

Rishi Raj, Ph.D.

Associate Professor,
Department of Mechanical Engineering
and
Principle Investigator,
Thermal and Fluid Transport Laboratory (TFTL)
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+91-611-5233166 (office), +91-829-2339322 (mob)

1. Major scientific fields of interest

Energy, Boiling, Condensation, Micro-/Nano-Scale Thermal and Fluidic Transport, Colloids and Interface Science, Microgravity Science

2. Education

Degree	University / Institution	Year	Specialization
B.Tech.	Indian Institute of Technology Guwahati	2006	Mechanical
M.S.	University of Maryland, College Park, MD, USA	2009	Mechanical, Thermal
Ph.D.*	University of Maryland, College Park, MD, USA	2010	Mechanical, Thermal

*Doctoral Dissertation Title: [Development of a Boiling Regime Map and Gravity Scaling Parameter for Pool Boiling Heat Transfer](#) (Best Dissertation Award)

3. Experience

Duration	Institution	Position
July 2021 – present	Indian Institute of Technology Patna	Associate Dean, Resources
December 2019 – present	Indian Institute of Technology Patna	Associate Professor, Department of Mechanical Engineering
August 2013 – December 2019	Indian Institute of Technology Patna	Assistant Professor, Department of Mechanical Engineering
August 2011 – July 2013	Massachusetts Institute of Technology, Cambridge, MA, USA	Post-doctoral Associate, Department of Mechanical Engineering
May 2010 – July 2011	University of Maryland, College Park, MD, USA	Post-doctoral Research Associate, Department of Mechanical Engineering
January 2009 – May 2010	University of Maryland, College Park, MD, USA	Future Faculty Fellow
August 2006- May 2010	University of Maryland, College Park, MD, USA	Research Assistant

4. Awards and Recognition

Awards from Academies	Details	Year	Type
Medal for Young Scientists	Awarded by the Indian National Science Academy (INSA)	2019	National
Young Engineer Award	Awarded by the Indian National Academy of Engineering (INAE)	2018	National
Associateship	Awarded by the Indian Academy of Science (IASc)	2018	National
Keynote Lectures	Details	Year	Type
Keynote Speaker	Delivered a Keynote Address during the One-Day Online International Symposium on Fluid and Thermal Engineering (FLUTE 2021) organized by Amity University on 22 nd July, 2021.	2021	International
Keynote Speaker	Delivered a Keynote Address during the 25th National and 3rd International ISHMT-ASTFE Heat and Mass Transfer Conference (IHMTc) organized at IIT Roorkee between 28-31 December 2019.	2019	International

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	Keynote Speaker	Delivered a Keynote Address during the ASME 2017 International Conference on Nanochannels, Microchannels and Minichannels , Hyatt Regency, Cambridge, MA, August 27-30, 2017.	2017	International
	Best Paper/Poster Awards	Details	Year	Type
	Best Poster Award	For the paper titled "Constant Mean Curvature Based Framework for Modeling Droplet Evaporation on Lubricant-Infused Surfaces," 10th International Colloids Conference , Mallorca, Spain (Conducted Online), December 6-9, 2020.	2020	International
	Prof. P. K. Sarma Best Paper Award	For the paper titled "Acoustic feedback-controlled pool boiling of aqueous surfactant solutions" during the 25th National and 3rd International ISHMT-ASTFE Heat and Mass Transfer Conference (IHMT) organized at IIT Roorkee between 28-31 December 2019.	2019	International
	Best Poster Award	For the paper titled "Pool boiling with aqueous ionic liquid solutions" during the 10th International Conference on Boiling and Condensation Heat Transfer , 12-15 March 2018, Nagasaki, Japan	2018	International
	Best Paper Award	For the paper titled "Experimental characterization and modeling of capillary-pumped thin-film evaporation from micropillar wicks" during the ASME THE/FE/ICNMM Conference , Washington DC, July 10-14, 2016	2016	International
	Best Poster Award	For the paper titled "Hotspot Thermal Management via Thin-Film Evaporation" during The Intersociety Conference on Thermal and Thermomechanical Phenomena in Electronic Systems (iTherm) , Las Vegas, May 31 – June 3, 2016.	2016	International
	Best Paper Award	For the paper titled "Nanoporous evaporative device for advanced electronics thermal management" during The Intersociety Conference on Thermal and Thermomechanical Phenomena in Electronic Systems (iTherm) , Lake Buena Vista, Orlando, FL, USA, May 27-30, 2014.	2014	International
	Best Poster Award	For the paper titled "Characterization of Pool Boiling over a Range of Gravity Levels and Heater Sizes" during the 5th International Topical Team Workshop on Two-Phase Systems for Ground and Space Applications , Kyoto, Japan, Sept. 26-29, 2010.	2010	International
	Best Poster Award	For the paper titled "Gravity Scaling Parameter for Pool Boiling Heat Transfer," during the ASME International Mechanical Engineering Congress and Exposition (IMECE) , Lake Buena Vista, Orlando, Florida, November 13-19, 2009.	2009	International
	Teaching	Details	Year	Type
	Best Teacher Award	Awarded by the Indian Institute of Technology Patna	2018	Institutional
	Fellowships	Details	Year	Type
	Postdoctoral Fellowship	Recipient of the 2011/12 Battelle/MIT Postdoctoral Fellowship by the Department of Mechanical Engineering, Massachusetts Institute of Technology	2011	International

