

## RANGANATHAN GOPALAKRISHNAN

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Faculty page: <http://www.memphis.edu/me/faculty/gopalakrishnan.php>

Google Scholar: <https://scholar.google.com/citations?user=tOrZ9j4AAAAAJ&hl=en&oi=ao>

Teaching videos: <https://www.youtube.com/channel/UCDVMZHHXN5U5JJGMzWmgEsQ>

### A. PROFESSIONAL PREPARATION

National Institute of Technology, Tiruchirappalli	Tiruchirappalli, India	Mechanical Engineering	Bachelor of Technology (May 2008).
University of Minnesota – Twin Cities	Minneapolis, MN	Mechanical Engineering	Ph. D. (August 2013)
California Institute of Technology	Pasadena, CA	Chemical Engineering	Postdoc (September 2013 to September 2014)
University of California – Berkeley	Berkeley, CA	Chemical & Biomolecular Engineering	Postdoc (October 2014 to July 2015)

### B. APPOINTMENTS

August 2016 – present	Assistant Professor	Mechanical Engineering	The University of Memphis
July 1 – 20, 2018	Visiting Academic Fellow/Professor with Salary	Laboratoire des Sciences des Procédés et des Matériaux	University Paris XIII
August 2015 to July 2016	Lecturer	Mechanical & Industrial Engineering	The University of Iowa

### C. HONORS

- 2012-13 Doctoral Dissertation Fellowship, University of Minnesota
- Honorable mention in 2014 Best Dissertation Competition, University of Minnesota
- FY2020 Early Career Award, US Dept of Energy <https://science.osti.gov/early-career>
- UMRF Ventures Assistant Professorship, University of Memphis (Sep 2020 – Aug 2022)
- Featured in top 20 finalists for 2021 U. of Memphis Distinguished Alumni Teaching Award
- 2022 Herff College of Engineering Faculty Research Award, University of Memphis

## D. RESEARCH SUPPORT

### Summary of awarded research support

Federal (item i)	\$1,314,150
Sub-awards (item ii)	\$58,054
<b>Total</b>	<b>\$1,372,204</b>

#### i. Federally Sponsored Research Projects

1. National Science Foundation Division of Physics (**Ongoing**)
  - An effective potential approach to the modeling of concentrated dusty plasmas
  - **\$199,673**, July 1, 2019 – June 30, 2023
  - **Role:** PI (no Co-PIs)
  - **Publicly released project abstract:**  
[https://nsf.gov/awardsearch/showAward?AWD\\_ID=1903432](https://nsf.gov/awardsearch/showAward?AWD_ID=1903432)
2. Department of Energy Office of Science – Fusion Energy Sciences (**Ongoing**)
  - Thermodynamics and Transport Models of Strongly Coupled Dusty Plasma Matter (FY 2020 **EARLY CAREER** award)
  - **\$750,695**, September 1, 2020 – August 31, 2025
  - **Role:** PI (no Co-PIs)
  - **Publicly released project abstract:**  
<https://pamspublic.science.energy.gov/WebPAMSEExternal/Interface/Common/ViewPublicAbstract.aspx?rv=81050aaf-d943-419a-b14d-e911370cf527&rtc=24>
3. Department of Energy Office of Science – Basic Energy Sciences (**Ongoing**)
  - Langevin Dynamics modeling of gas-phase ion-ion recombination
  - **\$363,782**, September 1, 2020 – August 31, 2023
  - **Role:** PI (no Co-PIs)
  - **Publicly released project abstract:**  
<https://pamspublic.science.energy.gov/WebPAMSEExternal/Interface/Common/ViewPublicAbstract.aspx?rv=412be1ad-8af3-4d68-ab51-53fc44ee8975&rtc=24>

#### ii. Sub-awards

1. University of Minnesota Board of Regents (**Completed**)
  - Fabrication of ultrasonic aerosol generators
  - **\$8,054**, May 1, 2019 – August 31, 2019
2. Jet Propulsion Laboratory – California Institute of Technology (**Ongoing**)
  - PK-4 data organization for NASA Physical Sciences Informatics
  - **\$50,000**, March 1, 2022 – December 31, 2022
  - **Role:** PI (no Co-PIs)

**E. TEACHING** (F: Fall, S: Spring, F09 = Fall 2009)

*The University of Memphis* (as Assistant Professor, F16 – present)

