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Division of Fluid Dynamics

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Monday Afternoon, November 25, 2024

Session	3:08 PM	3:21 PM	3:34 PM	3:47 PM	3:47 PM
R29. Separated Flows: General Room: 255 A Chair: X. Huang, Caltech	R29.07 Abstract Withdrawn	R29.08 Thrust Generation by Shark Denticles <i>W. Wu, B. Savino</i>			
R30. Fluid-Structure Interactions, Membranes, Flutter I Room: 255 B Chair: R. Crikshank, MSU	R30.07 On the Connection between the Transverse Force and Flow Separation on Gallinging Pione Rectangular Cylinders <i>A. Naguib, A. Sattarpour, M. Koochesfahani</i>	R30.08 Interpretation of the flow-induced transverse vibrations of a rectangular cylinder through energy portraits <i>R. Crikshank, D. Olson, A. Naguib, M. Koochesfahani</i>	R30.09 Unravelling the Influence of Taper Ratio on 2-DOF Vortex-Induced Vibration Characteristics of a Circular Cylinder <i>M. Verma, A. De</i>		
R31. Supersonics and Hypersonics Room: 255 C Chair: D. Galtonde, The Ohio St. U.	R31.07 Effect of Surface Roughness on Hypersonic Turbulent Boundary Layers <i>M. Schrabbl, L. Duan, D. Galtonde</i>	R32.08 Thermal Impacts on wind-driven loads of solar PV modules <i>B. Stanislawski, E. Young, S. Veilapanthula</i>			
R32. Convection and Buoyancy-Driven Flows: General Room: 255 D Chair: O. Schilling, LLNL	R32.07 Battery thermal performance evaluation with regular polygon arrangement under natural convection <i>C. Mao, H. Kang, H. FFRAN LEON RODRIGUEZ</i>	R33.08 Impact of multi-scale riblet design on turbulent boundary layer control and drag reduction effectiveness <i>Y. Jin, M. Zani, N. Maor, D. Bhanilipadi Suresh</i>	R33.09 Suppression of crossflow-induced boundary layer transition on a swept wing by sinusoidal roughness elements <i>M. Hirota, Y. Ide, Y. Hattori</i>		
R33. Drag Reduction III: Textured Surfaces Room: 255 E Chair: Y. Jin, The U. Texas at Dallas	R33.07 Modeling turbulent flow over sharp riblets via change of coordinates <i>M. Naseri, A. Zare</i>	R34.08 Rayleigh-Taylor Unstable Flames: A Transition to Distributed Burning? <i>E. Hicks</i>	R34.09 Existence of Invariant Region to Damkholer number in a Reactive Viscous Fingering <i>P. Verma, M. Mishra, C. Chen</i>		
R34. Reacting Flows: Instabilities Room: 255 F Chair: V. Raju Hasil, U. Central Florida	R34.07 Dynamics of planar flames within closed channels <i>G. Krishnan, C. Parlano, M. Malato</i>				
R35. Waves: Surface Waves II Room: 355 A Chair: K. Yousefi, U. Texas at Dallas	R35.07 Dispersion relation and memory effects in dynamics of viscid gravity-capillary waves <i>J. Braz, D. Garwood, I. Spielman</i>	R35.08 Abstract Withdrawn	R35.09 The effect of surface roughness induced by mean turbulent water flow on excitation of waves by wind <i>L. Shemer, K. Kumar</i>		
R36. Boundary Layer Roughness Effect II Room: 355 B Chair: J. Yuan, MSU	R36.07 Experimental Characterization of the 3D Flow Field around a Roughness Element Embedded in the Inner Part of a Rough-Wall Turbulent Boundary Layer <i>D. Sharma, S. Zimmerman, J. Katz</i>	R36.08 Impacts of system yaw on secondary and tertiary flow structures generated over E-type roughness elements <i>K. Taylor, E. Compton, S. Smith, Z. Sadek, O. Ferencik, A. Abdelajjem, R. Cal, M. Calaf</i>	R36.09 Abstract Withdrawn		
R37. Turbulence: DNS Room: 355 C Chair: A. Lozano-Duran, Caltech / MIT	R37.07 Accelerating temporal convergence of high-fidelity simulations by introducing additional physical constraints <i>S. Toosi, P. Schlatter</i>				

S01: Poster Session & Refreshment Break
3:47 PM–4:45 PM, Hall C & Hall 1

Battery thermal performance evaluation with regular polygon arrangement under natural convection

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ABSTRACT

Natural convection, being independent of additional power sources, is currently regarded as the most reliable method for dissipating heat. This study investigates the heat dissipation of Lithium-ion batteries under natural convection using different packaging methods and arrangements through simulation research. The results indicate that non-packaged battery modules demonstrate superior heat dissipation, while conventional packaging methods significantly influence heat dissipation. Moreover, the impact of packaging on heat dissipation varies with battery arrangement. A regular polygon based method is introduced here to represent the centrally symmetric arrangements for batteries. The results showed that the circular arrangement method is more conducive to the heat dissipation of the battery. Finally, the performance of battery modules is evaluated using volumetric effective energy after 500 cycles. The findings reveal that the non-packaged 4x4 array achieves the highest remaining volumetric effective energy at a 0.5C discharge rate, measuring 1.7 J/mm³, compared to 0.84 J/mm³ for the 3x3 array under identical conditions.

Keywords: Natural convection, Lithium-ion battery, Packaging methods, Arrangements, Battery performance.

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