

**Proceedings of ASME
2024 International Mechanical
Engineering Congress and Exposition
(IMECE2024)**

Volume 9

**November 17-21, 2024
Portland, Oregon**

Conference Sponsor
American Society of
Mechanical Engineers

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: 978-0-7918-8867-4

TABLE OF CONTENTS

<p>Experimental and Numerical Analysis of Frost Formation Over a Flat Additive Manufactured Surface.....</p> <p style="padding-left: 2em;"><i>Kaan Demirhan, Alper Abdusoglu, Seyedmehrab Hosseini, Altug Melik Basol, Mehmet Arik, Elham Mirkoohi</i></p>	1
<p>Experimental Evaluation of Heat Transfer and Pressure Drop in an Additively Manufactured Evaporator Channel Using Water as Working Fluid.....</p> <p style="padding-left: 2em;"><i>Mohammad Arif, Toochukwu Aka, Vignesh Ramakrishnan, Jason Edward Hicken, Sandipan Mishra, Shankar Narayan</i></p>	7
<p>Preliminary Design of an Additively Manufactured Bio-Inspired Thermosyphon for Thermal Energy Storage</p> <p style="padding-left: 2em;"><i>Ryan Spence, Gavin Hazlett, John Nuszowski, Stephen Stagon, Christopher Oshman</i></p>	13
<p>Multi-Physics Modeling of Continuous and Pulsed Lasers: Impact on Thermal History and Surface Properties in Powder Bed Fusion Additive Manufacturing.....</p> <p style="padding-left: 2em;"><i>Abdul Qadeer, S. Sohail Akhtar, Abba A. Abubakar, Abul Fazal M. Arif, Samir Mekid, Khaled S. Al-Athel</i></p>	22
<p>Experimental Evaluation of the Thermal Conductivity of 3D-Printed Polylactic Acid Composite Materials.....</p> <p style="padding-left: 2em;"><i>Noah MacFarland, Gerardo Carbajal, Edwar Romero-Ramirez, Christian Stanfill</i></p>	29
<p>Potential Safety Hazards Associated With Li-Ion Battery Thermal Runaway Vent Gas Heat Transfer in Energy Storage Systems.....</p> <p style="padding-left: 2em;"><i>Ala' E. Qatramez, Andrew Kurzawski, John Hewson, Michael Meehan, Daniel Foti, Alexander J. Headley</i></p>	34
<p>Comparative Analysis of Phase Change Material (PCM) Thermal Energy Storages Under Different Orientations With and Without Metal Foam.....</p> <p style="padding-left: 2em;"><i>Atiq Ur Rehman Fareedi, Abdul Qadeer Khoso, Hurmat Khan, Bernardo Buonomo, Oronzio Manca, Sergio Nardini</i></p>	44
<p>Optimizing Lithium-Based Battery Cooling: A Numerical Simulation of Phase Change Materials Partially Filled With Metal Foam Based Liquid Cooling Technique.....</p> <p style="padding-left: 2em;"><i>Aanandsundar Arumugam, Bernardo Buonomo, Sergio Nardini, Oronzio Manca</i></p>	54
<p>A Hyper Physics-Informed Neural Network for Predicting Heat Transfer Patterns During the Curing Process in Aerospace Composite Manufacturing</p> <p style="padding-left: 2em;"><i>Anirudh Deodhar, Milad Ramezankhani, Rishi Parekh, Dagnachew Birru</i></p>	64
<p>Conceptual Study of Cryogenic Carbon Capture in a Swirl Flow System</p> <p style="padding-left: 2em;"><i>Emel V. Kurian, Pavitra Sandilya</i></p>	74
<p>Thermal Characterization of Nonconductive Micro-Scale Fibers via Transient Electrothermal Technique</p> <p style="padding-left: 2em;"><i>William Spirnock, Alison Hake, Heng Ban</i></p>	81
<p>In Situ Thermal Measurement of Polymers.....</p> <p style="padding-left: 2em;"><i>Carson Powers, Simon Bratescu, Peter Bearden, Fahim Dorsey, Jessica Trinh, Dal Hyung Kim, Jungkyu Park</i></p>	89

