AMRITA CHAKRABORTY

in/amrita-chakraborty-b69b5aa4/
2301 Broadmoor Dr, Bryan, TX 77802
amritarimic@gmail.com 713-269-0188

RESEARCH INTERESTS

My primary research interest focuses on creating nanostructures with intriguing physicochemical properties through chemical interactions between nanoparticles of varying sizes, and examining their potential for diverse applications. During my Ph.D., I synthesized anisotropic noble metal nanoparticles and atomically precise nanoclusters, their systematic assembly or atom exchange to generate alloy or composite nanostructures. I employed spectroscopic techniques including surface enhanced Raman spectoscopy (SERS) for chemical sensing using some of these structures. During my post-doctoral research, I have investigated structural chirality associated with composite nanostructures using dark-field scattering, followed by ultrasensitive detection of biomarkers. Currently, I am investigating the mechanism of ion transport through lipid membranes using nonlinear optical scattering.

PROFESSIONAL EXPERIENCE

Postdoctoral scholar, Interface Science Lab, Department of Chemistry *2025 - present*
Texas A&M University, Texas, USA
Research topic: Molecular organization of interfaces.
Advisor: Prof. Saranya Pullanchery

Postdoctoral scholar, Nanobioengineering Lab, Department of Mechanical Engineering *2023 - 2024*
University of Texas at Dallas, Texas, USA
Research topic: Single molecule diagnostic techniques using nanomaterials towards infectious and neurological diseases.
Advisor: Prof. Zhenpeng Qin

Postdoctoral scholar, Department of Chemistry *2021-2023*
Rice University, Texas, USA
Research topic: Circular differential scattering spectroscopy of chiral gold nanorod dimers
Advisor: Prof. Stephan Link

EDUCATION

PhD, Department of Chemistry *2021*
Indian Institute of Technology Madras, Chennai, India
Advisor: Thalappil Pradeep
Thesis: Chemical Interactions Between Nanoscale Systems: Novel Structures and Emerging Properties

M.Sc., Department of Chemistry *2015*
Jadavpur University, Kolkata, India
Advisor: Nitin Chattopadhyay
Thesis: Delivery of a biological photosensitizer to the DNA through liposomal nanocarrier: A spectroscopic investigation.

B.Sc., Department of Chemistry *2013*
Jadavpur University, Kolkata, India

Journal Publications

J17. **Amrita Chakraborty**, Ojasvi Verma, Gopal Narmada Naidu, Mihir Dass, Zhenyang Jia, Christy F. Landes, Alessandro Alabastri, Peter Nordlander, Tim Liedl, and Stephan Link, "The influence of the supporting substrate on single-particle circular differential scattering of DNA assembled nanorod dimers," *Adv. Optical Mater.* 2025, 2403002. **I. F. 10**

J16. **Amrita Chakraborty**, Sujan Manna, Biswajit Mondal, Mohammad Bodiuzzaman, Ankit Nagar, Soham Chowdhury, Tanmayaa Nayak, Nonappa, and Thalappil Pradeep, "Morphology-Preserved Alloying in Anisotropic Gold Nanoparticles Using Atomically Precise Nanoclusters," *Small 2025, 2410784.* **I. F. 13**

J15. Ting-Lian Yuan, Xiaofei Guo, Stephen Lee, Sadie Brasel, **Amrita Chakraborty**, David Masiello, Stephan Link, "Chemical Interface Damping Revealed by Single-Particle Absorption Spectroscopy," *ACS Nano 2025 19 (10), 10277-10288* . **I. F. 15.8**

J14. Ojasvi Verma, Subhasis Adhikari, **Amrita Chakraborty**, Prashant K. Jain*, and Stephan Link, "Bovine-Hemoglobin Detection by Single-Particle Plasmon-Coupled Circular Dichroism," *Nano Letters, 2025, Article ASAP DOI: 10.1021/acs.nanolett.5c00476.* **I. F. 9.6**

J13. Alexandar A. Al-Zubeidi, ... **Amrita Chakraborty**, ... Stephan Link, "Mechanism for plasmon-generated solvated electrons," *PNAS* 2023 120, e2217035120. **I. F. 9.4**

J12. **Amrita Chakraborty**, Megha Maria Stanley, Biswajit Mondal, Nonappa, Md Bodiuzzaman, Papri Chakraborty, M. P. Kannan and Thalappil Pradeep, "Tunable reactivity of silver nanoclusters: a facile route to synthesize a range of bimetallic nanostructures," *Nanoscale*, 2023 15, 2690-2699. **I. F. 8.3**

