

Kashif Nawaz

Kashif Nawaz is the Senior Research Scientist at Oak Ridge National Laboratory (Energy Science and Transportation Division). Over the past fifteen years of active research and development work, Dr. Nawaz has established himself as a leader in fundamental and applied energy conversation science and technology. He is widely recognized for his work in different aspects of buildings heating, cooling, dehumidification systems including novel heat exchanger, enhanced phase change processes through the deployment of additive manufacturing, porous media and surface morphology, heat pump air and water heating, efficient separate sensible and latent cooling systems and emerging refrigerants. He has pioneered the development of a new generation of high-temperature heat exchanger manufactured with ceramics and composites using additive manufacturing. More recently, his research has led to the development of unique concepts for direct air capture of carbon dioxide using existing buildings infrastructure.

Education

- Ph.D., Mechanical Engineering, 2013, University of Illinois at Urbana Champaign
- M.S., Mechanical Engineering, 2010, University of Illinois at Urbana Champaign.
- BS, Mechanical Engineering, 2007, Ghulam Ishaq Khan Institute of Science and Technology, Pakistan

Employment History

- Senior Research Scientist, Building Equipment Research, Energy and Transportation Science Division, Oak Ridge National Laboratory, Oak Ridge, TN (8/16–present)
- Senior Heat Transfer Engineer, Heat Transfer Center of Excellence, Johnson Controls Inc. Norman, OK (9/13–7/16)
- Lecturer and Research Staff, Aerospace and Mechanical Engineering, University of Oklahoma, Norman, OK (1/14–7/16)
- Graduate Research Assistant, Mechanical Science and Engineering, University of Illinois at Urbana-Champaign, Urbana, IL (8/08–8/13)

Honors and Awards

- ASHRAE Distinguished Service Award (2018)
- Johnson Controls Inc. Merit Award for Excellence in Research and Innovation (2015)
- ASHRAE Graduate Student Grant-in-Aid Award (2011)
- University of Illinois at Urbana Champaign Alumni Teaching Fellowship (2011 and 2012)

Publications

1. K. Nawaz, J. Bock, Z. Dai, and A. Jacobi, “Thermal-hydraulic performance of metal foam heat exchangers under dry operating conditions”, *Applied Thermal Engineering*, 2017, 119(5), 222–232.
2. Z. Dai, K. Nawaz, Y. Park, Q. Chen, A. M. Jacobi “A comparison of metal-foam heat exchangers to compact multi-louver designs for air-side heat transfer applications”, *Journal of Heat Transfer Engineering*, 2012, 33 (1), 21-30.
3. Z. Dai, K. Nawaz, Y. G. Park, J. Bock, A. M. Jacobi “Correcting and extending the Boomsma-Poulikakos effective thermal conductivity model for three-dimensional, fluid-saturated metal foams”, *International communication in heat and mass transfer*, 2010, 37 (6), 575-580.
4. K. Nawaz, A. M. Jacobi, "Metal foams: Novel materials for air cooling and heating application- Performance under dry, wet and frosted conditions", 16th International Heat Transfer Conference, 2018, August 10-15, Beijing, China.
5. K. Nawaz, B. Fricke, E. Lara-Curzio, " The opportunities and challenges for novel materials for future power generation systems", CIMTEC, 2018, June 4-14, Perugia, Italy.
6. K. Nawaz, A. M. Jacobi, “Open Cell Metal Foam Heat Exchangers for Air-dehumidification Applications”, 3rd Thermal and Fluids Engineering Conference, 2018, March 4-7, Fort Lauderdale, FL USA.
7. K. Nawaz, “Thermal-Hydraulic Performance of Wavy-Fin Heat Exchanger Under Dehumidifying Conditions”, ASHRAE 2018 Winter Conference January 20-24, Chicago, IL USA.