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Future Faculty Fellowship	Awarded by A. James Clark School of Engineering, University of Maryland, College Park, MD, USA	2009	International
Others	Details	Year	Type
Member, International Scientific Committee	Member of International Scientific Committee of the International Conference on Boiling and Condensation Heat Transfer	2018	International
Travel Award	Department of Science and Technology Travel Award for attending the 15th International Heat Transfer Conference, August 10-15th 2014, Kyoto, Japan.	2014	National
Best Doctoral Dissertation Award	Best Doctoral Dissertation Award 2010 by the Department of Mechanical Engineering University of Maryland, College Park, USA	2010	International

5. Scholarly Publications/Patents

Patents Granted

- [1] Raza, M. Q., and Raj, R., "Surfactant Based Boiling System for Zero Gravity," Application filed with the Indian Patent Office, **Indian Patent Number 314531, Issue Date 24/06/2019**, Application Number 208/KOL/2015, Priority Date 26/02/2015.
- [2] Xiao, R., Raj, R., Narayanan, S., Wang, E. N., Enright, R., and Maroo, S. C., "Enhanced Evaporative Heat Transfer Device Using Porous Membranes," **U.S. Patent No. 9,835,363, Issue Date. December 5, 2017.**

Patents Filed

- [3] Sharma, D., Kumar, A., Ghosh, D. P., Raj, R., and Saha, S. K., "An Improved Heat Sink System for Suppressing Two-Phase Thermal and Flow Instabilities and a Method Thereof," Application filed with the Indian Patent Office, **Serial Number 201931001796, Application no. TEMP/E-5/1861/2019-KOL, Date 15/01/2019.**
- [4] Raj, R., Thakur, A., Banerjee, S., and Pandey, U., "A System and Method for Controlling the Buoyancy of an Underwater Submersible," Application filed with the Indian Patent Office, **Serial Number 201831028588, Application no. E-12/31190/2018-KOL, Date 30/07/2018.**
- [5] Sunil, Raj, R., Thakur, A. D., Rajan, B. K., Chaitanya, B., Sinha, R., Agarwal, A., and Agarwal, A., "System and Method for Heat Recovery in Gasification Process," Application filed with the Indian Patent Office, **Serial Number 201831011600, Application no. TEMP/E-1/12145/2018-KOL, Date 28/03/2018.**

Book Chapters

- [6] Chaitanya, B., Thakur, A. D., and Raj, R., 2020, "Biomass Gasifier-Powered Adsorption Chiller for Atmospheric Water Harvesting: Prospects in Developing World," **Advances in Energy Research, Vol. 1.**, Springer, pp. 451-460. ISBN 978-981-15-2666-4.
- [7] Ghosh, D. P., Raj, R., Mohanty, D., Saha, S. K., 2016, "Onset of Nucleate Boiling, Void Fraction, and Liquid Film Thickness," **Microchannel Phase Change Transport Phenomena**, Elsevier, pp. 5–90. ISBN 978-0128-04-356-1.
- [8] Chattopadhyay, A., Thakur, A., and Raj, R., 2016, "Spline Based Modeling of Two-Dimensional Droplets on Rough and Heterogeneous Surfaces," **Fluid Mechanics and Fluid Power - Contemporary Research**, Springer, ISBN 978-81-322-2741-0.

Archival Technical Reports


- [9] Kim, J., Raj, R., McQuillen, J., 2014, "Gravity and Heater Size Effects on Pool Boiling Heat Transfer," **NASA Contractor Report # NASA/CR-2014-216672, E-18879, GRC-E-DAA-TN13259.**
- [10] Jakhar, K., Chattopadhyay, A., Thakur, A., and Raj, R., 2019, "Spline-based Interface Modeling and Optimization (SIMO) for Surface Tension and Contact Angle Measurements," **arXiv**, 1909.05943.

