

**Proceedings of ASME 2024 7th
International Conference on
Micro/Nanoscale Heat and
Mass Transfer**
(MNHMT2024)

**August 5-7, 2024
Nottingham, United Kingdom**

**Conference Sponsor
Heat Transfer Division**

THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS

© 2024, The American Society of Mechanical Engineers, 150 Clove Road, Little Falls, NJ 07424, USA
(www.asme.org)

All rights reserved. "ASME" and the above ASME symbols are registered trademarks of the American Society of Mechanical Engineers. No part of this document may be copied, modified, distributed, published, displayed, or otherwise reproduced in any form or by any means, electronic, digital, or mechanical, now known or hereafter invented, without the express written permission of ASME. No works derived from this document or any content therein may be created without the express written permission of ASME. Using this document or any content therein to train, create, or improve any artificial intelligence and/or machine learning platform, system, application, model, or algorithm is strictly prohibited.

INFORMATION CONTAINED IN THIS WORK HAS BEEN OBTAINED BY THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS FROM SOURCES BELIEVED TO BE RELIABLE. HOWEVER, NEITHER ASME NOR ITS AUTHORS OR EDITORS GUARANTEE THE ACCURACY OR COMPLETENESS OF ANY INFORMATION PUBLISHED IN THIS WORK. NEITHER ASME NOR ITS AUTHORS AND EDITORS SHALL BE RESPONSIBLE FOR ANY ERRORS, OMISSIONS, OR DAMAGES ARISING OUT OF THE USE OF THIS INFORMATION. THE WORK IS PUBLISHED WITH THE UNDERSTANDING THAT ASME AND ITS AUTHORS AND EDITORS ARE SUPPLYING INFORMATION BUT ARE NOT ATTEMPTING TO RENDER ENGINEERING OR OTHER PROFESSIONAL SERVICES. IF SUCH ENGINEERING OR PROFESSIONAL SERVICES ARE REQUIRED, THE ASSISTANCE OF AN APPROPRIATE PROFESSIONAL SHOULD BE SOUGHT.

ASME shall not be responsible for statements or opinions advanced in papers or . . . printed in its publications (B7.1.3). Statement from the Bylaws.

For authorization to photocopy material for internal or personal use under those circumstances not falling within the fair use provisions of the Copyright Act, contact the Copyright Clearance Center (CCC), 222 Rosewood Drive, Danvers, MA 01923, tel:978-750-8400, www.copyright.com.

Requests for special permission or bulk reproduction should be addressed to the ASME Publishing Department, or submitted online at: <https://www.asme.org/publications-submissions/journals/information-for-authors/journalguidelines/rights-and-permissions>

ISBN: 978-0-7918-8815-5

TABLE OF CONTENTS

Numerical and Experimental Study on Fluid-Structure Interactions in the Oscillating Flow in a Microfluidic Device.....	1
<i>Tuo Hou, Jing Wang, Yong Ren</i>	
Rapid Acid Value Test-Kit Development for Oleochemical Product Quality Control Using Microfluidic Technology	7
<i>Pei Xuan Ho, Kai Seng Koh, Billie Yan Zhang Hiew, Chang Nong Lim, Yong Ren</i>	
Study on the Flow Characteristics of Droplet Breaking Behavior in Microchannels.....	13
<i>Naixiang Zhou, Yuting Zhao, Li Lei, Jingzhi Zhang</i>	
Natural Convection in an Enclosure With Multiple Heat Sources Filled With a Hybrid Nanofluid.....	19
<i>Abdulaziz Alasiri, Ramadan Y. Sakr</i>	
Numerical Investigation on Mixed Convection With Nanofluids in Vertical Channels With Different Aspect Ratios and Moving Plate	36
<i>Bernardo Buonomo, Oronzio Manca, Sergio Nardini, Chiara Ripoli, Gianluca Sarli</i>	
Lithium-Ion Battery Thermal Management System Using Diamond Based Nanofluid and Hybrid Nanofluid Active Cooling.....	46
<i>Farooq Riaz Siddiqui, Jim Zhang</i>	
Investigation of Liquid Cooling for Lithium-Based Batteries: A Numerical Analysis With Nano Enhanced Phase Change Materials and Metal Foam.....	52
<i>Aanandsundar Arumugam, Bernardo Buonomo, Sergio Nardini, Oronzio Manca</i>	
Ballistic-Diffusive Phonon Transport and Anderson Localization in Aromatic-Ring Single-Molecule Junctions.....	62
<i>Renjie Hua, Xiaogeng Gu, Zhiyuan Huang, Yuan Dong</i>	
Molecular Dynamics Simulations of the Role of Oxygen and Nitrogen in the Evaporative Condensation Process of Water in the Knudsen Layer.....	68
<i>Zhijun Tian, Yanfeng Liu</i>	
Interfacial Transport Across Graphene-Water From Machine Learning Molecular Dynamics	73
<i>Zhiqiang Li, Huanhuan Zhao, Linhua Liu, Jia-Yue Yang</i>	
A New Model for Capillary Imbibition With Asymmetric Wettability Walls.....	78
<i>Chenyue Zhu, Yuying Yan, Mark Alston</i>	
Capillary-Driven Passive Fog Harvesting With Cones From 3D Printing	83
<i>Abubaker S. Omer, Aikifa Raza, Maryam AlShehhi, Faisal AlMarzooqi, TieJun Zhang</i>	
Multiscale Simulation on Heat and Mass Transfer in Porous Electrodes for Electrolytic Air Dehumidification.....	87
<i>Tang Zhixian, Qi Ronghui</i>	
An Enhanced Volume of Fluid Based Numerical Modelling Approach for Sub-Micron Scale Boiling Heat Transfer.....	91
<i>Bhaskar Chakraborty, Mirko Gallo, Marco Marengo, Joel De Coninck, Carlo Massimo Casciola, Nicholas Miche, Anastasios Georgoulas</i>	