Undergraduate courses

- MECH 2311 Thermodynamics I (F19, S20)
- MECH 3331 Fluid Mechanics (F18, S20, F20)
- MECH 3335 Fluid Mechanics Lab (S20, F20, S21, F21, S22, F22, S23)
- MECH 3341 Numerical and Statistical Methods (F18, F19)
- MECH 4309/6309 Gas Dynamics (F16)
- MECH 4991/6991 Special Topics: Aerosol Engineering (S17, S21)

Graduate courses

- MECH 7302/8302: Theory of Continuous Media (S22)
- MECH 7341/8341 Engineering Analysis I (F17, F22)
- MECH 7342/8342 Engineering Analysis II (S18)
- MECH 7378/8378 Introduction to Computational Fluid Dynamics (S18)

*The University of Iowa* (as Lecturer, F15 & S16)

- S16: ME 3052 Mechanical Systems
- S16: ME 4080 Experimental Engineering
- S16: ME 4086 Mechanical Engineering Design Project
- F15: ME 3351 Engineering Instrumentation
- F15: ME 4080 Experimental Engineering

*University of Minnesota – Twin Cities* (as Graduate Teaching Assistant, F09 – S12)

- ME 4031W: Basic Mechanical Measurements Laboratory  
*Instructor:* Prof. Peter H. McMurry, Terms: F09, F10, S11, F11, S12
- ME 3332: Thermal Sciences II  
*Instructor:* Prof. Christopher J. Hogan Jr., Term: S10

**F. STUDENT MENTORING** (F: Fall, S: Spring, Su: Summer)

**PhD graduates**

1. Spring 2020: Rayhan Ahmed
2. Spring 2021: Li Li
3. Summer 2022: Vikram Suresh

**MS graduates**

1. Spring 2018: Ewe Jiun Chng
2. Spring 2018: Lekhnath Pokharel
3. Spring 2019: Harjindar Singh Chahl
4. Spring 2019: Prashant Parajuli
5. Fall 2021: Andrei Fendley

**Current PhD Advisee(s)**

Mrittika Roy (F21 – present)  
Ravi Kumar (F21 – present)  
Sai Kiran Madugula (F21 – present)

**Current MS Advisees**

Zhibo Liu (Su21 – present)

**Undergraduate Research**

Joshua Redmond Go Felipe (F19)  
Zhibo Liu (S20 – S21)  
Sophie Wood (S21)  
Zach Perry (F20 – present)

## G. SCHOLARLY PRODUCTS

### i. Peer reviewed journal articles (\* - advisees of Dr. Gopalakrishnan)

Journal	2020 Impact Factor	# of publications
Journal of Aerosol Science	3.433	9
Aerosol Science and Technology	2.580	5
Journal of Chemical Physics	3.488	2
Physical Review E	2.529	2
Journal of Physics D: Applied Physics	3.207	2
Thin Solid Films	2.183	1
Powder Technology	5.130	1
<b>Career total (as of June 22, 2022)</b>		<b>22</b>
<b>Google Scholar® Citation total (as of June 22, 2022)</b>		<b>700</b>
<b>h-index</b>		<b>13</b>
<b>Publications as Assistant Professor</b>		<b>10</b>

#### 2022

1. Suresh\*, V., Liu\*, Z., Perry\*, Z. and **Gopalakrishnan, R.**, Modeling Particle-Particle Binary Coagulation Rate Constants for Spherical Aerosol Particles at High Volume Fractions Using Langevin Dynamics Simulations. *Journal of Aerosol Science* 164: 106001. <https://doi.org/10.1016/j.jaerosci.2022.106001>

#### 2021

2. Suresh\*<sup>#</sup>, V., Li\*<sup>#</sup>, L., Redmond Go Felipe\*, J. and **Gopalakrishnan, R.**, Modeling nanoparticle charge distribution in the afterglow of non-thermal plasmas and comparison with measurements *Journal of Physics D: Applied Physics* 54, 275205 (2021). <https://doi.org/10.1088/1361-6463/abf70c>
3. Li\*, L. and **Gopalakrishnan, R.** (2021), An experimentally validated model of diffusion charging of arbitrary shaped aerosol particles. *Journal of Aerosol Science* 151: 105678. <https://doi.org/10.1016/j.jaerosci.2020.105678>
4. Suresh\*, V. and **Gopalakrishnan, R.** (invited article), Tutorial: Langevin Dynamics methods for aerosol particle trajectory simulations and collision rate constant modeling. *Journal of Aerosol Science* 155: 105476. <https://doi.org/10.1016/j.jaerosci.2021.105746>