Peer-reviewed Journal Articles

SN	Name of all Authors	Paper Title	Name of Journal	Impact Factor+ (IF), H5 Index++	Year, Vol. No. Page	DOI of the paper
1.	Hedau, G., Raj, R. , and Saha, S. K.	Complete Suppression of Flow Boiling Instability in Microchannel Heat Sinks using a Combination of Inlet Restrictor and Flexible Dampener	<i>International Journal of Heat and Mass Transfer</i>	Impact Factor: 5.584 H5 Index: 95	2022, 182, pp. 121937: 1-18.	https://doi.org/10.1016/j.ijheatmasstransfer.2021.121937
2.	Gunjan, M. R., Kumar, A., and Raj, R.	Cloaked Droplets on Lubricant-Infused Surfaces: Union of Constant Mean Curvature Interfaces Dictated by Thin-Film Tension	<i>Langmuir</i>	Impact Factor: 3.882 H5 Index: 71	2021, 37 (22), pp. 6601-6612.	https://doi.org/10.1021/acs.langmuir.0c03560
3.	Verma, A., Kumar, N., and Raj, R.	Direct prediction of foamability of aqueous surfactant solutions using property values	<i>Journal of Molecular Liquids</i>	Impact Factor: 6.165 H5 Index: 97	2021, 323, pp. 114635: 1-10.	https://doi.org/10.1016/j.molliq.2020.114635
4.	Sinha, K. N. R., Kumar, V., Kumar, N., Thakur, A., and Raj, R.	Deep Learning the Sound of Boiling for Advance Prediction of Boiling Crisis	<i>Cell Reports Physical Science</i>	Impact Factor: NA H5 Index: NA	2021, 2, pp. 100382: 1-14.	https://doi.org/10.1016/j.xcrp.2021.100382
5.	Hedau, G., Raj, R. , and Saha, S. K.	Effect of Outlet Plenum Design on Flow Boiling Heat Transfer in Microchannel Heat Sinks	<i>Thermal Science and Engineering Progress</i>	Impact Factor: NA H5 Index: 27	2021, 23, pp. 100868: 1-19.	https://doi.org/10.1016/j.tsep.2021.100868
6.	Kumar, A., Gunjan, M. R., and Raj, R.	On the Validity of Force Balance Models for Predicting Gravity-Induced Detachment of Pendant Drops and Bubbles	<i>Physics of Fluids</i>	Impact Factor: 3.521 H5 Index: 50	2020, 32(10), pp. 101703: 1-5.	https://doi.org/10.1063/5.0025488
7.	Kumar, V., Sinha, K. N. R., and Raj, R.	Leidenfrost Phenomenon during Quenching in Aqueous Solutions: Effect of Evaporation-Induced Concentration Gradients	<i>Soft Matter</i>	Impact Factor: 3.679 H5 Index: 64	2020, 16, pp. 6145-6154.	https://doi.org/10.1039/D0SM00622J
8.	Gunjan, M. R., Kumar, A., and Raj, R.	Droplets on Lubricant-Infused Surfaces: Combination of Constant Mean Curvature Interfaces with Neumann Triangle Boundary Conditions	<i>Langmuir</i>	Impact Factor: 3.882 H5 Index: 71	2020, 31 (11), pp. 2974-2983.	https://doi.org/10.1021/acs.langmuir.9b03927
9.	Sarode, A., Raj, R. , and Bhargav, A.	On the Role of Confinement Plate Wettability on Pool Boiling Heat Transfer	<i>International Journal of Heat and Mass Transfer</i>	Impact Factor: 5.584 H5 Index: 95	2020, 156, pp. 119723: 1-12.	https://doi.org/10.1016/j.ijheatmasstransfer.2020.119723

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10.	Kumar, N., Sinha, K. N. R., Raza, M. Q., Verma, A., Seth, D., Jasvanth, V. S., and <u>Raj, R.</u>	Design, Fabrication, and Performance Evaluation of a Novel Orientation Independent and Wickless Heat Spreader	<i>International Journal of Heat and Mass Transfer</i>	Impact Factor: 5.584 H5 Index: 95	2020, 153, pp. 119572: 1-12.	https://doi.org/10.1016/j.ijheatmasstransfer.2020.119572
11.	Hedau, G., Dey, P., <u>Raj, R.</u> , and Saha, S. K.	Experimental and Numerical Investigation of the Effect of Number of Parallel Microchannels on Flow Boiling Heat Transfer	<i>International Journal of Heat and Mass Transfer</i>	Impact Factor: 5.584 H5 Index: 95	2020, 158, pp. 119973: 1-18.	https://doi.org/10.1016/j.ijheatmasstransfer.2020.119973
12.	Ghosh, D. P., Sharma, D., Kumar, A., Saha, S. K., and <u>Raj, R.</u>	An Ingenious Fluidic Capacitor for Complete Suppression of Thermal Fluctuations in Two-Phase Microchannel Heat Sinks	<i>International Communications in Heat and Mass Transfer</i>	Impact Factor: 5.683 H5 Index: 56	2020, 110, pp. 104347: 1-8.	https://doi.org/10.1016/j.ichmat.2019.104347
13.	Kumar, A., Gunjan, M. R., Jakhar, K., Thakur, A., and <u>Raj, R.</u>	Unified Framework for Mapping Shape and Stability of Pendant Drops Including the Effect of Contact Angle Hysteresis	<i>Colloids and Surfaces A: Physicochemical and Engineering Aspects</i>	Impact Factor: 4.539 H5 Index: 58	2020, 597, pp. 119973: 1-10.	https://doi.org/10.1016/j.colsurfa.2020.124619
14.	Sinha, K. N. R., Ranjan, D., Kumar, N., Raza, M. Q., and <u>Raj, R.</u>	Simultaneous Audio-Visual-Thermal Characterization of Transition Boiling Regime	<i>Experimental Thermal and Fluid Science</i>	Impact Factor: 3.232 H5 Index: 50	2020, 118, pp. 110162: 1-12.	https://doi.org/10.1016/j.expthermflusci.2020.110162
15.	Rahman, O.S.A., Mukherjee, B., Priyadershini, S., Gunjan, M. R., <u>Raj, R.</u> , Aruna, S. T., and Kehsri, A. K.	Investigating the Wetting Phenomena and Fabrication of Sticky, Para-hydrophobic Cerium Oxide Coating	<i>Journal of the European Ceramic Society</i>	Impact Factor: 5.302 H5 Index: 60	2020, 40, pp. 5749-5757.	https://doi.org/10.1016/j.jeurceramsoc.2020.06.028
16.	Hedau, G., Dey, P., <u>Raj, R.</u> , and Saha, S.K.	Combined Effect of Inlet Restrictor and Nanostructure on Two-Phase Flow Performance of Parallel Microchannel Heat Sinks	<i>International Journal of Thermal Sciences</i>	Impact Factor: 3.744 H5 Index: 52	2020, 153, pp. 106339: 1-16.	https://doi.org/10.1016/j.ijthermalsci.2020.106339
17.	Sarode, A., <u>Raj, R.</u> , and Bhargav, A.	Scalable Macroscale Wettability Patterns for Pool Boiling Heat Transfer Enhancement	<i>Heat and Mass Transfer</i>	Impact Factor: 2.464 H5 Index: 30	2020, 56, pp. 989-1000.	https://link.springer.com/article/10.1007/s00231-019-02783-y
18.	Sachi, S., Zaitsev, D. V., and <u>Raj, R.</u>	Effect of Ionic Liquid Additives on Temperature and Pressure Fluctuations during Water Flow Boiling in Microchannels	<i>Journal of Physics: Conf. Ser.</i>	Impact Factor: 0.54 H5 Index: 51	2020, 1677, pp. 012093.	https://doi.org/10.1088/1742-6596/1677/1/012093
19.	Sarode, A., <u>Raj, R.</u> , and Bhargav, A.	Effect of Confinement and Heater Surface Inclination on Pool Boiling Performance of Patterned Wettability Surfaces	<i>Journal of Enhanced Heat Transfer</i>	Impact Factor: 1.406 H5 Index: 9	2020, 27 (8), pp. 711-727.	https://doi.org/10.1615/JEnhHeatTransf.2020033852

