Curriculum Vitae

Gisuk Hwang, Ph.D.

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EDUCATION

Ph.D. in Mechanical Engineering, **University of Michigan** — 09/06 – 08/10, Ann Arbor, MI

- Thesis Topic: Molecular Simulation and Bimodal Network Model of Nanoscale Water/Proton Transport in Polymer Electrolyte of Fuel Cells, Advisor: M. Kaviany

M.S.E. in Mechanical Engineering, **University of Michigan** — 09/04 – 04/06, Ann Arbor, MI

- Thesis Topic: Modeling of a Modulated Wick Heat Pipe, Advisor: M. Kaviany

B.E. in Mechanical Engineering and Electronic Engineering (Double Major), **Handong University** — 03/97 – 08/02, Pohang, Korea

- Thesis Topic: Electrical Capacitance Tomography Using Genetic Algorithm, Advisor: J.Y. Lee
- Computer Engineering (Minor), Early Graduation

PROFESSIONAL APPOINTMENT

Assistant Professor, Department of Mechanical Engineering, Wichita State University — 09/13 – Present, 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

Multiscale thermofluid in porous media; waste heat recovery; advanced thermal and water management; optimal porous material design; X-ray image-based, pore-scale modeling; lattice Boltzmann transport; advanced porous structure manufacturing; molecular dynamics simulation; fuel cell and flow battery electrodes; polymer electrolyte membrane

RESEARCH EXPERIENCE

Assistant Professor, Wichita State University — 09/13 – Present, Wichita, KS

- Development of Novel Thermal Diode and Transistor using Heterogeneous Nanoporous Structures using Molecular Dynamics Simulations and Grand Canonical Monte Carlo Simulations
- Multiscale Modeling of Coolability of Molten Core for Loss of Coolant Accident in Nuclear Power Plant
- Measurement of High Flux Two-Phase Thermal Management System using Novel 3D Microporous Structures
- 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/cm^2 and 0.05 $K/(W/cm^2)$
  - ✓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 Ann Arbor, MI
- Experimental Study of Critical Heat Flux Enhancement using Surface-Modulated Porous Coatings, achieving 2-fold Critical Heat Flux Improvement

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) Pohang, Korea
- Experimental Study of the Two-phase Flow Measurement using Electrical Resistance Probe Method

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)**: 75 Students (2017 F), 79 (2017 S), 51 (2016 F), 102 (2016 S), 63 (2015 F) Wichita, KS
- **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)**: 10 Students (2017 F), 13 (2016 S), 12 (2014 S)
- **Molecular Dynamics Simulation (ME 850Z)**: 12 Students (2015 S)

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) Pohang, Korea
- **Introduction to Information Processing and Lab**: Lecture of Computer Lab. for 60 students (in Korean)

STUDENT ADVISING

Graduate Student: As a Committee Chair

- Shahabedin Yahya Nasersharifi, Ph.D. Thesis, ME, WSU, "Hierarchical Capillary Evaporator in High Heat Flux Flow Boiling", expected graduation, Dec. 2018 — 09/13-Present, Wichita, KS
- Tadeh Avanessian, Ph.D. Dissertation, ME, WSU, "Adsorption and Capillary Transition-Controlled Thermal Diodes and Switches using Heterogeneous Nanostructures", 12/17/2017
- Athul Pai, M.S. Thesis, ME, WSU, "Columnar-Post Wick for Novel Flow Boiling", expected graduation, Dec. 2018
- Aamer Khan, M.S. Thesis, ME, WSU, "Development of Graphene-Nafion-based Catalyst Layer for Polymer Electrolyte Membrane Fuel Cells", Aug, 2015
- Kapot Kallol Tarafder, M.S. Thesis, ME, WSU, "Optimal Design of Capillary-Wick for High Heat Flux Thermal Management System", May, 2015

