposium, Wichita State University, 4/29/2016.
- [7] **M. Moulod** and **G. Hwang** (Poster Presentation), "Comparative Studies on Water Self-Diffusivity Confined in Graphene Nanogap: Molecular Dynamics Simulation", Graduate Research and Scholarly Projects (GRASP) Symposium, Wichita State University, 4/29/2016.
- [8] **Y. Nasersharifi** and **G. Hwang**, "Enhanced Critical Heat Flux in Pool Boiling using Canopy-Capillary Evaporator Wick", Graduate

Research and Scholarly Projects (GRASP) Symposium, Wichita State University, 4/29/2016.

- [9] Y. Manickavasagar and **G. Hwang**, “Development of Thin Sample Thermal Conductivity Measurement System”, Undergraduate Research Creative Activity Forum (URCAF), Wichita, WSU, 4/7/2015.
- [10] Q.H. Weng and **G. Hwang**, “Optimal Design of Gas Diffusion Layer of Polymer Electrolyte Membrane Fuel Cells using Bimodal Porosity and Wettability”, Undergraduate Research Creative Activity Forum (URCAF), Wichita, WSU, 4/7/2015.

RESEARCH GRANTS

External Grants: Total of \$1,106,735 as a PI

- [1] **G. Hwang** (PI), “RII Track-4: Tailored Flow Boiling Mechanisms Using 3D Printed Multifunctional Wick Structures”, National Science Foundation (NSF) Established Program to Stimulate Competitive Research (EPSCoR) (Award#: OIA-1929187), \$243,635, 12/01/2019 – 11/30/2021.
- [2] **G. Hwang** (PI), A. Betz, M. Derby, X. Li, and R. Nair (Co-PIs), “Efficient and Compact Thermal and Water Management Systems using Novel Capillary Structure for Space Technology”, NASA Cooperative Agreement Notice (CAN) Established Program to Stimulate Competitive Research (EPSCoR) (Grant#: 80NSSC18M0030), \$750,000, 12/01/2017 – 11/30/2020.
- [3] **G. Hwang** (PI), “Optimal Design of Planar, Multistage Thermoelectric Cooler”, Sandia National Laboratory, \$30,000, 3/24/2016 – 9/23/2016.
- [4] **G. Hwang** (PI), “Adsorption-Controlled, Thermal diode and Switch (ACTS)”, Kansas National Science Foundation (NSF) Established Program to Stimulate Competitive Research (EPSCoR), First Award, \$83,100, 1/1/2016 – 12/31/2016.

Internal Grants: Total of \$350,667

- [1] **G. Hwang** (PI), N. Saideep, M. Alagic, R. Shen, T. Lu, K. Ambal, X. Wang, T. Babb (Co-PIs), “Smart Fusion Material Research Cluster”, President’s Convergence Sciences Initiative, Wichita State University, \$300,000, 10/01/2020 – 09/30/2023.
- [2] Jacob Keese (Undergraduate Student) and **G. Hwang** (Faculty Advisor), “Enhanced Capillary Flow in Sintered Particles for Efficient Two-Phase Cooling Systems”, Undergraduate Research and Creative Activities (URCA) Grant, Wichita State University, \$1,000, 12/01/2019-11/30/2020.
- [3] Evan Waddell (Undergraduate Student) and **G. Hwang** (Faculty Advisor), “Ultrasound-Heated Polymer Skin for Efficient Deicing Systems”, Undergraduate Research and Creative Activities (URCA) Grant, Wichita State University, \$1,000, 11/04/2019-11/04/2020.
- [4] Moriah Ausherman (Undergraduate Student) and **G. Hwang** (Faculty Advisor), “Fundamental Understandings of Monolayer Wick for Enhanced Cooling”, Nebraska Nanoscale Facility Professor/Student Pair Project, University of Nebraska-Lincoln, \$5,500, 06/01/2019 - 08/12/2019.
- [5] Evan Waddell (Undergraduate Student) and **G. Hwang** (Faculty Advisor), “Deicing Performance Characterizations of Ultrasound-Activated Polymer Skin”, Undergraduate Engineering Summer Research Grant, College of Engineering, Wichita State University, \$3,620, 06/07/2019 - 08/31/2019.
- [6] **G. Hwang** (PI), “Dynamic 3D Capillary Flow Visualization using Fast X-ray Microtomography”, Award for Research/Creative Projects in Summer (ARCS), Wichita State University, \$4,000, 05/01/2018 – 08/31/2018.
- [7] Nathan Albu (Undergraduate Student) and **G. Hwang** (Faculty Advisor), “Design of Highly Permeable Monolayer Wick for Advanced Thermal Management Systems”, Undergraduate Engineering Research Grant, College of Engineering, Wichita State University, \$3,500, 06/01/2018 - 08/17/2018.
- [8] Evan Boutz (Undergraduate Student) and **G. Hwang** (Faculty Advisor), “Understanding of Capillary Transition in Heterogeneous Carbon and Silicon-based Nanoporous Structures using Molecular Simulations”, Undergraduate Engineering Summer Research Grant, College of Engineering, Wichita State University, \$3,600, 06/01/2018 - 08/17/2018.