8. K. Nawaz, A. M. Jacobi, "The Impact of Base Metal on the Thermal-Hydraulic Performance of Metal Foam Heat Exchanger for Cooling and Dehumidification Applications", ASME Heat Transfer Conference, July. 9-14, 2017, Bellevue, Washington, USA.
9. K. Nawaz, J. Bock, and A. Jacobi, "Thermal-hydraulic performance of metal foam heat exchangers", 14th International Refrigeration and Air Conditioning Conference, July 14th 2012, Purdue University Lafayette, IN
10. Z. Dai, K. Nawaz, Y. Park, Q. Chen, A. M. Jacobi, "A comparison of Metal-Foam heat exchangers to compact multilouver design for air-side heat transfer applications", 7th International Conference on Enhanced, Compact and Ultra-Compact Heat Exchangers: From Microscale Phenomena to Industrial Applications, Sep. 13-18, 2009, Heredia, Costa Rica.
11. K. Nawaz, B. Shen, A. Elatar, V. Baxter, O. Abdelaziz, "Performance Optimization of CO₂ HPWH System", International Journal of Refrigeration, 2018, 85, 213-228.
12. K. Nawaz, B. Shen, A. Elatar, V. Baxter, O. Abdelaziz, "R-1234yf and R-1234ze(Z) as Low GWP Refrigerants for Residential Heat Pump Water Heaters", International Journal of Refrigeration, 2017, 82, 348-365.
13. S. Chavan, H. Cha, D. Orejon, K. Nawaz, N. Singla, Y.F. Yeung, D. Park, D.H. Kang, Y. Chang, Y. Takata, N. Miljkovic, "Heat Transfer through a Condensate Droplet on Hydrophobic and Nanostructured Superhydrophobic Surfaces", Langmuir, 2016, 32 (31), 7774-7787.
14. K. Nawaz, S. Schmidt, and A. Jacobi. 2015. "A Parametric Study about Mass Diffusion Coefficient of Desiccants for Dehumidification Applications: Silica Aerogels and Silica Aerogel Coatings on Metal Foams." HVAC&R Research 21 (5) 637-647.
15. K. Nawaz, S. Schmidt, and A. Jacobi. 2014 "Effect of Catalysts Used in the Sol-Gel Process on the Microstructure and Absorption/Desorption Performance of Silica Aerogels." International Journal of Heat and Mass Transfer 74 25-34.
16. K. Nawaz, S. Schmidt, and A. Jacobi. 2014. "Effect of Catalyst and Substrate on the Moisture Diffusivity of Silica-Aerogel-Coated Metal Foams." International Journal of Heat and Mass Transfer 73 634-644.
17. K. Nawaz, S.J. Schmidt, A.M. Jacobi "A Study of the effect of catalyst used in the Sol-Gel process on the microstructure and diffusivity of silica aerogels" ASME 2013 International Mechanical Engineering Congress & Exposition, November 15-21, 2013 –San Diego, CA USA.
18. S. Chavan, K. Nawaz, Y.F. Yeung, N. Miljkovic, "Heat transfer through a condensate droplet", ASME Heat Transfer Conference, Washington, DC July 2016.
19. K. Nawaz, B. Shen, A. Elatar, V. Baxter, O. Abdelaziz, "Hydrocarbons as natural refrigerants for heat pump water heating applications", 13th IIR Gustav Lorentzen conference on natural refrigerants, 2018, June 18-20, Valencia – Spain.
20. K. Nawaz, B. Fricke, Z. Ayub, O. Abdelaziz, " Pool boiling heat transfer for ammonia using open-celled metal foams to augment the process", 10th International Conference on Boiling & Condensation Heat Transfer, March 12-15, 2018, Nagasaki, Japan.

Invention Disclosures

1. Invention Disclosure 201904399, "Compliant heat exchangers, heat pipes and methods for making same", E. Lara-Curzio, K. Nawaz, C. Cramer, A. Elliott, B. Fricke, P. Jain, R. Lowden, K. Nawaz, V. Rao, M. Sandlin.
2. Invention Disclosure 201703999, DOE S-138,663, "Silica Aerogel and Hydrophilic Carbon Foams as Novel Materials for Solar Energy Harvesting".
3. Invention Disclosure 201703954, DOE S-138,615, "Metal Foam Heat Exchangers for Air and Gas Cooling and Heating Application (Dry, Wet and Frosted Conditions)
4. Provisional patent application, "A novel, highly flexible energy storage system for building applications".
5. Provisional patent application, "High Performance PCM System Using Novel "Smart" Magnetic Nanoparticle-embedded PCM Nano-capsules".