An Experimental Study of the Thermal Transport Mechanisms in Porous Media for Thermal Protection Systems	95
<i>Mahedi Hassan, M. Ruhul Amin, Yaofa Li</i>	
Numerical Analysis of the Alteration in Natural Convection Flow and Heat Transfer in Porous Media Using Magnetic Field	102
<i>Ranjit J. Singh, Sanjairaj Vijayavenkataraman, Sunil Kumar</i>	
Spatial Variation of Heat Transfer of a Fluidic Oscillator Jet Impinging on a Flat Surface	109
<i>Rita C. S. Gomes, Flavia V. Barbosa, Erany Constantino, Senhorinha C. F. Teixeira, Jose C. F. Teixeira</i>	
Heat Transfer Deterioration Mitigation for Supercritical CO ₂ Fluid in Inclined Mini Tubes: Computational Analysis.....	117
<i>Mohamed L. Elsayed, Ahmed Afifi, Chanwoo Park, Constandinos Mitsingas, Chol-Bum Kweon</i>	
Mechanical Property Evaluation of Sublimation Agents on Nanostructure Stability in Semiconductor.....	127
<i>Yosuke Hanawa, Jianliang Zhang, Yuta Sasaki, Koichi Sawada, Junichi Yoshida, Minghan Xu, Mohammaderfan Mohit, Agus P. Sasmito, Atsushi Sakuma</i>	
Solidification of Cyclohexanol in Sublimation Drying for Enhancing Semiconductor Manufacturing: Experimental and Mathematical Studies.....	132
<i>Minghan Xu, Mohammaderfan Mohit, Yosuke Hanawa, Jianliang Zhang, Junichi Yoshida, Koichi Sawada, Yuta Sasaki, Atsushi Sakuma, Agus P. Sasmito</i>	
Hybrid Thermal Management Method of Li-Ion Batteries Using Heat Pipes and PCM for Electric Vehicles	138
<i>Nourouddin Sharifi, Christian Millard, Ugochukwu Etufugh, Hamidreza Shabgard</i>	
Enhancement of Pool Boiling Heat Transfer Through Induced Vibrations - A Cascaded Lattice Boltzmann Study	151
<i>Sonali Priyadarshini Das, Anandaroop Bhattacharya</i>	
Exploring the Influence of Channel Diameter, Fill Ratio, and Adiabatic Length Variation on Long Oscillating Heat Pipes	161
<i>Marcos S. Santana, Anthony Cabrera, Apryl E. Sperling, Jim Kuo, John Bellardo, Takuro Daimaru, Eric Sunada, Scott N. Roberts</i>	
Impact of High-Strain and Deformation on Heat Pipe Capillary Flow Geometries	168
<i>Sayyada Harry, Bryce Sinift, Wyatt Smith, AmirHossein MajidiRad, Christopher Oshman</i>	
Evaluation of Eutectic Freeze Crystallization (EFC) Performance of Reverse Osmosis Brine.....	174
<i>Amira Nemmour, Khadije El Kadi, MD Islam, Isam Janajreh</i>	
Effects of Flow Boiling on Mini Channels With Ultra-Thin Fins and Cavity Arrays.....	181
<i>Alexander Nees, Gerardo Carbajal, Younggil Park, Edwar Romero</i>	
Performance Assessment of a Novel PNIPAM Polymer Desiccant Coated Heat Exchanger.....	190
<i>Md Islam, Mahmadrifik Choudhari, Ahmad Abdalla, Hemant Mittal, O. A. Qureshi, Ali Al Alili</i>	
Numerical Modeling of Hydrodynamic and Thermal Behavior During Bubble Growth in Film Boiling.....	197
<i>Divyprakash Pal, Isaac Perez-Raya</i>	