- [9] **G. Hwang** (PI), "Efficient Water Boiler using 3D Microstructured Surface", John A. See Innovation Award, Wichita State University, \$11,000, 05/01/2017 – 4/30/2018.
- [10] **G. Hwang** (PI), "Edison Engineering Incubator (EEI)", Brenton Myers Innovation in Engineering Education Award, Wichita State University, \$7,000, 01/17/2017 – 01/16/2018.
- [11] Kian Hong Er (Undergraduate Student) and **G. Hwang** (Faculty Advisor), "Fundamental Understandings of Monolayer Wick for Enhanced Cooling", Undergraduate Research Grant, Wichita State University, \$999, 1/5/2017-1/4/2018.
- [12] Nisal Habakkala (Undergraduate Student) and **G. Hwang** (Faculty Advisor), "Development of Efficient Solar-Thermal-Based Water Desalination System using Biphillic Surfaces, \$975, 1/5/2017-1/4/2018.
- [13] Dilanki Wevita (Undergraduate Student) and **G. Hwang** (Faculty Advisor), "Liquid-Artery Wick for Novel Solar-Thermal-Based Water Desalination System", Undergraduate Research Grant, Wichita State University, \$998, 1/5/2017-1/4/2018.
- [14] **G. Hwang** (PI), "Innovative Capillary-Wick Evaporator for Efficient and Economic Steam Generator", University research/Creative Projects Award (URCA), Wichita State University, \$4,500, 7/1/2015 – 6/30/2016.
- [15] Qi Heng (Undergraduate Student) and **G. Hwang** (Faculty Advisor), "Development of Heterogeneously Surface Treated Gas Diffusion Layer of High Performance and Low Cost Proton-Exchange-Membrane Fuel Cells", Undergraduate Research Grant, Wichita State University, \$1,000, 5/1/2015-4/30/2016.
- [16] Yatharsana Manickavasagar (Undergraduate Student) and **G. Hwang** (Faculty Advisor), "Development of Thin Sample Thermal Conductivity Measurement", Undergraduate Research Grant, Wichita State University, \$975, 5/1/2015-4/30/2016.
- [17] Aneek Noor (Undergraduate Student) and **G. Hwang** (Faculty Advisor), "Development of Optimal Water Management System for a Proton Exchange Membrane Fuel Cell (PEMFC)", Undergraduate Research Grant, Wichita State University, \$1,000, 3/1/2015-2/28/2016.

Computing Time:

- [1] **G. Hwang** (PI), "Optimal Designs of Heterogeneous Nanomaterials for Advanced Thermal Management Systems", CTS160045, Computing Time and Data Storage in NSF XSEDE (SDSC), 400 K SUs and 2 TB, (Equivalent Value of \$14,218), 10/01/2016 – 12/31/2017.