Graduate Students: As a Committee Member

- McCord Cox, Ph.D., Mechanical Engineering Department, WSU, "Dielectric Relaxation of Soy Protein-Based Biomaterial and its Nanocomposites", expected graduation, May 2018.
- Tyler Alexander, M.S., Mechanical Engineering Department, WSU, "The Effects of Porosity and Micro-scale Sodium Chloride Inclusions on the Figure of Merit of Bismuth Telluride", May 2017.
- Teja Swaroop Naik Mudiki, M.S., Mechanical Engineering Department, WSU, "Study of Pressure Drop and Heat Transfer in Micro Channel Branch with Varying Bifurcation Angle, Aspect Ratio, and Temperature", May 2017.
- Azhar Hussain Mohammed, M.S., Mechanical Engineering Department, WSU, "Tuning the Energy Bands of Sol-Gel Based TIO_2 Nanoparticles via C_{60}, SWCNT and ITO as Dopants", Jun. 2016.
- Aneesha Gonineni, Ph.D., Mechanical Engineering Department, WSU, "Flow Dynamics and Wall Shear Stresses in Partially Blocked Stented Artery under Comorbid Conditions", Dec. 2015.
- Salahuddin Mohammad, M.S. Thesis, Mechanical Engineering Department, WSU, "Investigating Superhydrophobic Behaviors of Carbonized PAN Nanofibers on Gas Diffusion Layers of PEM Fuel Cells", Dec. 2015.
- Gopinath Jayakumar, M.S. Thesis, 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)", Aug. 2015.
- Anuruddaha Ransilu Pattiyage Peiris, M.S. Project, ME, WSU, "Characterization of Polyvinylidene Fluoride and Boron Nitride Nanocomposites", May 2015.
- Daniel Calvario, M.S. Thesis, ME, WSU, "Effects of Material Surface Characteristics on Thermal-hydraulics in Microchannel Flow of Newtonian Fluids", May 2015.
- Tewodros Fiseha Wondimu, M.S. Thesis, ME, WSU, "Numerical Study of Nanoparticle Concentration Effect on Heat Transfer Enhancement in Mini-Channel Flow", Dec. 2014.

Undergraduate Students

- Evan Boutz, ME, WSU, "Molecular Simulations of Thermal Diode", 02/2018 - Present — 09/13-Present, Wichita, KS
- Christian Swift, Walter Agbor, Keith Carlin, and Matt Klenda, Capstone Design, ME, WSU, "Portable Water Distillery", Sep. – Dec. 2017.
- Kian Hong Er, Undergraduate Student Research, ME, WSU, "Porosity and Permeability Measurement of Monolayer Wick", Sep. 2016 – Dec. 2017.
- Nisal N. Habakkala Kankanange, Undergraduate Student Research, ME, WSU, "Water Capture using Biphililc Surfaces", May 2016 – Dec. 2017.
- Dilanki Terrenska Webita Vidanalage Dona, Undergraduate Student Research, ME, WSU, "Enhanced Water Condensation using Microporous Structures", May 2016 – Dec. 2017.

- Wade Hughes, Bernardo Gaspar, Chad Giles, and Levi Ehrsam, Capstone Design, ME, WSU, "Solar-Powered, Portable Water Desalination System: Solar-Electrochemical System", Jan. - May 2016.
- Keaton Kristner, Andrew Heinrich, and Matthaw Kornfeld, Capstone Design, ME, WSU, "Solar-Powered, Portable Water Desalination System: Solar-Thermal System", Sep.-Dec. 2015.
- Qi Heng Weng, Undergraduate Student Research, ME, WSU, "Development of Heterogeneously Surface Treated Gas Diffusion Layer of High Performance and Low Cost Proton-Exchange-Membrane Fuel Cells", Jan.-Dec. 2015.
- Yatharsana Manickavasagar, Undergraduate Student Research, ME, WSU, "Development of Thin Sample Thermal Conductivity Measurement", Jan.-Dec. 2015.
- Aneek Noor, Undergraduate Student Research, ME, WSU, "Development of Optimal Water Management System for a Proton Exchange Membrane Fuel Cell (PEMFC)", Jan.-Dec. 2015

- Gregory Trigub (2013) at LBNL: Measurement of surface area of acid/thermal treated porous media. 09/12 – 08/13
- Joseph Grant (2013) at LBNL: Measurement of effective diffusivity through porous media. Results: Obtained experimental results presented in *ECS Meeting*, Oct., 2014 Berkeley, CA
- 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
- 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 Ann Arbor, MI

PROFESSIONAL EXPERIENCE

Journal and Conference Reviews

- Nanoscale and Microscale Thermophysical Engineering 09/13 - 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
- Electrochemical Society Journal/Transaction, Journal of Mechanical Science and Technology 09/10 - Present

