Isabel Panicker

778 Atlantic Dr NW, Atlanta, GA 30332
630-210-6600 | ipanicker@gatech.edu

Education

Georgia Institute of Technology, *School of Chemical and Biomolecular Engineering, Atlanta, GA* August 2023 - Current
PhD Candidate, Chemical and Biomolecular Engineering
Focus: Liquid-Phase TEM, single-particle tracking, anomalous diffusion, nanotechnology
Advisor: Dr. Vida Jamali
Committee: Dr. Saad Bhamla (ChBE), Dr. David Flaherty (ChBE), Dr. Joshua Kacher (MSE), Dr. Hang Lu (ChBE)

Purdue University, *Davidson School of Chemical Engineering, West Lafayette, IN* May 2023
B.S. Chemical Engineering, Minor in Management

Research Experience

PhD Candidate - Jamali Lab | Georgia Institute of Technology September 2023 - Current

- *Thesis:* Developing Liquid-Phase TEM as a robust single-particle tracking tool to Probe Nanoscale Transport and Mechanics
- Advanced LPTEM as a single-particle tracking (SPT) platform by uncovering how the ionic charge environment of the solution modulates liquid cell interfacial chemistry that generates non-Brownian nanoparticle dynamics.
- Applied canonical statistical diffusion analysis and deep-learning-based diffusion classification on particle trajectories in various ionic media to reveal environment-specific transitions diffusion mechanisms.
- Developed the first passive nanorheology framework in LPTEM to model these dynamics, enabling quantitative extraction of complex viscoelastic moduli from nanoparticle trajectories.
- Built custom Python-based tools to enhance tracking precision and throughput, including SAM-EM, an analysis framework that integrates Meta's Segment Anything Model 2 (SAM-2) with particle tracking and statistical analysis tools, enabling zero-shot segmentation of noisy LPTEM acquisitions.
- Designing a correlative light and electron microscopy platform combining Total Internal Reflection Fluorescence (TIRF) microscopy with in-situ LPTEM to visualize the non-equilibrium dynamics of sub-100 nm catalytic active nanoparticles across spatial and temporal regimes.
- Utilizing the LPTEM-based nanorheology framework to map nanoscale viscoelasticity in soft polymers, revealing how spatially heterogeneous mechanics evolve at the nanoscale.
- Performed LPTEM imaging of Self-Agglomerating Nanohydrogels (SANGs) to visualize structural evolution under variable environmental conditions as part of a collaborative drug delivery study.
- Mentoring undergraduate researchers in laboratory skills, nanomaterial synthesis, and microscopy, enabling them to carry out independent experiments and contribute meaningfully to research projects.

Undergraduate Researcher - Solar Energy Group | Purdue University January 2022 - June 2023

- Selected as a First-Time Researcher Fellow, a competitive program supporting initial undergraduate involvement in high-impact research.
- Developed and optimized solution-based synthesis protocols for multinary sulfide thin films (e.g., Cu_2BaSnS_4, alkaline earth metal chalcogenide perovskites) as energy efficient, earth abundant alternatives for photovoltaic applications.
- Synthesized crystalline sulfide materials via low-temperature decomposition of thiol-metal precursors, systematically screening thiol-metal combinations across solvent environments and confirming phase purity and composition using Raman spectroscopy, XRD, and XRF.
- Completed a senior thesis titled "*Solution Based Synthesis of Alkaline Earth Metal Thiolate Precursors for Photovoltaically Active Multinary Sulfides.*"

Professional Experience

Drive Unit Quality Engineering Intern | Tesla Gigafactory, Reno, Nevada May 2022 - August 2022

- Learned and utilized SolidWorks to create a 3D printed tool that aided rundown in the manufacturing process.
- Wrote and published manufacturing instructions on how to store Drive Unit parts prior to workstation introduction.
- Cross-functionally managed the acquisition and installation of a water in oil sensor currently being utilized inline.
- Investigated part contamination resulting from storage practices by designing and conducting cleanliness tests.
- Executed validation trials to ensure supplier compliance to dimension specs and prevent part starvation.

Publications

Peer-Reviewed Articles

- **Panicker, I.**, Shabeeb, Z., Hargus, C., Jamali, V. "Solution-Tunable Interfacial Interaction Landscape Governs Anomalous Nanoparticle Diffusion in Liquid-Phase Electron Microscopy." *ACS Nano* (2026) (Featured on Front Cover).

- Housley, S.N., Bourque, A.R., Matyunina, L.V., **Panicker, I.,** Echeverri, E.S., Izykowicz, M., Herrmann, O.A., Lee, S., Arboleda, J.C., Jamali, V., McDonald, J.F., Dahlman, J.E., Finn, MG. "Tumor Agnostic Drug Delivery with Self-Agglomerating Nanohydrogels (SANGs)." *Nature Communications (*2026).

- Agarwal, S., Vincent, K. C., Turnley, J. W., Hayes, D. C., Uible, M. C., Durán, I., Canizales, A. S. M., Khandelwal, S., **Panicker, I.**, Andoh, Z., Spilker, R. M., Ma, Q., Huang, L., Hwang, S., Kisslinger, K., Svatek, S., Antolin, E., Bart, S. C., & Agrawal, R. "Breaking Barriers in Chalcogenide Perovskite Synthesis: A Generalized Framework for Fabrication of $BaMS_3$ (M═Ti, Zr, Hf) Materials." *Advanced Functional Materials* (2024).