PUBLICATIONS

Total Citations: **1,829**, h-index: **23**, i10-index: 30, as of 11/30/2020 based on google scholar

Peer-Reviewed Book Chapters

- [1] **G. Hwang**, and T. Avanesian, "Multiscale Thermal Diode and Switch for Advanced Thermal Management Systems", *Multiscale Thermal Transport in Energy Systems*, edited by Y.-L. He and Y. Zhang, Nova Science Publisher Inc. New York, Dec., 2016.
- [2] **G. Hwang**, C.W. Park, and M. Kaviani, "High-Heat-Flux, Distributed, Capillary-Artery Evaporators", *Handbook of Porous Media*, 3rd Eds., edited by K. Vafai, Taylor and Francis & CRC Press, July, 2015. (Citations: 10)

Peer-Reviewed Journal Articles

- [1] M.K. Egbo and **G. Hwang**, "Phase-change Heat Transfer of Bare Surface Evaporator with Phase-Separating Wick in Downward Facing Orientation", *Int. J. Heat Mass Transfer*, submitted, 12/2020.
- [2] F. Li, H. Li, J. Wang, G. Xia, and **G. Hwang**, "Tunable thermal rectification and negative differential thermal resistance in gas-filled nanostructure with mechanically-controllable nanopillars", *Front. Phys.*, submitted, 11/2020.
- [3] F. Wang, G.A. Riley, M.K. Egbo, M.M. Derby, **G. Hwang**, and X. Li, "Integrated Micro X-ray Tomography and Pore-Scale Simulations for Accurate Permeability Predictions of Porous Media", *Front. Heat Mass Transf.*, 15, 1-8, 2020.
- [4] M.K. Egbo, Y. Nasersharifi, and **G. Hwang**, "Phase-Change Heat Transfer of Sintered-Particle Wick in Downward Facing