J11. **Amrita Chakraborty**, Ann Candice Fernandez, Anirban Som, Biswajit Mondal, Ganapati Natarajan, Ganesan Paramasivam, Tanja Lahtinen, Hannu Häkkinen, Nonappa, and Thalappil Pradeep, "Atomically precise nanocluster assemblies encapsulating plasmonic gold nanorods," *Angew. Chem. Int. Ed.*, 2018 57, 6522–6526. **I. F. 16.1**

J10. Papri Chakraborty, Abhijit Nag, **Amrita Chakraborty**, and Thalappil Pradeep, "Approaching materials with atomic precision using supramolecular cluster assemblies," *Acc. Chem. Res.*, 2019 52, 2–11. **I. F. 16.4**

J9. Anirban Som, Alessandra Griffo, Indranath Chakraborty, Hendrik Hähl, Biswajit Mondal, **Amrita Chakraborty**, Karin Jacobs, Päivi Laaksonen, Olli Ikkala, and Thalappil Pradeep, "Strong and Elastic Membranes via Hydrogen Bonding Directed Self-Assembly of Atomically Precise Nanoclusters," *Small* 2022 18, 2201707. **I. F. 13.3**

J8. Pallab Basuri, **Amrita Chakraborty**, Tripti Ahuja, Biswajit Mondal, Jenifer Shantha Kumar and Thalappil Pradeep, "Spatial reorganization of analytes in charged aqueous microdroplets," *Chem. Sci.*, 2022 13, 13321-13329. **I. F. 7.6**

J7. Wakeel Ahmed Dar, Arijit Jana, Korath Shivan Sugi, Ganesan Paramasivam, Mohammad Bodiuzzaman, Esma Khatun, Anirban Som, Ananthu Mahendranath, **Amrita Chakraborty**, and Thalappil Pradeep, "Molecular Engineering of Atomically Precise Silver Clusters into 2D and 3D Framework Solids," *Chem. Mater.* 2022 34 (10), 4703–4711. **I. F. 7.2**

J6. **Amrita Chakraborty**, Nonappa, Biswajit Mondal, Kamalesh Chaudhari, Heikki Rekola, Ville Hynninen, Mauri Kostiainen, Robin Ras and Thalappil Pradeep, "Near-infrared chiral plasmonic microwires through precision assembly of gold nanorods on soft biotemplates," *J. Phys. Chem. C*, 2021 125, 3256-3267. **I. F. 3.3**

J5. **Amrita Chakraborty**, Harsh Dave, Biswajit Mondal, Esma Khatun, and Thalappil Pradeep, "Shell-Isolated Assembly of Atomically Precise Nanoclusters on Gold Nanorods for Integrated Plasmonic-Luminescent Nanocomposites," *J. Phys. Chem. B* 2022 126 (8), 1842-1851. **I. F. 2.8**

J4. Papri Chakraborty, Paulami Bose, Jayoti Roy, Abhijit Nag, Biswajit Mondal, **Amrita Chakraborty**, and Thalappil Pradeep, "Isotopic Exchange of Atomically Precise Nanoclusters with Materials of Varying Dimensions: From Nanoscale to Bulk," *J. Phys. Chem. C*, 2021 125 (29), 16110-16117. **I. F. 3.3**

J3. Debasmita Ghosh, Mohd Azhardin Ganayee, Anirban Som, Pillalamarri Srikrishnarka, Nidhi Murali, Sandeep Bose, **Amrita Chakraborty**, Biswajit Mondal, Pijush Ghosh and Thalappil Pradeep, "Hierarchical assembly of atomically precise metal clusters as a luminescent strain sensor," *ACS Appl. Mater. Interfaces*, 2021 13 (5), 6496–6504. **I. F. 8.3**

J2. Moses Egor, Avula Anil Kumar, Tripti Ahuja, Sritama Mukherjee, **Amrita Chakraborty**, Chennu Sudhakar, Pillalamarri Srikrishnarka, Sandeep Bose, Swathy Jakka Ravindran, and Thalappil Pradeep, "Cellulosic Ternary Nanocomposite for Affordable and Sustainable Fluoride Removal," *ACS Sustainable Chem. Eng.* 2021 9 (38), 12788–12799. **I. F. 7.1**

J1. Md Rabiul Islam, Soujit Sen Gupta, Sourav Kanti Jana, Pillalamarri Srikrishnarka, Biswajit Mondal, Sudhakar Chennu, Tripti Ahuja, **Amrita Chakraborty** and Thalappil Pradeep, "A covalently integrated reduced graphene oxide-ion exchange resin electrode for efficient capacitive deionization," *Adv. Mater. Interfaces* 2021 8, 2001998. **I. F. 5.4**

Manuscript under preparation

M3. **Amrita Chakraborty**, Deepak Sapkota, Yuhui Guo, Ouyang Hui and Zhenpeng Qin, "Composition-dependent phase transitions in lab-generated bioaerosols."