Service and Leadership Activities

- **Award Committee Member**, CoE, WSU 09/15 – Present
- **Topic Organizer**, 2018 AIAA/ASME Joint Thermophysics and Heat Transfer Conference 08/17 – Present
- **Panel Reviewer**, National Science Foundation 03/17
- **Topic Organizer**, 2017 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
- **Executive Committee Member**, ASME Process Industry Division (PID) 09/14 - Present
- **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

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

- 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 AFFLIATIONS

- Member of American Society for Mechanical Engineers (ASME)
- Member of Electrochemical Society (ECS)

PROFESSIONAL PRESENTATIONS (Underlined for Presenter)

- T. Avanessian and **G. Hwang**, "Nanostructure-driven Thermal Switch Using Molecular Simulations", ASME 2017 International Mechanical Engineering Congress and Exposition, Tampa, Florida, 11/08/2017.
- **G. Hwang** (Invited Talk), "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.
- T. Avanessian and **G. Hwang**, "Adsorption and Capillary Condensation in Nanogap with Nanoposts", ASME 2017 Summer Heat Transfer Conference, Bellevue, Washington, USA, 07/11/2017.
- **G. Hwang** (Invited Talk), "Nano Thermal Diode/Switch using Gas-Filled Heterogeneous Nanostructures", Graduate Seminar at School of Mechanical Engineering, Chungnam National University, Daejeon, Korea, 06/08/2017.
- **G. Hwang** (Invited Talk), "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.
- **G. Hwang** (Invited Talk), "Nanoscale Thermal Management Systems," Graduate Seminar at School of Mechanical Engineering, University of Ulsan, Ulsan, Korea, 05/22/2017.
- **G. Hwang** (Invited Talk), "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.
- **G. Hwang** (Invited Talk), "Nanoscale-Interfacial-Resistance-Controlled Thermal Diode and Switch", Graduate Seminar at Department of Mechanical Engineering, Kyunghee University, Suwon, Korea, 06/07/2017.
- **G. Hwang** (Invited Talk), "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.

- **G. Hwang** (Invited Talk), "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.
- T. Avanessian and **G. Hwang**, "Adsorption-Controlled Thermal Switch using Nonequilibrium Molecular Dynamics Simulation", ASME IMECE, 2016, Nov., Phoenix, AZ, USA.
- M. Moulod and **G. Hwang**, "Nano Heat Pipe: Nonequilibrium Molecular Dynamics Simulation", ASME IMECE, 2016, Nov., Phoenix, AZ, USA.
- **G. Hwang** (Invited Talk), "Advanced Thermal Management Systems," Seminar at Department of Applied Photonic Microsystems, Sandia National Laboratories, Albuquerque, New Mexico, 9/22/2016.
- Y. Nasersharifi and **G. Hwang**, "Critical Heat Flux Enhancement in Pool Boiling: Canopy-Capillary Evaporator Wick", ASME, ICNMM, Washington DC, 7/10-7/14/2016.
- M. Moulod and **G. Hwang**, "Comparative Studies on Water Self-Diffusivity Confined in Graphene Nanogap: Molecular Dynamics Simulation," ASME, ICNMM, Washington DC, 7/10-7/14/2016.
- T. Avanessian 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.
- 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.
- 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.
- **G. Hwang** (Invited Talk), "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.
- **G. Hwang** (Invited Talk), "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.
- **G. Hwang** (Invited Talk), "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.
- 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 ECS Meeting, Chicago, IL, 5/24/2015.
- 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, 3/27/2015, Schloss Reinach, Freiburg-Munzingen, German.
- Y. Manickavasagar and **G. Hwang**, "Development of Thin Sample Thermal Conductivity Measurement System", Undergraduate Research Creative Activity Forum (URCAF), Wichita, WSU, 4/7/2015.
- 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.
- **G. Hwang** (Invited Talk), "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.

- **G. Hwang** (Invited Talk), "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.
- **G. Hwang** (Invited Talk), "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
- **G. Hwang** (Invited Talk), "Polymer Electrolyte Membrane Fuel Cell: Technology Trend," Seminar at Green Technology Center, Korea, 1/7/2015.
- **G. Hwang** (Invited Talk), "Transport and Degradation Phenomena in Polymer Electrolyte Membrane Fuel Cells at Low Temperatures," Seminar at Research, Fuel Cell Laboratory in Korea Institute Energy, Korea, 1/7/2015.
- **G. Hwang** (Invited Talk), "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.
- J. Gostick, **G. Hwang**, and A.Z. Weber, "Understanding invasion mechanisms in fibrous gas diffusion media: Direct comparison of simulations with tomographic visualization", 223rd ECS Meeting, Toronto, ON, CANADA, 2013.