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20.	Kumar, N., Raza, M. Q., Sinha, K. N. R., Seth, D., and <u>Raj, R.</u>	Amphiphilic Additives to Enhance Pool Boiling Heat Transfer in Confined Spaces	<i>Journal of Enhanced Heat Transfer</i>	Impact Factor: 1.406 H5 Index: 9	2020, 27 (6), pp. 545-560.	https://doi.org/10.1615/JEnhHeatTransf.2020034432
21.	Sunil, Sinha, R., Chaitanya, B., Rajan, B. K., Agarwal, A., Thakur, A. D., and <u>Raj, R.</u>	Design, Fabrication, and Performance Evaluation of a Novel Biomass-Gasification-Based Hot Water Generation System	<i>Energy</i>	Impact Factor: 7.147 H5 Index: 98	2019, 185, pp. 148-157.	https://doi.org/10.1016/j.energy.2018.09.183
22.	Raza, M. Q., Kumar, N., and <u>Raj, R.</u>	Effect of Foamability on Pool Boiling Critical Heat Flux with Nanofluids	<i>Soft Matter</i>	Impact Factor: 3.679 H5 Index: 64	2019, 15, pp. 5308-5318.	https://doi.org/10.1039/C8SM02565G
23.	Sinha, K. N. R., Ranjan, D., Raza, M. Q., Kumar, N., Kaner, S., Thakur, A., and <u>Raj, R.</u>	In-situ acoustic detection of critical heat flux for controlling thermal runaway in boiling systems	<i>International Journal of Heat and Mass Transfer</i>	Impact Factor: 5.584 H5 Index: 95	2019, 138, pp. 135-143.	https://doi.org/10.1016/j.ijheatmasstransfer.2019.04.029
24.	Sharma, D. Ghosh, D. P., Saha, S. K., and <u>Raj, R.</u>	Thermohydraulic Characterization of Flow Boiling in Nanostructured Microchannel Heat Sink with Vapor Venting Manifold	<i>International Journal of Heat and Mass Transfer</i>	Impact Factor: 5.584 H5 Index: 95	2019, 130, pp. 1249-1259.	https://doi.org/10.1016/j.ijheatmasstransfer.2018.11.005
25.	Kumar, N., Raza, M. Q., Seth, D., and <u>Raj, R.</u>	Surface-Active Ionic Liquids as Potential Additive for Pool Boiling Based Energy Systems	<i>Journal of Molecular Liquids</i>	Impact Factor: 6.165 H5 Index: 97	2019, 287, pp. 110953: 1-12.	https://doi.org/10.1016/j.molliq.2019.110953
26.	Raza, M. Q., Kumar, N., and <u>Raj, R.</u>	Experimental Characterization and Modeling of Critical Heat Flux with Subcooled Foaming Solution	<i>International Journal of Thermal Sciences</i>	Impact Factor: 3.744 H5 Index: 52	2019, 141, pp. 199-210.	https://doi.org/10.1016/j.ijthermalsci.2019.03.007
27.	Ghosh, D. P., Sharma, D., Mohanty, D., Saha, S. K., and <u>Raj, R.</u>	Facile Fabrication of Nanostructured Microchannels for Flow Boiling Heat Transfer Enhancement	<i>Heat Transfer Engineering</i>	Impact Factor: 2.172 H5 Index: 23	2019, 40 (7), pp. 537-548.	https://doi.org/10.1080/01457632.2018.1436399
28.	Chaitanya, B. Bahadur, V., Thakur, A. D., <u>Raj, R.</u>	Biomass-gasification-based atmospheric water harvesting in India	<i>Energy</i>	Impact Factor: 7.147 H5 Index: 98	2018, 165, pp. 610-621.	https://doi.org/10.1016/j.energy.2018.09.183
29.	Raza, M. Q., Kumar, N., and <u>Raj, R.</u>	Wettability-Independent Critical heat Flux during Boiling Crisis in Foaming Solutions	<i>International Journal of Heat and Mass Transfer</i>	Impact Factor: 5.584 H5 Index: 95	2018, 126(A), pp. 567-579.	https://doi.org/10.1016/j.ijheatmasstransfer.2018.05.062
30.	Kumar, N., Raza, Md. Q., <u>Raj, R.</u>	Aqueous Ionic Liquid Solutions for Boiling Heat Transfer Enhancement in the Absence of Buoyancy Induced Bubble Departure	<i>International Journal of Heat and Mass Transfer</i>	Impact Factor: 5.584 H5 Index: 95	2018, 122, pp. 354-363.	https://doi.org/10.1016/j.ijheatmasstransfer.2018.01.101