M2. Boylan Dylan, **Amrita Chakraborty**, Tingting Zhang, Zhenpeng Qin, and Xianming Dai, "Coersening effect for SERS-based ultrasensitive biodetection."

M1. Biswajit Mondal, **Amrita Chakraborty**, Kartheek Joshua, Pillalamarri Srikrishnarka, Md Rabiul Islam, Jenifer Shantha Kumar, Ramesh Kumar, Sandeep Bose, and Thalappil Pradeep, "A practical holey 2D MoS2 based membrane with Mo-rich edges for efficient desalination of water."

Book Chapter

B1. **Amrita Chakraborty**, and Thalappil Pradeep, "Chapter 6: Nanoparticle-nanoclusters coassemblies" in "Atomically Precise Metal Nanoclusters", ed. T. Pradeep, Elsevier, Amsterdam, 2023.

Presentations and recognition

P8. Poster presentation "Morphological evaluation of bioaerosols with compositional complexity" in **University of Texas System Postdoctoral Symposium 2024**, United States (September 16, 2024).

P7. Poster presentation "Single Particle Chirality Studies of DNA-templated Gold Nanorod Dimers Towards Improved Chiral Sensitivity" in **Gordon Research Seminar and Conference on Noble Metal Nanoparticles**, United States (June 12-17, 2022).

P6. **Best oral talk award** for "Noble metal nanocomposites: Advanced materials for catalysis" in Virtual National Conference on **Materials for Energy Harvesting and Catalysis** (May 01-03, 2020).

P5. Poster presentation "Atomically Precise Nanocluster Assemblies Encapsulating Plasmonic Gold Nanorods" in **Gordon Research Seminar and Conference on Noble Metal Nanoparticles**, United States (June 16-22, 2019).

P4. **Best poster award** for "Atomically Precise Nanocluster Assemblies Encapsulating Plasmonic Gold Nanorods" in **Chemistry in-House Symposium (CiHS-2018)** IIT Madras, India, 2018.

P3. Poster presentation "Atomically Precise Nanocluster Assemblies Encapsulating Plasmonic Gold Nanorods" in **International Conference on Nanoscience and Technology (ICONSAT)**, India (2018).

P2. Poster presentation "Systematic Self-Assembly of Ag44 Clusters on Reconstructed Gold Nanorod Surface Leading to Octahedral Nanocages" in **International Symposium on Monolayer-Protected Clusters**, Switzerland (2017).

P1. Institute Researcher Award, IIT Madras (Jan-May, 2021) CSIR UGC NET fellowship for doctoral research in Chemistry (AIR 74) 2015-2020, INSPIRE Scholarship (2010-15) by DST, Govt. of India (awarded to the top 1% students of the state pursuing higher education in basic science)

RESEARCH EXPERTISE

Department of Chemistry, Texas A&M University, USA *2025 - present*

Postdoctoral scholar

Major Project
Mechanism of carrier-mediated ion transport through lipid membrane

- Sum frequency generation spectroscopy.
- Surface pressure measurement of Langmuir monolayer.
- Brewster angle microscopy
- Liposomal fluorescence assay

Department of Mechanical Engineering, University of Texas at Dallas, USA *2023 - 2024*

Postdoctoral scholar

Major Project
Digital plasmonic nanobubble detection for rapid and ultrasensitive virus diagnostics

- Laser-based heating of plasmonic nanoparticle for the generation of nanobubble in an optofluidic setup.
- Conjugation of antibody to gold nanoparticle and silica bead
- Sandwich immunoassay

Side Projects

- SERS-based pathogen detection.
- Morphological analysis of respiratory bioaerosols.

Grant writing experience
Digital detection of *mycobacterium tuberculosis* (under preparation)

Department of Chemistry, Rice University, USA *2021 - 2023*

Postdoctoral scholar

Major Project
Circular differential scattering of DNA-origami mediated gold nanorod dimer (in collaboration with Prof. Tim Liedl at LMU Munich, Germany):

- Patterning glass substrate with gold films using electron-beam evaporator.
- Studying single-particle differential scattering of DNA-origami mediated chiral gold nanorod dimers.
- Collecting SEM images of the analysed nanoparticles to have correlated structure and property relation for each nanostructure.
- Using MATLAB for data analysis.

Side Projects

- Detecting biomolecules using single-particle chirality of gold nanoparticle dimers
- Solid state reflectance measurement
- Polymer-coated nanoparticle synthesis.