- Orientation: Particle Size and Wick Thickness Effects", *Int. J. Heat Mass Transfer*, 155, 119840, 2020.
- [5] S. Dahariya, N. Patel, M.K. Egbo, **G. Hwang**, and A.R. Betz, "High Pressure Pool Boiling Heat Transfer Enhancement Mechanism on Sintered-Particle Wick Surface", *Front. Mech. Eng.*, 5, 1-12, 2020.
 - [6] E. Norouzi, C. Park, and **G. Hwang**, "Nanoscale Heat Pipe using Surface-Diffusion-Driven Condensate Return", *Int. J. Heat Mass Transfer*, 130, 1238-1248, 2019. (Citation: 1)
 - [7] P.A. García-Salaberri, I.V. Zenyuk, **G. Hwang**, M. Vera, A.Z. Weber, and J.T. Gostick, "Implications of Inherent Inhomogeneities in Thin Carbon Fiber-Based Gas-Diffusion Layers: A Comparative Modeling Study", *Electrochim. Acta*, 295, 861-874, 2019. (Citations: 12)
 - [8] P.A. García-Salaberri, I.V. Zenyuk, **G. Hwang**, M. Vera, A.Z. Weber, and J.T. Gostick, "Analysis of Representative Elementary Volume and Through-plane Regional Characteristics of Carbon-Fiber Papers: Diffusivity, Permeability and Electrical/Thermal Conductivity", *Int. J. Heat Mass Transfer*, 127, 687-703, 2018. (Citation: 26)
 - [9] M. Salahuddin, M. N. Uddin, **G. Hwang**, and R. Asmatulu, "Superhydrophobic PAN Nanofibers for Gas Diffusion Layers of Proton Exchange Membrane Fuel Cells for Cathodic Water Management", *Int. J. Hydrogen Energy*, 43, 11530-11538, 2018. (Citations: 17)
 - [10] Y. Nasersharifi, M. Kaviani, and **G. Hwang**, "Pool-boiling Enhancement using Multilevel Modulated Wick", *Appl. Therm. Eng.*, 137, 268-276, 2018. (Citations: 18)
 - [11] T. Avanesian, and **G. Hwang**, "Thermal Diode Using Controlled Capillary in Heterogeneous Nanopores", *Int. J. Heat Mass Transfer*, 124, 201-209, 2018. (Citations: 4)
 - [12] T. Avanesian, and **G. Hwang**, "Adsorption and Capillary Transition in Heterogeneous Nanostructures using Grand Canonical Monte Carlo Simulation", *Int. J. Heat Mass Transfer*, 123, 879-887, 2018. (Citations: 3)
 - [13] R. Asmatulu, A. Khan, V.K. Adigoppula, and **G. Hwang**, "Enhanced Transport Properties of Graphene-Based, Thin Nafion® Membrane for Polymer Electrolyte Membrane Fuel Cells", *Int. J. Energ. Res.*, 42, 508-519, 2018. (Citations: 12)
 - [14] B. Hwang, K. Moriyama, **G. Hwang**, M. Kaviani, M. Lee, E. Kim, and H. Park, "Sensitivity and Uncertainty Analyses of Ex-vessel Molten Core Cooling in a Flooded Cavity during a Severe Accident", *Nucl. Eng. Des.*, 328, 121-133, 2018. (Citations: 2)
 - [15] T. Avanesian, and **G. Hwang**, "Thermal Switch Using Controlled Capillary Transition in Heterogeneous Nanostructures", *Int. J. Heat Mass Transfer*, 121, 127-136, 2018. (Citations: 8)
 - [16] M. Moulod, and **G. Hwang**, "Water self-diffusivity confined in graphene nanogap using molecular dynamics simulations", *J. Appl. Phys.*, 120, 194302, 2016. (Citations: 4)
 - [17] T. Avanesian, and **G. Hwang**, "Adsorption-based Thermal Diode: Non-equilibrium Molecular Dynamics Simulations", *J. Appl. Phys.*, 120, 165306, 2016. (Citations: 10)
 - [18] **G. Hwang**, M. Kaviani, K. Moriyama, H. Park, B. Hwang, M. Lee, E. Kim, and Y. Nasersharifi, "FARO Tests Corium-Melt Cooling in Water Pool: Roles of Melt Superheat and Sintering in Sediment", *Nucl. Eng. Des.*, 305, 569-581, 2016. (Citations: 5)
 - [19] P.A. García-Salaberri, J.T. Gostick, **G. Hwang**, A.Z. Weber, and M. Vera, "Effective Diffusivity in Partially-Saturated Carbon-Fiber Gas Diffusion Layers: Effect of Local Saturation and Application to Macroscopic Continuum Models", *J. Power Sources*, 296, 440-453, 2015. (Citations: 59)
 - [20] P.A. García-Salaberri, **G. Hwang**, M.V. Coello, A.Z. Weber, J.T. Gostick, "Effective Diffusivity in Partially-Saturated Carbon-Fiber Gas Diffusion Layers: Effect of Through-plane Saturation Distribution", *Int. J. Heat Mass Transfer*, 86, 319-333, 2015. (Citations: 73)
 - [21] I.V. Zenyuk, D.Y. Parkinson, **G. Hwang**, and A.Z. Weber, "Probing Water Distribution in Compressed Fuel-Cell Gas-Diffusion Layers Using X-ray Computed Tomography", *Electrochem. Commun.*, 53, 24-28, 2015. (Citations: 99)