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31.	Kumar, N., Raza, Md. Q., <u>Raj, R.</u> ,	Surfactant Aided Bubble Departure during Pool Boiling	<i>International Journal of Thermal Sciences</i>	Impact Factor: 3.744 H5 Index: 52	2018, 131, pp. 105-113.	https://doi.org/10.1016/j.ijthermalsci.2018.05.025
32.	Adera, S., Antao, D. S., <u>Raj, R.</u> , and Wang, E. N.,	Hotspot Thermal Management via Thin-Film Evaporation - Part II: Modeling,	<i>IEEE Transactions on Components, Packaging and Manufacturing Technology</i>	Impact Factor: 1.738 H5 Index: 32	2018, 8 (1), pp. 99-112.	https://doi.org/10.1109/TCPMT.2017.2757461
33.	Adera, S., Antao, D. S., <u>Raj, R.</u> , and Wang, E. N.,	Hotspot Thermal Management via Thin-Film Evaporation - Part I: Experimental Characterization,	<i>IEEE Transactions on Components, Packaging and Manufacturing Technology</i>	Impact Factor: 1.738 H5 Index: 32	2018, 8 (1), pp. 88-98.	https://doi.org/10.1109/TCPMT.2017.2757463
34.	Gunjan, M. R., and <u>Raj, R.</u> ,	Dynamic Roughness Ratio Based Framework for Modeling Mixed Mode of Droplet Evaporation	<i>Langmuir</i>	Impact Factor: 3.882 H5 Index: 71	2017, 33 (28), pp. 7191-7201.	https://doi.org/10.1021/acs.langmuir.7b01653
35.	Jakhar, K., Chattopadhyay, A., Thakur, A., and <u>Raj, R.</u> ,	Spline Based Shape Prediction and Analysis of Uniformly Rotating Sessile and Pendant Droplets	<i>Langmuir</i>	Impact Factor: 3.882 H5 Index: 71	2017, 33 (22), pp. 5603-5612.	https://doi.org/10.1021/acs.langmuir.7b00811
36.	Kumar, A., and <u>Raj, R.</u> ,	Droplets on Microdecorated Surfaces: Evolution of the Polygonal Contact Line	<i>Langmuir</i>	Impact Factor: 3.882 H5 Index: 71	2017, 33 (19), pp. 4854-4862.	https://doi.org/10.1021/acs.langmuir.7b00559
37.	Raza, M. Q., Kumar, N., and Raj, R.	Surfactants for Bubble Removal against Buoyancy	<i>Scientific Reports</i>	Impact Factor: 4.379 H5 Index: 178	2016, 6, 19113	doi:10.1038/srep19113
38.	Adera, S., Antao, D. S., Raj, R., and Wang, E. N.,	Design of micropillar wicks for thin-film evaporation	<i>International Journal of Heat and Mass Transfer</i>	Impact Factor: 5.584 H5 Index: 95	2016, 101, pp. 280-294	https://doi.org/10.1016/j.ijheatmasstransfer.2016.04.107
39.	Antao, D. S., Adera, S., Zhu, Y., Farias, E., <u>Raj, R.</u> , and Wang, E. N.	Dynamic Evolution of the Evaporating Liquid-Vapor Interface in Micropillar Arrays	<i>Langmuir</i>	Impact Factor: 3.882 H5 Index: 71	2016, 32 (2), pp. 519-526.	http://pubs.acs.org/doi/abs/10.1021/acs.langmuir.5b03916
40.	Antao, D. S., Adera, S., Zhu, Y., Farias, E., <u>Raj, R.</u> , and Wang, E. N.	Visualization of Evaporating Liquid-Vapor Interface in Micropillar Arrays	<i>Journal of Heat Transfer – Transactions of ASME</i>	Impact Factor: 2.021 H5 Index: 28	2016, 138 (2), pp. 020910.	https://heattransfer.asmedigitalcollection.asme.org/article.aspx?articleid=2484592