Department of Chemistry, Indian Institute of Technology Madras *2015 - 2021*

Doctoral candidate

Wet-chemical synthesis and colloidal assembly of nanoparticles, their chemical interactions to develop novel nanostructures of emerging or improved functionalities:

- Synthesis of noble metal nanoparticles of various morphologies (gold nanosphere, nanorod, nanotriangle, nanocube, silver nanoparticle and nanocubes etc)
- Synthesis of thiolate and phosphate-protected atomically precise nanoclusters of noble metals (Ag44, Ag25, Au102, Cu18 etc.)
- Electrostatic and H-bond mediated colloidal assemblies towards functional nanocomposites.
- Nanoscale reactions to fabricate bimetallic and trimetallic nanostructures

Department of Chemistry, Jadavpur University *2014 - 2015*

Graduate student

Studied the potential of anionic lipid, dimyristoyl-L-α-phosphatidylglycerol as a nanocarrier for delivering the cationic drugs to the most relevant biomacromolecular target, DNA using:

- UV-vis absorption and Steady-state fluorescence measurements
- Time-correlated single photon counting (TCSPC) technique
- Circular dichroism spectroscopy

RELATED PROFESSIONAL SKILLS

Analytical tools:

- UV-vis, FT-IR, Raman, fluorescence, circular dichroism, dark-field scattering, Non-linear spectroscopy
- Field emission scanning electron microscopy (FESEM), High resolution transmission electron microscopy (HRTEM), Cryo-EM, Scanning transmission electron microscopy (STEM), Energy dispersive X-ray spectroscopy
- X-Ray diffration (XRD), X-ray Photoelectron Spectroscopy (XPS), Electrospray ionization mass spectrometry (ESI-MS)

Programming Languages:

- C, Fortran, Matlab

ACADEMIC SERVICE

Reviewed for journal:

- Advanced Materials **I. F. 27.4**
- Laser and Photonics Reviews **I. F. 9.8**
- Open Chemistry **I. F. 2.3**

TEACHING EXPERIENCE

Department of Chemistry, IIT Madras *2016 - 2017*
Graduate Teaching Assistant

- Teaching assistant in "Quantum Mechanics" course at Indian Institute of Technology Madras, India (July-November, 2016)
- Teaching assistant in "Lab-based experimental chemistry" course at Indian Institute of Technology, Madras, India (Jan-May, 2017)

Department of Mechanical Engineering, University of Texas at Dallas *2024*
Guest Lecture

- Delivered Lecture on "Optical properties of materials: Fluorescence and Chirality" as a part of the course "Conductive and Radiative Heat transfer" at University of Texas at Dallas, Richardson, United States (November, 2024)

MENTORING EXPERIENCE

1. Mentoring Anabela Meier (Masters' student at Texas A&M University), who got selected in 2025 Chemistry summer research program.
2. Mentored a group of high school students as a part of 'PACE Research program for minors' by UT Dallas (2023-2024). Research topic: Nanoparticle-based virus detection.
3. Mentored Alison Carroll (Summer 2022) as a part of the Research Experiences for Undergraduates (REU), who won the **best poster award** funded by NSF at Rice University.
4. Mentored Megha Maria Stanley (Summer intern at IIT Madras, 2020) which led to publication #13 (Nanoscale, 2023, 15, 2690-2699).

5. Mentored Harsh Dave (Summer intern at IIT Madras, 2019) which led to publication #4 (J. Phys. Chem. B, 2022, 126 (8), 1842-1851).

ACHIEVEMENTS

1. **Provost's Office Postdoctoral Appreciation Award**, University of Texas at Dallas, 2024
2. **Institute Research Award**, IIT Madras (Jan-May, 2021)
3. **Best oral talk award** in a virtual conference on **Materials for Energy Harvesting and Catalysis**, 2020
4. **Best poster award** in **Chemistry in-house symposium** (Physical Chemistry section), 2018
5. **CSIR UGC NET fellowship** for doctoral research in Chemistry (All India Rank 74) Human Resource Development Group, Council of Scientific Industrial Research, India, 2015-2020
6. **Indira Gandhi SIngle Girl Child Scholarship,** Govt. of India, 2013-2015
7. **INSPIRE Scholarship** (awarded to the top 1% students of the state pursuing higher education in basic science), Department of Science and Technology, Govt of India, 2010-2015

REFERENCES

1. **Prof. T. Pradeep**
   DST Unit of Nanoscience, Indian Institute of Technology Madras, Chennai 600036, India.
   Email: pradeep@iitm.ac.in
2. **Prof. Stephan Link**
   Department of Chemistry, University of Illinois Urbana Champaign, IL, USA
   Email: slink@illinois.edu
3. **Prof. Saranya Pullanchery**
   Department of Chemistry, Texas A&M University, College station, TX-77840 USA
   Email: saranya.pullanchery@tamu.edu
4. **Prof. Nonappa**
   Department of Engineering and Natural Sciences, Tampere University, FI-33720 Tampere, Finland
   Email: nonappa@tuni.fi