- [22] **G. Hwang**, D. Parkinson, A. Kusoglu, A. MacDowell, and A.Z. Weber, "Understanding Water Uptake and Transport in Nafion® using X-ray Micro-Tomography", *ACS Macro Lett.*, 2, 288-291, 2013. (Citations: 45)
- [23] **G. Hwang**, H. Kim, R. Lujan, R. Mukundan, D. Spornjak, R.L. Borup, M. Kaviani, M.H. Kim, and A.Z. Weber, "Phase-Change-Related Degradation of Catalyst Layers in Proton-Exchange-Membrane Fuel Cells", *Electrochim. Acta*, 95, 29-37, 2013. (Citations: 22)
- [24] Y. Sungtaek Ju, M. Kaviani, Y. Nam, S. Sharratt, **G. Hwang**, I. Catton, E. Fleming, and P. Dussinger, "Planar Vapor Chamber with Hybrid Evaporator Wicks for the Thermal Management of High-Heat-Flux and High-Power Optoelectronic Devices", *Int. J. Heat Mass Transfer*, 60, 163-169, 2013. (Citations: 76)
- [25] **G. Hwang**, and A. Z. Weber, "Effective-Diffusivity of Partially-Saturated Gas-Diffusion Layer of Fuel Cells", *J. Electrochem. Soc.*, 159, F683-F692, 2012. (Citations: 105)
- [26] Qinggang He, Tawanda Mugadza, **G. Hwang**, and Tebello Nyokong, "Mechanisms of Electrocatalysis of Oxygen Reduction by Metal Porphyrins in Trifluoromethane Sulfonic Acid Solution", *Int. J. Electrochem. Sci.*, 7, 7045-7064, 2012. (Citations: 31)
- [27] A.J. Gross, **G. Hwang**, B. Huang, H.-X. Yang, N. Ghafouri, H. Kim, R.L. Peterson, C. Uher, M. Kaviani, and K. Najafi, "Multistage Planar Thermoelectric Microcoolers", *J. MEMS.*, 20, 1201-1210, 2011. (Citations: 25)
- [28] **G. Hwang**, M. Kaviani, J.T. Gostick, B. Kientiz, A.Z. Weber, M.H. Kim, "Roles of Water States on Water Uptake and Water and Proton Transport in Nafion using Molecular Simulation and Bimodal Network Model", *Polymer*, 52, 2584-2593, 2011. (Citations: 60)
- [29] **G. Hwang**, E. Fleming, B. Carne, S. Sharratt, Y. Nam, P. Dussinger, Y.S. Ju, M. Kaviani, "Multi-Artery Heat Pipe Spreader: Lateral Liquid Supply", *Int. J. Heat Mass Transfer*, 54, 2334-2340, 2011. (Citations: 51)
- [30] **G. Hwang**, Y. Nam, E. Fleming, P. Dussinger, Y.S. Ju, and M. Kaviani, "Multi-Artery Heat Pipe Spreader: Experiment", *Int. J. Heat Mass Transfer*, 53, 2662-2669, 2010. (Citations: 93)
- [31] **G. Hwang**, and M. Kaviani, "Molecular Dynamics Simulation of Effective Thermal Conductivity of Vapor-Filled Nanogap and Nanocavity", *J. Appl. Phys.*, 106, 024317-1-6, 2009. (Citations: 25)
- [32] **G. Hwang**, J. H. Nam, M. H. Kim, S. Y. Son, and M. Kaviani, "Pore-Water Morphological Transitions in Polymer Electrolyte of a Fuel Cell", *J. Electrochem. Soc.*, 156, B1192-B1200, 2009. (Citations: 19)
- [33] J.H. Nam, K. J. Lee, **G. Hwang**, C. J. Kim, and M. Kaviani, "Microporous Layer for Water Morphology Control in PEMFC", *Int. J. Heat Mass Transfer*, 52, 2779-2791, 2009. (Citations: 225)
- [34] D.H. Min, **G. Hwang**, Y. Usta, O.N. Cora, M. Koc, and M. Kaviani, "2-D and 3-D Modulated Porous Coatings for Enhanced Pool Boiling", *Int. J. Heat Mass Transfer*, 52, 2607-2613, 2009. (Citations: 76)
- [35] **G. Hwang**, A.J. Gross, H. Kim, S. W. Lee, N. Ghafouri, B. L. Huang, C. Lawrence, C. Uher, K. Najafi, and M. Kaviani, "Micro Thermoelectric Cooler: Planar Multistage", *Int. J. Heat Mass Transfer*, 52, 1843-1852, 2009. (Citations: 33)
- [36] D.H. Min, **G. Hwang**, and M. Kaviani, "Multi-Artery, Heat-Pipe Spreader", *Int. J. Heat Mass Transfer*, 52, 629-635, 2009. (Citations: 31)
- [37] B. Huang, C. Lawrence, A. Gross, **G. Hwang**, N. Ghafouri, S. W. Lee, H. Kim, C. P. Li, C. Uher, K. Najafi, and M. Kaviani, "Low-Temperature Characterization and Micro Patterning of Co-Evaporated Bi₂Te₃/Sb₂Te₃ Films", *J. Appl. Phys.*, 104, 113710-1-8, 2008. (Citations: 68)
- [38] **G. Hwang**, M. Kaviani, W.G. Anderson, and J. Zuo, "Modulated Wick Heat Pipe", *Int. J. Heat Mass Transfer*, 50, 1420-1434, 2007. (Citations: 74)
- [39] **G. Hwang**, M. Kaviani, "Critical Heat Flux in Thin, Uniform Particle Coatings", *Int. J. Heat Mass Transfer*, 49, 844-849, 2006.