Oscillating Heat Pipe and Thermosyphon Operated With Ferronanofluid Under Magnetic Field	101
<i>Matthias H. Buschmann</i>	
Experimental Investigation of the Heat Transfer Performance of Low Concentration Surfactant Aided Pool Boiling With Electric Field.....	108
<i>Chung Ki Cheng, Song Ni, Kwun Ting Lau, Shahid Ali Khan, Jiyun Zhao</i>	
Multi-Fidelity Design of Flow Boiling Heat Transfer Processes in Microchannels.....	116
<i>Yi Yuan, Li Chen, Chuangde Zhang, Wen-Quan Tao</i>	
Flow Boiling in Microchannels Based Heat Sinks Combined With Micro-Nano Modified Surfaces	126
<i>Mariana Perez, Pedro Pontes, Antonio L. N. Moreira, Ana S. Moita</i>	
Molecular Dynamic Study on the Nucleation Characteristics of Carbon Dioxide During Pressure Drop.....	133
<i>Xiang Wang, Fang Liu</i>	
Numerical Study of Pool Boiling Heat Transfer on a Heated Cylinder by Lattice Boltzmann Method	143
<i>Xi Li, Huixiong Li, Xiaoyi Wu</i>	
New Bubbles Behavior and Flow Pattern Transition of Open Micro-Channel and Jet Impingement Hybrid Cooling Scheme by Separating Liquid-Vapour Pathways.....	161
<i>Yifei Li, Yuming Guo, Liang Zhao</i>	
Heat Transfer and Flow Characteristics of Flow Boiling in Manifold Microchannel	171
<i>Jinjin Xu, Jingzhi Zhang, Gongming Xin, Wei Li</i>	
Experimental Study of Single-Bubble Dynamics and Microlayer Characteristics in Pool Boiling on Different Wettability Surfaces	177
<i>Pengfei Zhao, Jawed Ahmed Jamali, Zihou Zhu, Ying He</i>	
Two-Dimensional Numerical Simulation on Bubble Growth in Microchannel Boiling Flow	189
<i>Hongtao Gao, Jianrong Zhai, Dong Niu, Huaqiang Liu, Yuying Yan</i>	
Effect of Different Vertical Curved Surfaces on Bubble Merger Using Lattice Boltzmann Model With Large Density Ratio.....	195
<i>Hongtao Gao, Wenjie Guo, Huaqiang Liu, Dong Niu, Yuying Yan</i>	
Transition in Droplet State on Heated Structured Hydrophobic Substrates.....	203
<i>Venugopal Venkitesh, Pranjal Agrawal, Susmita Dash</i>	
Thermal and Fluid Flow Behavior Within an Organ-on-a-Chip Model: A Numerical Study	210
<i>Filipe Barbosa, Violeta Carvalho, Glauco Nobrega, Diana Pinho, Jorge Duenas-Pamplona, Cristiano Abreu, Senhorinha Teixeira, Rui A. Lima, Ana Moita</i>	
Flow Boiling of Zeotropic Refrigerant Mixture R456a in Microchannels	216
<i>Yu Xia, Dilara Suulker, Zhen Long, Hua Sheng Wang</i>	
Experimental Investigation of Green Nanofluids: Assessment of Wettability, Viscosity and Thermal Conductivity	222
<i>Glauco Nobrega, Beatriz Cardoso, Filipe Barbosa, Diana Pinho, Cristiano Abreu, Reinaldo Souza, Ana Moita, Joao Ribeiro, Rui A. Lima</i>	
Superhydrophilic Composite Structure of Copper Micro-Channel and Nano-Forest for Enhancing Boiling Heat Transfer	227
<i>Xiang Ma, Yonghai Zhang, Xiaoping Yang, Jinjia Wei</i>	