#### 2020

5. Li\*, L., Chahl\*, H. S. and **Gopalakrishnan, R.** (2020), Comparison of the predictions of Langevin Dynamics-based diffusion charging collision kernel models with canonical experiments, *J. Aerosol. Sci.* 140, 105481. <https://doi.org/10.1016/j.jaerosci.2019.105481>

- Ahmed\*, R., Suresh\*, V., Li\*. L. and **Gopalakrishnan, R.** (2020), Scalable generation of high concentration aerosol in the size range of 0.1–10  $\mu\text{m}$  from commercial powders using ultrasonic dispersion, *Powder Technology* **376**, 52.  
<https://doi.org/10.1016/j.powtec.2020.08.009>

### 2019

- Ahmed\*, R., & **Gopalakrishnan, R.** (2019), Computational study of electrostatic focusing of aerosol nanoparticles using an Einzel lens, *Journal of Aerosol Science*, 105443 (2019).  
<https://doi.org/10.1016/j.jaerosci.2019.105443>
- Chng\*, E. J., Watson, A. B., Suresh\*, V., Fujiwara, T., Bumgardner, J. D., & **Gopalakrishnan, R.** (2019), Adhesion of electrosprayed chitosan coatings using silane surface chemistry, *Thin Solid Films*, 137454. <https://doi.org/10.1016/j.tsf.2019.137454>
- Chahl\*, H. S. and **Gopalakrishnan, R.,** (2019) High potential, near free molecular regime Coulombic collisions in aerosols and dusty plasmas, *Aerosol Science and Technology*, 53(8): 933-957. <https://doi.org/10.1080/02786826.2019.1614522>
- Pokharel\*, L., Parajuli\*, P., Li\*, L., Chng\*, E. J., and **Gopalakrishnan, R.,** (2019) An ultrasonic feeding mechanism for continuous aerosol generation from cohesive powders. *Aerosol Science and Technology*, 53(3): 321-331.  
<https://doi.org/10.1080/02786826.2018.1559920>
- Wong, C.-S., **Gopalakrishnan, R.,** and Goree, J. A., (2019) Fluctuation-theorem method of measuring a particle's mass without knowing its shape or density, *Journal of Aerosol Science*, 129: 116-123. <https://doi.org/10.1016/j.jaerosci.2018.12.009>

### 2018

- Wong, C.-S., Goree, J. A., & **Gopalakrishnan, R.,** (2018) Experimental demonstration that a free-falling aerosol particle obeys a fluctuation theorem, *Physical Review E (Rapid Communication)*, 97: 050601(R). <https://doi.org/10.1103/PhysRevE.97.050601>

### 2016 & prior years

- Gopalakrishnan, R.,** Kawamura, E., Lichtenberg, A. J., Lieberman, M. A., & Graves, D. B., (2016) Solvated electrons at the atmospheric pressure plasma-water anodic interface *J. Phys. D: Appl. Phys.*, 49: 295205. <https://doi.org/10.1088/0022-3727/49/29/295205>  
*Selected by the Editorial Board of J. Phys. D: Appl. Phys. to feature in Highlights of 2016.*
- Gopalakrishnan, R.,** McMurry, P. H., & Hogan, C. J., (2015). The Bipolar Diffusion Charging of Nanoparticles: A Review and Development of Approaches for Non-Spherical Particles. *Aerosol Science and Technology*, 49(12): 1181-1194.  
<https://doi.org/10.1080/02786826.2015.1109053>
- Gopalakrishnan, R.,** McMurry, P. H., & Hogan, C. J. (2015), The electrical mobilities and scalar friction factors of modest-to-high aspect ratio particles in the transition regime. *Journal of Aerosol Science*, 82: 24-39. <https://doi.org/10.1016/j.jaerosci.2015.01.001>