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41.	Raj, R. , Adera, S., Enright, R., and Wang, E. N.,	High Resolution Liquid Patterns via Three-Dimensional Droplet Shape Control	<i>Nature Communications</i>	Impact Factor: 14.919 H5 Index: 273	2014, 5, 4975	doi:10.1038/ncomms5975
42.	Humphlik, T., Raj, R. , Maroo, S. C., Laoui, T., and Wang, E. N.	Effect of Hydrophilic Defects on Water Transport in MFI Zeolites	<i>Langmuir</i>	Impact Factor: 3.882 H5 Index: 71	2014, 30(22), pp. 6446-6453.	DOI: 10.1021/la500939t
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- [77] Raj, R., Maroo, S. C., and Wang, E. N., "Substrate Effect on the Wettability of Graphene," *2013 Material Research Society Spring Exhibit and Meeting*, San Francisco, California, April 1-5, 2013.
- [78] Humplik, T., Raj, R., Laoui, T., Wang, E. N., "Determining the Optimal Zeolite Properties for Increasing Water Permeability," *2013 Material Research Society Spring Exhibit and Meeting*, San Francisco, CA, April 1-5, 2013.
- [79] Raj, R., Enright, R., Adera, S., and Wang, E. N., "Thermodynamic Model for Contact Angle Hysteresis on Rough Surfaces," *Bulletin of the American Physical Society, APS March Meeting*, 58(1), 2013.
- [80] Adera, S., Raj, R., Enright, R., and Wang, E. N., "Evaporation-Induced Cassie Droplets on Superhydrophilic Microstructured Surfaces," *ASME International Mechanical Engineering Congress and Exposition*, Houston, Texas, November 9-15, 2012.
- [81] Di Marco, P., Raj, R., and Kim, J., "Boiling in Variable Gravity under the Action of Electric Field: Preliminary Results of Two Parabolic Flight Experiments," *Seventh International Topical Team Workshop on Two-Phase Systems for Ground and Space Applications*, Beijing, China, September 17-21, 2010.
- [82] Kim, J., Raj, R., and McQuillen, J., Pool Boiling Heat Transfer in Microgravity: Results from the Microheater Array Boiling Experiment (BXF-MABE) on the ISS, *1st Annual ISS research and Development Conference*, Colorado, Denver, USA, June 26-27, 2012.
- [83] Raj, R., and Kim, J., "Characterization of Pool Boiling over a Range of Gravity Levels and Heater Sizes," *Fifth International Topical Team Workshop on Two-Phase Systems for Ground and Space Applications*, Kyoto, Japan, September 26-29, 2010. [Best Poster Award](#)
- [84] Raj, R., Kim, J., and John McQuillen, "Gravity Scaling Parameter for Pool Boiling Heat Transfer," *Fifth International Topical Team Workshop on Two-Phase Systems for Ground and Space Applications*, Kyoto, Japan, September 26-29, 2010.
- [85] Di Marco, P., Raj, R., and Kim, J., "Boiling in Variable Gravity under the Action of Electric Field: Preliminary Results from the Parabolic Flight Experiments," *Fifth International Topical Team Workshop on Two-Phase Systems for Ground and Space Applications*, Kyoto, Japan, September 26-29, 2010.
- [86] Raj, R., Kim, J., and McQuillen, J., "Subcooled Pool Boiling in Variable Gravity Environments," *Third International Topical Team Workshop on Two-Phase Systems for Ground and Space Applications*, Brussels, Belgium, September 10-12, 2008.

6. Invited Talks

- i. Boiling Heat Transfer with Foaming Solutions for Terrestrial and Microgravity Applications, *Faculty Development Programme (FDP) on "Advanced Engineered Surfaces for Phase Change Heat Transfer Application"*, Department of Chemical Engineering, NIT Calicut, India, July 13, 2021.
- ii. Bubble Dynamics during Boiling with Foaming Solutions: Implications on Earth and Microgravity Heat Transfer, *Department of Mechanical and Materials Engineering, University of Cincinnati (online)*, USA, January 22, 2021.
- iii. Enhancement of Boiling Heat Transfer via the Suppression of Coalescence in Microgravity, *ISRO Academia Day 2021*, January 7, 2021.
- iv. Novel Insights on Fluidic Interfaces in Thermal Applications, Bubble Dynamics during Boiling with Foaming Solutions, *ScienceConnect: Langmuir, The ACS Journal of Fundamental Interface Science*, 10-12 October, 2020.
- v. Boiling Heat Transfer in Earth and Space, *TEQIP-3 Webinar*, Bhagalpur College of Engineering, Gaya, Bihar, India, September 25, 2020.
- vi. Boiling Heat Transfer in Earth and Space, *TEQIP-3 Webinar*, Gaya College of Engineering, Gaya, Bihar, India, August 4, 2020.
- vii. Bubble Dynamics during Boiling with Foaming Solutions, *Two Day International Workshop on Interfacial Flow and Heat Transfer in Droplets and Liquid Films for Advanced Thermal Management*, Indian Institute of Technology, Bombay, India, March 6-7, 2020