Frequency Analysis of Pressure Oscillations in Subcooled Flow Boiling Through Microchannel Heat Sink	234
<i>Nishant Shah, Hemantkumar B. Mehta, Jyotirmay Banerjee</i>	
Design of a Four-Layer Induced-Transmission Filter for Promoting Thermophovoltaic Efficiency	240
<i>Fan Yi, Boxiang Wang, Changying Zhao</i>	
Tunable Electro-Optical Switch in Infrared Communication Band Through Coupling Surface Plasmon Polaritons and Magnetic Polaritons	248
<i>Yiquan Gong, Yanming Guo, Shuni Chen, Qinghui Pan, Yong Shuai</i>	
Power-Generating Smart Glass With Adjustable Spectral Transmission.....	255
<i>Shuni Chen, Yanming Guo, Yiquan Gong, Chao Shen, Yong Shuai</i>	
Double-Sided Spectrally Splitting Contrast Grating for an Asymmetric Thermal Regulation Window	261
<i>Ken Araki, Richard Z. Zhang</i>	
Numerical Simulation of Leidenfrost Effect of Droplets on Porous Substrate.....	266
<i>Peilin Cui, Zhenyu Liu, Huiying Wu</i>	
Investigation of Nano-Fin Effect (NFE) for Pool Boiling on Nanostructured Surfaces Using Surface Micromachined Temperature Nanosensors	274
<i>Ronita Roy, Yi Wang, Debjyoti Banerjee</i>	
Nanoscale Thermal Cloak Based on Amorphous Hole Structure of Silicon Film	293
<i>Haochun Zhang, Jian Zhang</i>	
Ballistic Phonon Heat Conduction Under Non-Equilibrium in Nanoscale Heterogeneous Semiconductor Thin Films	299
<i>Richard Z. Zhang</i>	
Thermal Simulation for Nanoscale FinFET Using First-Principles Nongray Phonon Boltzmann Transport Equation	304
<i>Yufei Sheng, Hua Bao</i>	
Effect of Temperature and Water Content on Thermal Conductivity in Ordered and Amorphous Proton Exchange Membranes: A Molecular Dynamics Study.....	310
<i>Ke Ren, Xinjian Liu, Zhonghao Rao</i>	
Substantial Phonon Nonequilibrium Near Nanoscale Hotspots in III-V Semiconductors.....	316
<i>Jiaxuan Xu, Hua Bao</i>	
Impact of Fluid Vibration and Temperature Gradient on Thermocapillary Droplet Flow	322
<i>Yousuf Alhendal, Sara Touzani</i>	
Machine-Learning-Based Thermal Conductivity Prediction in Two-Dimensional TiS ₂ /MoS ₂ Van Der Waals Heterostructures	328
<i>Akhil Kunjikuttan Nair, Carlos Manuel Da Silva, Cristina H. Amon</i>	
Molecular Dynamics Investigation of Wettability Transition of Copper and Design of a Durable Superwetting Structure	334
<i>Zhigang Huang, Jiangyou Long, Kai Luo</i>	
Mode-Resolved Phonon Transmittance Across Ga ₂ O ₃ /SiC Interface Using Lattice Dynamics With Machine Learning Potentials	339
<i>HongAo Yang, YuanBin Liu, BingYang Cao</i>	