16. **Gopalakrishnan, R.**, Thajudeen, T., Ouyang, H. & Hogan, C. J. (2013), The unipolar diffusion charging of arbitrary shaped aerosol particles. *Journal of Aerosol Science*, 64: 60-80. <https://doi.org/10.1016/j.jaerosci.2013.06.002>
17. **Gopalakrishnan, R.**, Meredith, M. J., Larriba, C. & Hogan, C. J. (2013), Brownian dynamics determination of the bipolar steady charge distribution on sphere and non-spheres in the transition regime. *Journal of Aerosol Science*, 63: 126-145. <https://doi.org/10.1016/j.jaerosci.2013.04.007>
18. Thajudeen, T., **Gopalakrishnan, R.** & Hogan, C. J. (2012), The collision rate of non-spherical particles and aggregates for all diffusive Knudsen numbers. *Aerosol Science and Technology*, 46(11): 1174-1186. <https://doi.org/10.1080/02786826.2012.701353>
19. Ouyang, H., **Gopalakrishnan, R.** & Hogan, C. J. (2012), Nanoparticle collisions and growth in the gas phase in the presence of singular attractive potentials. *Journal of Chemical Physics*, 137: 064316. <https://doi.org/10.1063/1.4742064>
20. **Gopalakrishnan, R.**, & Hogan, C. J. (2012), Coulomb-influenced collisions in aerosols and dusty plasmas. *Phys. Rev. E*, 85: 026410. <https://doi.org/10.1103/PhysRevE.85.026410>
21. **Gopalakrishnan, R.**, Thajudeen, T. & Hogan, C. J. (2011), Collision limited reaction rates for arbitrarily shaped particles across the entire diffusive Knudsen number range. *Journal of Chemical Physics*, 135: 054302. <https://doi.org/10.1063/1.3617251>
22. **Gopalakrishnan, R.**, & Hogan, C. J. (2011), Determination of the transition regime collision kernel from mean first passage times. *Aerosol Science and Technology*, 45: 1499-1509. <https://doi.org/10.1080/02786826.2011.601775>

ii. **Granted patents** (\* - advisees of Dr. Gopalakrishnan)

1. **Gopalakrishnan, et al.**, “SYSTEMS AND METHODS FOR DISPERSION OF DRY POWDERS”, US Patent Number 11,358,112  
<https://patft.uspto.gov/netacgi/nph-Parser?Sect1=PTO2&Sect2=HITOFF&p=1&u=%2Fnetacgi%2FPTO%2Fsearch-bool.html&r=1&f=G&l=50&col=AND&d=PTXT&s1=Gopalakrishnan.AANM.&OS=AANM/Gopalakrishnan&RS=AANM/Gopalakrishnan>

iii. **Invited Presentations** (\* - advisees of Dr. Gopalakrishnan, F: Fall, S: Spring)

1. Chahl\*, H. S., & **Gopalakrishnan, R.** (presenter), Langevin dynamics modeling of gas-phase ion-ion recombination rates, 1st Symposium on Nonequilibrium Multiphase Systems, Saint Louis, MO USA December 7-8, 2018, Hosted at Washington University in Saint Louis (WUSTL) by the Center for Aerosol Science and Engineering (CASE).
2. Vikram Suresh\*, Ewe Jiun Chng\*, Joel Bumgardner & **Ranganathan Gopalakrishnan** (presenter), invited presentation titled “Evaluation of the Adhesion of Electrospayed and Solution-Cast Chitosan Coatings on Titanium Surfaces”, Session D2-TuA2, Abstract #292 at the International Conference on Metallurgical Coatings and Thin Films (ICMCTF) 2019, May 19 – 24, 2019, San Diego, CA, USA.
3. Vikram Suresh\*, Li Li\*, & **Ranganathan Gopalakrishnan** (presenter), invited presentation titled “MODELING NANOPARTICLE CHARGE DISTRIBUTION IN THE AFTERGLOW OF NON-THERMAL PLASMAS AND COMPARISON WITH MEASUREMENTS”, Session 3I-A: (Invited) Dusty Plasmas at the 48<sup>th</sup> International Conference on Plasma Science, September 12 – 16, 2021, Virtual Conference.
4. Abstract 3I-A-04: MODELING NANOPARTICLE CHARGE DISTRIBUTION IN THE AFTERGLOW OF NON-THERMAL PLASMAS AND COMPARISON WITH MEASUREMENTS. Vikram Suresh, Li Li, **Ranganathan Gopalakrishnan** (presenter). 48<sup>th</sup> International Conference on Plasma Science | September 12 – 16, 2021 | Virtual | <http://ece-events.unm.edu/icops2021/program.html>
5. MODELING GRAIN LEVEL AND GRAIN PHASE LEVEL TRANSPORT PROCESSES IN DUSTY PLASMAS. **Ranganathan Gopalakrishnan** (presenter). International Online Seminar on Dusty Plasmas. Kiel University | February 23, 2022 | Virtual | [https://www.youtube.com/watch?v=f6Yc0tmT7ew&ab\\_channel=RanganathanGopalakrishnan](https://www.youtube.com/watch?v=f6Yc0tmT7ew&ab_channel=RanganathanGopalakrishnan)
6. Departmental seminars presentations (S17 = Spring 2017)
  - S17: Physics and Materials Science, University of Memphis
  - S18: Biomedical Engineering, University of Memphis
  - S19: Mechanical Engineering, University of Maryland-Baltimore County
  - F20: Mechanical and Aerospace Engineering, Worcester Polytechnic Institute
  - F20: Mechanical Engineering, Saranathan College of Engg., Tiruchirappalli, India