- viii. Boiling with Foaming Solutions for Earth and Microgravity Applications, [Keynote Address](#), *25th National and 3rd International ISHMT-ASTFE Heat and Mass Transfer Conference*, IIT Roorkee, India, December 28-31, 2019.
- ix. Passive Heat Spreader for Hotspot Mitigation, *Structured Training Programme (STP) on 'GenNext Spacecraft Systems & Technologies'*, URSC, ISRO, December 16-20, 2019.
- x. Workshop on Research Projects and Publications, Keynote Address, *Amity University, Ranchi, Jharkhand*, July 2019.
- xi. Energizing the Waste: Biomass Based Gasifier Heating System for Energy and Environment Applications, TEQIP-III Sponsored Faculty Development Programme, *Bhagalpur College of Engineering, Bihar*, May 2019.
- xii. Development of Two-Phase heat Sinks for Earth and Microgravity Thermal Management Applications, *Department of Mechanical Engineering, Indian Institute of Science, Bangalore*, April 5, 2019.
- xiii. Agricultural Waste Based Gasifier Heating System for Various Energy and Environment Applications, *TEQIP III, National Institute of Technology Patna*, December 19, 2018.
- xiv. Two-Phase Heat Spreader for Hotspot Mitigation in Reduced Gravity Applications, *INAE Annual Convention, RCI Hyderabad*, December 13-15, 2018.
- xv. Pool Boiling Critical Heat Flux Enhancement Strategies on Earth and in reduced Gravity of Space, *Indian Institute of Technology Gandhinagar*, September 8, 2017.
- xvi. Vapor Crowding-based Limit to Pool Boiling Critical Heat Flux, [Keynote Address](#), *ASME 2017 International Conference on Nanochannels, Microchannels and Minichannels*, Hyatt Regency, Cambridge, MA, August 27-30, 2017.
- xvii. Vapor Crowding based Hydrodynamic Limit to Critical Heat Flux during Pool Boiling with Nanofluids and Aqueous Surfactant Solutions, *Department of Mechanical Engineering, University of Maryland, College Park, MD, USA*, August 25, 2017.
- xviii. Critical Heat Flux Mechanism during Boiling with Surfactants, *6th International and 43rd National Conference on Fluid Mechanics and Fluid Power*, MNNITA, Allahabad, U.P., India, December 2016.
- xix. Boiling Heat Transfer: Introduction to Applications, *Workshop on Boiling Heat Transfer*, BCE Bhagalpur, Bihar, December 2016.
- xx. Nanotechnology for Two Phase Flow and Heat Transfer Enhancement, *TEQIP-II Sponsored Two Day's National Workshop on Advances in Two-Phase Flow and Heat Transfer*, NIT Agartala, Tripura, March 2016.
- xxi. Nanotechnology for Energy Efficient Thermal Management, TEQIP-II Sponsored Faculty Development Programme, *College of Engineering, Adoor, Kerala*, December 2015.
- xxii. Surfactants for Bubble Removal against Buoyancy, *ISRO Satellite Centre*, Bangalore, December 2015.
- xxiii. SEISMECH 2015, The Annual Technical Symposium, Department of Mechanical Engineering, IIT Guwahati, March 2015.
- xxiv. Role of Wettability on Micro and Nano-structured Surfaces for Enhanced Phase Change Heat Transfer, *International Workshop on Thermal Design and Management in Electronics*, Bangalore, December 2013.
- xxv. Microheater Array Boiling Experiment (MABE) on the International Space Station, *ISRO Satellite Centre*, Bangalore, December 2013.
- xxvi. Thermo-Fluidic Transport Processes Near the Three-Phase Contact Line, *Recent Advances in Micro/Nanoscale Heat Transfer and Applications in Clean Energy Technologies*, IIT Ropar, December, 2013
- xxvii. Thermo-Fluidic Transport Processes near the Microscopic Contact Line, *International Symposium on Micro/Nanoscale Heat Transfer & its Applications*, PESIT Bangalore, December 2013.
- xxviii. Surface Heterogeneity Effects on the Wettability of Graphene, *Department of Mechanical Engineering, Syracuse University*, March 2013.
- xxix. Multiscale Transport Phenomena for Space and Energy Applications, *Department of Mechanical Engineering, Indian Institute of Technology, Bombay*, September 2012.