Thermal Conductivity Characterisation and Quantification of Solid Dielectrics in Nano/Micro Scale Thin Film Systems	346
<i>Mohammad Ehsan Khaled, Liangchi Zhang</i>	
Effect of Adjacent Synthetic Jets on Mass Transfer in Microchannels.....	355
<i>Delara Soltani, Tim Persoons, Sajad Alimohammadi</i>	
Time-Dependent Solution of Unsteady Flow Equations for Nanoscale Heat and Mass Transfer, Advanced Fluidics, Biofluidics, and Blast Wave Propagations.....	364
<i>Ramlala P. Sinha</i>	
Developing Code_Saturne for Advanced Micro-Scale Gas Transport	373
<i>Xiao-Jun Gu, Adam Greenbank, Charles Moulinec, David R. Emerson</i>	
Pore-Scale Turbulent Physics Informed Neural Network of Turbulent Flow Over Porous Media.....	382
<i>Seohee Jang, Mohammad Jadidi, Yasser Mahmoudi</i>	
Development of Enhanced Interactions for Highly Coarse-Grained Materials	391
<i>Michael Seaton, Vlad Sokhan, Ilian Todorov</i>	
Experimental Insights Into Thermal-Hydraulic Performance of a Compact Printed Circuit Heat Exchanger With Airfoil Fins Using High-Pressure Water	401
<i>Weitong Liu, Haoxing Zhi, Han Qi, Yanchen Fu</i>	
Numerical Study on Thermal Storage-Discharge Process of Envelopes in Building Heating Systems With Different Terminals.....	409
<i>Baoping Xu, Hengrui Zhang, Yanzhe Dou, Xiaofeng Zheng, Yuying Yan</i>	
Study on Heat Transfer Characteristics of Successive Droplet Trains Impacting on Silicon Surface	415
<i>Yuhang Li, Xu Gao, Wenhao Deng, Yakang Xia, Haiwang Li, Xuan Gao</i>	
Experimental Investigation of Alternative Coolants for Combustion Engine Valves.....	422
<i>Shaozhe Zhang, Andreas Rittsche, Ronny Kunanz, Matthias H. Buschmann</i>	
Heat Transfer Characteristics of Liquid-Liquid Taylor Flows in Flat Mini Channels	429
<i>Naixiang Zhou, Jingzhi Zhang</i>	
Numerical and Experimental Transient Analysis of Water Flash Heating of Mini Channel Heat Exchangers	435
<i>Ganga Raju Challa, Ehsan Rezaei, Bruno Marangolo, Leonardo Bernardini, Paolo Di Marco</i>	
Experimental and Numerical Investigation of the Combustion of a Polymer Infused Fuel Droplet	445
<i>Rimjhim Spandan, Aayushi Bohrey, Mandeep Deka, Jun Xia, R. V. Ravikrishna, Pratikash Panda</i>	
On Liquid-Phase Transport Modeling of SARS-CoV-2 Virus-Laden Drops.....	453
<i>Sarah M. Seaba, Lea-Der Chen, James P. Seaba</i>	
Turbulent Flow Control in Composite Porous-Fluid Systems Through Graded Porosity	461
<i>Mohammad Jadidi, Alistair Revell, Yasser Mahmoudi</i>	
An Experimental and Modeling Study on Device- and System-Level Two-Phase Cooling for High-Heat-Flux Application	467
<i>Zhaozan Feng, Guomeng Song, Fan Xia, Bin Liu, Jinfeng Yang, Kai He</i>	

An Experimental Investigation on Characteristics of Liquid Film Thickness of Gas-Liquid Taylor Flow in Rectangular Microchannel	474
<i>Dengwei Fu, Sihui Hong</i>	
Experimental and Numerical Study on Phase Change Heat Transfer of Ternary Non-Azeotropic Mixture	483
<i>Bo Zhang, Peipei Tian, Zhiguo Wang, Zhiwei Sun, Peilin Cui, Zhenyu Liu</i>	
Experimental Study of a High-Temperature Oscillating Heat Pipe Using Infrared Imaging.....	491
<i>Xin Yang, Yulong Ji, Jianhang Sun, Mengke Wu, Yanmin Feng</i>	
Experimental Investigation of Two-Phase Flows in Printed Circuit Heat Exchangers.....	497
<i>Liangliang Zhang, Jingzhi Zhang, Li Lei, Wei Li</i>	
Experimental Study on the Heat Transfer Performance of a Cesium Oscillating Heat Pipe	504
<i>Yanmin Feng, Yulong Ji, Zhonghao Liu, Mengke Wu, Huaqiang Liu</i>	
Three-Dimensional Oscillating Heat Pipe: Flow Pattern Transition and Heat Transfer Performance.....	511
<i>Zhang Liu, Yulong Ji, Dengke Zhang</i>	
Heat Transfer Effects of Sintered Particle Monolayers on Steam Flow Condensation in Mini-Channels With Flow Visualization	521
<i>Gennifer A. Riley, David E. Mendez, Munonyedi K. Egbo, Gisuk Hwang, Melanie M. Derby</i>	
Thermal and Hemodynamic Characterization of Intracranial Aneurysm on Chip: A Numerical Investigation	528
<i>Gaurav Kumar, Aneesh A. M., Sumit Kumar</i>	
Thermoelectric Properties of Stressed P-Doped Polycrystalline Silicon Hollow Nanotubes	534
<i>Jose Manuel Sojo-Gordillo, Yashpreet Kaur, Merce Pacios-Pujado, Giulio de Vito, Saeko Tachikawa, Alex Morata, Ilaria Zardo</i>	
Application of Hexagonal Boron Nitride Nanoparticles in Thermal Improvement of Oil-Based Nanofluids Stabilized With Non-Ionic Surfactant	539
<i>Mustafa Alsaady, Tong Chan Ray, Suhaib Umer Ilyas, Ayman Abdulrahman, Rashid Shamsuddin</i>	

Author Index