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- [40] J.Y. Lee, **G. Hwang**, M. Kim, "Experimental Investigation on Onset Criteria of Liquid/Gas Entrainment in the Header-Feeder System of CANDU", *J. Mech. Sci. Tech.*, 20, 1030-1042, 2006.
- [41] J.Y. Lee, **G. Hwang**, M. Kim, H.C. NO, "Experimental Analysis of Off-Take Phenomena at Header-Feeder System in CANDU", *Ann. Nucl. Energy*, 33, 1-12, 2006. (Citations: 7)

Peer-Reviewed Conference Papers

- [1] M. Bashir, K. Sit, R. Nair, and **G. Hwang**, "Additive Manufacturing of Thin Wick Structures using Microsecond Pulse Laser (ICES-2019-234)", 49th International Conference on Environmental Systems, 2019, 07/07-11, Boston, MA, USA.
- [2] N. Albu, J. Keese, and **G. Hwang**, "Bimodal, Thin Wick Structures for High Heat Flux Two-Phase Thermal Control Systems (ICES-2019-206)", 49th International Conference on Environmental Systems, 2019, 07/07-11, Boston, MA, USA.
- [3] M. Borumand and **G. Hwang**, "High Heat Flux Two-Phase Thermal Control System using Non-Uniform Capillary Evaporator (ICES-2019-176)", 49th International Conference on Environmental Systems, 2019, 07/07-11, Boston, MA, USA.
- [4] S. Dahariya, A.J. Pai, **G. Hwang**, and A.R. Betz, "Pool Boiling Heat Transfer Enhancement using Sintered Particle Wick Structure (TFEC-2019-27387)", 4th Thermal and Fluids Engineering Conference (TFEC), 2019, 04/14-17, Las Vegas, NV, USA.
- [5] T. Avanesian and **G. Hwang**, "Nanostructure-driven Thermal Switch Using Molecular Simulations (IMECE2017-72663)", Proceedings of the ASME 2017 International Mechanical Engineering Congress and Exposition, 2017, Nov., Tampa, FL, USA.
- [6] P. Garcia-Salaberri, J. Gostick, I. Zenyuk, **G. Hwang**, M. Vera, A. Weber, "On the Limitation of Volume-Averaged Formulations of Gas Diffusion Layers in the Modeling of Polymer Electrolyte Fuel Cells (I01A-1366)", *ECS Transaction*, Oct. 2017, National Harbor, MD, USA.
- [7] T. Avanesian and **G. Hwang**, "Adsorption and Capillary Condensation in Nanogap with Nanoposts (HT2017-4782)", Proceedings of the ASME 2017 Summer Heat Transfer Conference, 2017, July, Bellevue, WA, USA.
- [8] T. Avanesian and **G. Hwang**, "Adsorption-Controlled Thermal Switch using Nonequilibrium Molecular Dynamics Simulation (IMECE2016-66707)", Proceedings of the ASME 2016 International Mechanical Engineering Congress and Exposition, 2016, Nov., Phoenix, AZ, USA.
- [9] M. Moulod and **G. Hwang**, "Nano Heat Pipe: Nonequilibrium Molecular Dynamics Simulation (IMECE2016-67448)", Proceedings of the ASME 2016 International Mechanical Engineering Congress and Exposition, 2016, Nov., Phoenix, AZ, USA.
- [10] B. Hwang, K. Moriyama, M. Lee, E. Kim, H.S. Park, **G. Hwang**, and M. Kaviani, "One-dimensional Analysis for Long-Term Cooling of Ex-Vessel Corium: Sensitivity Analysis (N11P0156)", NUTHOS-11: The 11th International Topical Meeting on Nuclear Reactor Thermal Hydraulics, Operation and Safety, 2016, Oct., Gyeongju, Korea.
- [11] T. Avanesian and **G. Hwang**, "Adsorption-Controlled Thermal Diode: Nonequilibrium Molecular Dynamics Simulation (ICNMM2016-7936)", ASME Heat Transfer, Fluids Engineering, & Nanochannels, Microchannels, and Minichannels Conferences, 2016, July, Washington, DC, USA.
- [12] M. Moulod and **G. Hwang**, "Comparative Studies on Water Self-Diffusivity Confined in Graphene Nanogap: Molecular Dynamics Simulation (ICNMM2016-7962)", ASME Heat Transfer, Fluids Engineering, & Nanochannels, Microchannels, and Minichannels Conferences, 2016, July, Washington, DC, USA.
- [13] M. Salahuddin, **G. Hwang**, and R. Asmatulu, "Superhydrophobic PAN Nanofibers for Gas Diffusion Layers of Proton Exchange Membrane Fuel Cells (SPIE 9802)", Proceeding of SPIE Smart Structures/NDE, Mar. 2016, Las Vegas, NV, USA.
- [14] A. Khan, R. Asmatulu, and **G. Hwang**, "Proton Conductivity of Graphene-based Polymer Electrolyte Membrane", *ECS Transaction*, Oct. 2015, Phoenix, AZ, USA.