7. Sponsored/Consultancy Projects

Title	Agency/Amount	Type	Status/Duration
Permanent Dropwise Condensation via Amphiphilic Additives in Vapor Phase (with co-PI Dr. S. Daschakraborty, IIT Patna)	Indo-Korea, DST Amount: 30 Lakhs	Sponsored	2021-2024 Ongoing
Psychrometry Driven Design and Fabrication of An All-Season Optimal Atmospheric Water Harvester (with co-PI Dr. A. D. Thakur, IIT Patna)	Water Technology Initiative, DST Amount: 32 Lakhs	Sponsored	2020-2023 Ongoing
Passive Two-Phase Heat Spreader for Hotspot Mitigation in Microgravity of Space	Human Spaceflight Centre (HSFC) ISRO Amount: 24 Lakhs	Sponsored	2020-2022 Ongoing
Development of an Ionic Liquid-based Ultra-High Heat Dissipation Module for Energy Efficient Boiling Systems	Core Research Grant, SERB Amount: 47 Lakhs	Sponsored	2020-2023 Ongoing
Surface Active Additives for Enhanced Flow Boiling in Microchannels	DST-RFBR Joint Call Amount: 16 Lakhs	Sponsored	2019-2021 Ongoing
Development of an agricultural waste based off-the-grid climate control unit for storage and processing of agricultural produce (with co-PI Dr. A. D. Thakur, IIT Patna) Industry Partner: New Leaf Dynamics	SERB under IMRPINT-2 scheme Amount: 108 Lakhs	Sponsored	2019-2022 Ongoing
Strengthening Interfacial Characterization Facilities: Funds for Improvement of S&T Infrastructure (one among six co-PIs with HoD as the PI)	DST FIST Amount: 290 Lakhs	Sponsored	2019-2024 Ongoing
Acoustic Detection of Leidenfrost Dynamics on Scalable Micro-/Nanostructured Surfaces	DST Nanomission Amount: 27 Lakhs	Sponsored	July 2016 – July 2019 (Completed)
Design and Development of an Agricultural Waste Based Gasifier Heating System for GreenCHILL™ (with co-PI Dr. A. D. Thakur, IIT Patna) Industry Partner: New Leaf Dynamics	MHRD and DST under UAY Amount: 95 Lakhs	Sponsored	August 2016 – August 2018 (Completed)
Enhancement of Boiling Heat Transfer via the Suppression of Coalescence in Microgravity	RESPOND ISRO Amount: 27 Lakhs	Sponsored	April 2015 – April 2018 (Completed)
Flow Boiling Heat Transfer in Scalable Nanostructured Microchannels for High Heat Flux Applications (with co-PI Dr. S. K. Saha, IIT Bombay)	DST SERB Amount: 50 Lakhs	Sponsored	August 2014 – August 2018 (Completed)
CFD Simulation in a Co-Current Pressure Nozzle-Spray Dryer	Haryana Leathers Chemical Ltd.	Consultancy	December 2016 – February 2017 (Completed)
Performance Analysis and Improvement of a Tonne, 7 kW Ammonia based Adsorption Refrigerator (with co-PI Dr. A. D. Thakur, IIT Patna)	New Leaf Dynamic Technologies (P) Ltd.	Consultancy	December 2014 – February 2015 (Completed)



8. Student Guidance

- Doctor of Philosophy
 - Awarded: 3, Thesis Submitted: 2, Ongoing: 7
- Project Staff: 9
- Bachelor of Technology: 16
- Master of Technology
 - Awarded: 13, Ongoing: 2

9. Reviewer for International Journals

Energy and Thermal Management: International Journal of Heat & Mass Transfer, Applied Thermal Engineering, Applied Energy, International Communications in Heat & Mass Transfer, International Journal of Therm. Sciences, International Journal of Multiphase Flow, Experimental Thermal and Fluid Sciences, Journal of Heat Transfer – Transactions of ASME, Journal of Electronic Packaging – Transactions of ASME, Journal of Thermal Science and Engineering Applications – Transactions of ASME, Thermal Science and Engineering Progress – Transactions of ASME, Heat Transfer Research, Heat Transfer Engineering, Microgravity Science and Technology, Transport in Porous Media, Journal of Enhanced heat Transfer

Colloids and Interface Science: Langmuir, Soft Matter, Journal of Colloids and Interface Science, Colloids and Surfaces A: Physicochemical and Engineering Aspect, The Journal of Physical Chemistry, Applied Surface Science, Current Opinion in Colloids and Interfaces, ACS Omega

Multidisciplinary: Advanced Materials Interfaces, Nature Materials, Nature Nanotechnology, Nature Microsystems and Nanoengineering, Scientific Reports, Nanoscale and Microscale Thermophysical Engineering

10. Professional Activities

- i. Serving as the Technical Program Committee Member (PC) member for the 26th National and 4th International ISHMT-ASTFE Heat and Mass Transfer Conference (IHMTTC-2021).
- ii. Served as the International Ambassador for the *The Intersociety Conference on Thermal and Thermomechanical Phenomena in Electronic Systems* (ITherm) for the years 2019-2020.
- iii. Served as the session chair and the programme committee (PC) member for the 25th National and 3rd International ISHMT-ASTFE Heat and Mass Transfer Conference (IHMTTC-2019).
- iv. Served as the International Scientific Committee Member at the 10th International Conference on Boiling and Condensation Heat Transfer, Nagasaki, Japan, 2018.
- v. Served as the session chair at the 24th National and 2nd International ISHMT-ASTFE Heat and Mass Transfer Conference (IHMTTC-2017).
- vi. Served as the session chair at the 6th International & 43rd National Conference on Fluid Mechanics and Fluid Power (FMFP-2016).
- vii. Served as the Technical Program Committee Member for the 6th International & 43rd National Conference on Fluid Mechanics and Fluid Power (FMFP-2016).
- viii. Served as the session chair at the 9th International Conference on Boiling and Condensation Heat Transfer, Boulder, Colorado, USA, 2015.
- ix. Served as the topic chair at the ASME 2015 InterPACK/ICNMM Conference.

11. Member of Academy/Professional Body

- i. Young Associate, Indian National Science Academy (INSA)
- ii. Young Associate, Indian National Academy of Engineering (INAE)
- iii. Associate, Indian Academy of Sciences (IASc)
- iv. Life Member, Indian Society of Heat and Mass Transfer