RESEARCH GRANTS

- **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), $750,000 (granted) + $380,121 (match), 12/01/2017 – 11/30/2019.
- **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.
- **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.
- **G. Hwang** (PI) and Kian Hong Er (Undergraduate Student), "Fundamental Understandings of Monolayer Wick for Enhanced Cooling", Undergraduate Research Grant, Wichita State University, $999, 1/5/2017-1/4/2018.
- **G. Hwang** (PI) and Nisal Habakkala (Undergraduate Student), "Development of Efficient Solar-Thermal-Based Water Desalination System using Biphillic Surfaces, $975, 1/5/2017-1/4/2018.
- **G. Hwang** (PI) and Dilanki Wevita (Undergraduate Student), "Liquid-Artery Wick for Novel Solar-Thermal-Based Water Desalination System", Undergraduate Research Grant, Wichita State University, $998, 1/5/2017-1/4/2018.
- **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.
- **G. Hwang** (PI), "Optimal Design of Planar, Multistage Thermoelectric Cooler", Sandia National Laboratory, $30,000, 3/24/2016 – 9/23/2016.
- **G. Hwang** (PI), "Adsorption-Controlled, Thermal diode and Switch (ACTS)", Kansas NSF EPSCoR, First Award, $83,100, 1/1/2016 – 12/31/2016.
- **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.
- **G. Hwang** (PI) and Qi Heng (Undergraduate Student), "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.

- **G. Hwang** (PI) and Yatharsana Manickavasagar (Undergraduate Student), "Development of Thin Sample Thermal Conductivity Measurement", Undergraduate Research Grant, Wichita State University, $975, 5/1/2015-4/30/2016.
- **G. Hwang** (PI) and Aneek Noor (Undergraduate Student), "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.

PUBLICATIONS

Book Chapters

1. **G. Hwang**, and T. Avanessian, "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. Kaviany, "High-Heat-Flux, Distributed, Capillary-Artery Evaporators", *Handbook of Porous Media*, 3rd Eds., edited by K. Vafai, Taylor and Francis & CRC Press, July, 2015.

Journal Articles (Total Citations: 1,111 as of 04/16/2018, google scholar)

1. P.A. García-Salaberri, I.V. Zenyuk, **G. Hwang**, M. Vera, A.Z. Weber, and J.T. Gostick, "Are Continuum-based Models Valid in the Absence of a Representative Elementary Volume? The Case of Thin Carbon Fiber-based Gas Diffusion Layers", *J. Power Sources*, submitted (under peer review), Apr., 2018.
2. 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 Trans.*, submitted (under peer review), Jan., 2018.
3. 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*, in press (available online), Aug., 2017. (Citation: 1)
4. Y. Nasersharifi, M. Kaviany, and **G. Hwang**, "Pool-boiling Enhancement using Multilevel Modulated Wick", *Appl. Therm. Eng.*, 137, 268-276, 2018.
5. T. Avanessian, and **G. Hwang**, "Thermal Diode Using Controlled Capillary in Heterogeneous Nanopores", *Int. J. Heat Mass Transfer*, 124, 201-209, 2018.
6. T. Avanessian, 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. (Citation: 1)
7. 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: 2)
8. B. Hwang, K. Moriyama, **G. Hwang**, M. Kaviany, 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.
9. T. Avanessian, and **G. Hwang**, "Thermal Switch Using Controlled Capillary Transition in Heterogeneous Nanostructures", *Int. J. Heat Mass Transfer*, 121, 127-136, 2018. (Citation: 1)
10. M. Moulod, and **G. Hwang**, "Comparative Study in Water Confined in Graphene Nanogap", *J. Appl. Phys.*, 120, 194302, 2016. (Citations: 4)
11. T. Avanessian, and **G. Hwang**, "Adsorption-based Thermal Diode: Non-equilibrium Molecular Dynamics Simulations", *J. Appl. Phys.*, 120, 165306, 2016. (Citations: 5)
12. **G. Hwang**, M. Kaviany, 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: 2)

13. 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: 38)
14. 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: 49)
15. 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: 60)
16. **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: 28)
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