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- [16] Xiaobing Zhu, John B. Kerr, Qinggang He, **G. Hwang**, Zulima Martin, Kyle Clark, and Adam Weber, "Bridge to Fuel Cell Molecular Catalysis: 3D non-Platinum Group Metal Catalyst in MEAs", *ECS Transaction*, May. 2012, Seattle, WA, USA.
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- [19] J.Y. Lee, **G. Hwang**, S.H. Hwang, M. Kim, "Critical Discussion on the Universal 2.5 Power Scale for the Onset Criteria of the Liquid Entrainment and Vapor Pull-Through through Branches in a Horizontal Pipe with Stratified Flow", *Proc. of KNS Spring Meeting*, May 2004, Kyungju, Korea.
- [20] **G. Hwang**, Y.M. Moon, H.C. No, J.Y. Lee, S. O. Yu, M. Kim, H.J. Kim, "Off-take Experiment at T-junction between Header and Feeder Pipes in CANDU", *International Topical Meeting on Nuclear Reactor Thermal Hydraulics (NURETH10)*, October 2003, Seoul, Korea.
- [21] **G. Hwang**, J.Y. Lee, H.C. NO, Y.M. Moon, S.O. Yu, M. Kim, H.J. Kim, "Improvement of Safety Analysis Methodology for CANDU Reactors: Off-take Experiment at T-junction between Header and Feeder Pipes with Arbitrary Angles in CANDU", *Proc. of KNS Spring Meeting*, May 2003, Kyungju, Korea.

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1. **G. Hwang**, "Pore-Water and Proton Transport in Polymer Electrolyte Membrane Fuel Cell: Molecular Dynamics and Mono- and Bimodal Wetting Treatments of Mesopore Hydrated Nafion", 2010, Ph.D. Thesis, University of Michigan.
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