Annual Energy Estimate of Asymmetric Light Transmitting Interface Luminescent Solar Concentrators.....	207
<i>Hannah Arnow, Noah Logan, Vincent Oliveto, Duncan Smith, Michael Hughes, Diana-Andra Borca-Tasciuc</i>	
UV-Resistant Colored Radiative Cooling Paints for Robust Outdoor Performance.....	213
<i>Daniel Carne, Emily Barber, Aakar Jain, Wonjune Lee, Xiulin Ruan</i>	
Manufacturing, Characterization and Terrestrial Passive Radiative Cooling Performance of Nanofibrous PTFE-PEO Composite Thermal Coatings	219
<i>Chieloka Ibekwe, Xuanjie Wang, Jason W. Hartwig, Adam M. Swanger, Shankar Narayan</i>	
Single Droplet Combustion of Alternative Fuels.....	228
<i>Karah Powell, Yunye Shi</i>	
A Comparative Analysis on the Effect of Hydrogen Addition on Combustion Behavior of Methane, Ethanol, and Ammonia	234
<i>Shrabanti Roy</i>	
Influence of Exhaust Gas Recirculation in Biomass Combustion	244
<i>Carlos Castro, Jose Teixeira, Manuel Ferreira, Lelis Fraga</i>	
Non-Spherical Droplet Dispersion in Homogeneous Isotropic Turbulent Flow.....	252
<i>Yushu Lin, John Palmore Jr.</i>	
Numerical Investigation of Wave Dynamics During Mode Transition in a Hydrogen-Fueled Rotating Detonation Engine Combustor.....	258
<i>Veeraraghava Raju Hasti, Reetesh Ranjan</i>	
Heat Transfer of High-Temperature in Rotating Aircraft Jet Engine Turbine Blades	268
<i>Ryoichi S. Amano</i>	
Heat Transfer in Tightly Packed Cylinder Arrays.....	277
<i>Martin Kovachev, Cameron Sexsmith, Mark Ricklick</i>	
Electrospun Silica Nanofibers as Passive Thermal Control Materials for the Extreme Environment of Low Earth Orbit	287
<i>Chieloka Ibekwe, Xuanjie Wang, Jason W. Hartwig, Jeffrey R. Feller, Adam M. Swanger, Shankar Narayan</i>	
Optimizing Aerodynamic Heating of a Mars Landing Vehicle: The Impact of Nose Angle and Aspect Ratio	296
<i>Fahad Nizam Rhisat, Majid Molki</i>	
Transient Evolution of Interface and Temperature in Twin Roll Casting Process Using Coupled Phase Field and Thermo-Fluid Model	305
<i>Akshay Soni, Swarup Bag, P. S. Robi, M. Ruhul Amin</i>	
Analysis of Convection Heat Transfer on a Plate With Porous Media	314
<i>Abdul Qadeer Khoso, Atiq Ur Rehman Fareedi, Hurmat Khan, Bernardo Buonomo, Oronzio Manca, Sergio Nardini</i>	
Thermal and Optical Analysis of a Light Engine With Multi Color and Ultraviolet Light Emitting Diodes.....	323
<i>Md Shafiqul Islam, Mehmet Arik</i>	

Computational Fluid Dynamics (CFD) Modeling of Flow Boiling Heat Transfer in Microchannels: Modeling Approaches Using ANSYS Fluent and Validation Studies.....	332
<i>Sreenivas Vyyuri</i>	
Performance Tests for 3-D Pulsating Heat Pipe Heat Exchanger Under the Horizontal Orientation	341
<i>Po-Shen Cheng, Shwin-Chung Wong, Shih-Kuo Wu</i>	
Design of a Novel Thermal Energy Storage Residential Cooking Stove	350
<i>Gavin Dickinson, Christopher Relken, Carlos Fernandez-Aballi, Christopher Oshman</i>	
Time-Dependent Solution of Unsteady Compressible Flow Equations for Nanoscale Heat and Mass Transfer in Wide-Ranging Diverse Applications.....	359
<i>Ramlala P. Sinha</i>	
Multi-Disciplinary Analysis and Optimization of Micro-Channel Evaporators	368
<i>Vignesh Ramakrishnan, Arif Mohammad, Jason Hicken, Sandipan Mishra, Shankar Narayan</i>	
Evaluation of Multi-Dimensional Optimization Methods for Maximizing Segmented Thermoelectric Unicouple Performance.....	378
<i>Caroline Lehrer, Shane P. Riley, Carter D. Gassler, Cara R. Rossetti, Jean-Pierre Fleurial, Michael J. Durka, Bill J. Nesmith, Matthew M. Barry</i>	
Investigating the Effects of Spray Nozzle Clogging in Continuous Casting of Steel.....	390
<i>Dianzhi Meng, Sai Bhuvanesh Nandipati, Armin Silaen, Chenn Zhou</i>	
Assessment of Machine Learning Approaches for the Predictive Modeling of Plasma-Assisted Ignition Kernel Growth	399
<i>Sharif Md Yousuf Bhuiyan, Tanzim Mostafa, Marco P. Schoen, Rajib Mahamud</i>	
Modeling of Turbulent Non-Premixed Combustion Using High Order Compact Finite Difference Method Combined With a Steady Flamelet Approach	407
<i>Rajib Mahamud, Md Kamrul Hasan, Md Azazul Haque</i>	
Development of Open Multi-Processing Based Parallel Multiphysics Topology Optimization Software for DC Bus Bar	417
<i>Hitesh Kumar Sinha, Krishna Mohan Singh</i>	

Author Index