- Turnley, J. W., Vincent, K. C., Pradhan, A. A**., Panicker, I**., Swope, R., Uible, M. C., Bart, S. C., & Agrawal, R. (2022). "Solution Deposition for Chalcogenide Perovskites: A Low-Temperature Route to BaMS3 Materials (M = Ti, Zr, Hf)." *Journal of the American Chemical Society* (2022).

Conference Proceedings/Workshop Papers

- Wang, A., Xu, M., Goel, R., Shabeeb, Z., **Panicker, I.,** Jamali, V. "SAM-EM: Real-Time Segmentation for Automated Liquid Phase Transmission Electron Microscopy." *AI for Accelerated Materials Design - NeurIPS* (2025).

Manuscripts Under Review

- Shabeeb, Z., Sreeram, S., **Panicker, I.,** Wang, A., Xu, M., Goel, R., Jamali, V. "SAM-EM: Segment Anything for Liquid-Phase Electron Microscopy Video Segmentation." *Under Review* (2026).

Manuscripts in Preparation

- **Panicker, I.,** Roque, K.I., Ruiz, R., Ben-Moshe, A., Bustamante, C., Alivisatos, A.P., Jamali, V. "Polarity-resolved Imaging Reveals Active Transport in Catalytic Janus Nanomotors." *In preparation* (2026).

Presentations and Panels

- "Revealing Superdiffusive Active Motion of Nanoscale Particles with Correlative Light and Electron Microscopy" - ACS Spring 2026
- "Programming and Probing Interfacial Transport in Liquid-Phase TEM through Ion Screening and Passive Nanorheology" - ACS Spring 2026
- "Programming and Probing Interfacial Transport in Liquid-Phase TEM through Ion Screening and Passive Nanorheology" - Invited Talk at the 2026 Gordon Research Seminar on Liquid-Phase TEM (Spring 2026)
- "Screening Nanoparticle Surface Interactions at the Liquid-Solid Interface in Liquid-Phase Transmission Electron Microscopy" - Poster Presentation at Soft Matter Day (Spring 2025)
- "Developing a Single Particle Tracking Method through Correlative Microscopy" - Poster Presentation at American Chemical Society Colloid and Surface Science Symposium (Summer 2024)
- "Developing a Correlative Microscopy Framework for Characterizing Motion of Active Matter at the Nanoscale" - Poster Presentation at Soft Matter Day (Spring 2024)
- "Organizing a Successful Research Symposium" - Panelist at AIChE Annual Student Conference (Fall 2023)
- "Synthesizing Metal Thiolates as Soluble Precursors for Multinary Sulfides" - Poster Presentation at AIChE Annual Student Conference (Fall 2023); Poster Presentation at Purdue University AIChE Undergraduate Research Symposium (Spring 2023); Poster Presentation at Purdue University Undergraduate Research Conference (Spring 2023)
- "Soluble Precursors for Chalcogenide Semiconductors Containing Alkaline Earth Metals" - Poster Presentation at Purdue University Undergraduate Research Conference (Spring 2022)

Honors and Awards

Georgia Tech ChBE Eckert Graduate Fellow	Spring 2026
Shell Outstanding Teaching Assistant	Spring 2026
NSF Graduate Research Fellowship Program - Honorable Mention	Spring 2025
2023 AIChE Undergraduate Research Symposium 1st Place Awardee - Purdue University	Spring 2023
2022 Spring Undergraduate Research Conference 2nd Place CoE Awardee - Purdue University	Spring 2022
First-Time Researcher Fellowship, Purdue University	Fall 2021
Purdue University Dean's List	2019 - 2023
Purdue University Semester Honors	2019 - 2023

Press

Georgia Tech: Study Uncovers New Insights into Nanoparticle Motion (06/05/2026)

Leadership and Involvement

Graduate Student Recruitment Chair | Georgia Institute of Technology Fall 2024 - Spring 2026

- Plan and coordinate the School of ChBE Graduate Recruitment Weekend to improve PhD offer acceptance and cohort retention.

Graduate Student Safety Council - Inspections Officer | Georgia Institute of Technology January 2024 - Current

- Conduct routine safety inspections in ChBE research labs and communicate corrective actions to maintain departmental safety standards

STEM Outreach Volunteer | Georgia Institute of Technology Spring - Fall 2025

- Led hands-on activities at the Boys and Girls Club of Atlanta to teach phase separation via "lava lamp" experiments
- Volunteered at the Atlanta Science Festival, engaging K-12 students with demonstrations on polymers and their everyday applications

Assistant Director | TEDxPurdueU, Purdue University April 2022 - April 2023

- Served as Internal Assistant Director for a 50-member organization delivering a 600 attendee TEDx Conference
- Led biweekly general meetings and coordinated cross-committee communication to ensure smooth event execution

Peer Research Mentor | Office of Undergraduate Research, Purdue University Fall 2022

- Mentored first-year students in the First Year Investigators Program, providing guidance on navigating their initial research experiences.

Chemical Engineering Ambassador | Purdue University April 2022 - May 2023

- Represented Purdue Chemical Engineering through conducting information sessions and giving tours to prospective students and families.

Logistics Co-Chair | TEDxPurdueU, Purdue University April 2021 - April 2022

- Co-led a 12 member logistics team for planning a TEDx conference

Philanthropy Committee Member | American Institute of Chemical Engineers Fall 2020 - Spring 2021

- Supported planning and execution of departmental fundraisers and community facing philanthropy events

Teaching Experience

Graduate Teaching Assistant: Fluid Mechanics (ChBE 3205) Fall 2024 and 2025