## H. SERVICE

- i.** *Reviewer*
  - Reviewed >60 manuscripts total as of May 2022 for various journals.
  - Reviewed proposals for
    - US National Science Foundation
    - US Department of Energy Office of Science
    - MagNetUS Frontier Plasma Science
- ii.** *Symposium Session Chair*
  - “Aerosol Physics” session at the annual conference (2015, Minneapolis, MN) of the American Association for Aerosol Research (AAAR).
  - “Aerosol Modeling” session at the International Aerosol Conference (2018, St. Louis, MO).
  - “Aerosol Physics” session at the annual conference (2020, Virtual Conference) of the American Association for Aerosol Research (AAAR).
  - “Computational Physics” session at the 48<sup>th</sup> International Conference on Plasma Science (2021, Virtual Conference).
- iii.** Service to the Department of Mechanical Engineering, The University of Memphis
  - *Graduate Program Coordinator* (Su21 – present)
  - *Chair*, Instructor Search Committee (S21)
  - *Member*, Undergraduate Curriculum Process Team (Aug 2016 – Nov 2018)
  - *Member*, Graduate Curriculum Process Team (Nov 2018 – present)
  - *Member*, Tenure-track Faculty Search Committees (F17, S18, S22)
  - *Member*, Instructor Search Committee (Su20)
  - *Member*, Tenured Faculty Search Committee (S22)
- iv.** Service to the Herff College of Engineering, The University of Memphis
  - *Member*, PhD Qualifying Examination Committee of the Department of Biomedical Engineering (S17, S18, S19, S20)
- v.** Service to The University of Memphis
  - *Member*, Herff College of Engineering Dean Search Committee (S22)
- vi.** Industrial Consulting
  - AllWorld Project Management Inc., Memphis, TN

## I. MENTIONS IN THE MEDIA

- ***UofM's Gopalakrishnan Receives \$750,000 U.S. DOE EARLY CAREER Award***, published on July 2, 2020. <https://www.memphis.edu/mediaroom/releases/2020/july/ranga.php>
- ***Movers & Shakers***, published on July 8, 2020 in the Daily Memphian. <https://dailymemphian.com/section/businessmovers-and-shakers/article/15298/movers-shakers>
- ***Research gains fuel U of M hopes for Carnegie R1 status***, published on August 31, 2020 in the Daily Memphian. <https://dailymemphian.com/section/metroeducation/article/16502/carnegie-r1-research-park-u-of-m>
- ***UofM's Gopalakrishnan receives \$363,782 DOE award for studying chemical recombination of gas-phase ions***, published on September 3, 2020 <https://www.memphis.edu/mediaroom/releases/2020/september/gopalakrishnandoeaward.php>
- ***U of M edges closer to R1 status, feels confident about chances in 2021***, published on September 10, 2020 in the Memphis Business Journal. <https://www.bizjournals.com/memphis/news/2020/09/10/university-of-memphis-r1-status.html>
- ***U of M professor part of international effort to harness clean, abundant energy source***, published on September 28, 2020 in the Memphis Business Journal. <https://www.bizjournals.com/memphis/news/2020/09/28/ranganathan-gopalakrishnan-university-of-memphis.html>
- ***MIT Fusion Startup Gears Up for Reactor Design and Construction***, published on October 9, 2020 in Engineering News-Record <https://www.enr.com/articles/50293-mit-fusion-startup-gears-up-for-reactor-design-and-construction>
- ***Fusion Test Produces More Power Than It Takes In***, published on September 8, 2021 in Engineering News Record <https://www.enr.com/articles/52374-fusion-test-produces-more-power-than-it-takes-in>