Harshada Suryawanshi

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Education

Ph.D. Candidate in Materials Science & Engineering **2023 - Present**
University of Michigan *GPA: 4/4*

B.Tech & M.Tech in Metallurgical Engineering & Materials Science **2018 – 2023**
IIT Bombay *GPA: 8.92/10*

Research Interests

Zinc metal batteries; non-aqueous electrolytes (ionic liquids and organic solvents); metal electrodeposition morphology; electrochemical diagnostics and characterization; microfabrication and microelectrode arrays

Publications

- **Suryawanshi, H. R.**, Wu, X., Melemed, A. M., Oh, D., Marbella, L. E., Singh, N., Dasgupta, N. P., Steingart, D. A., Li, Y. (2025). Current-Controlled Zinc Electrodeposition Morphology in Ionic Liquid Electrolytes Using Microelectrode Arrays. *Submitted to ACS Nano*. Preprint DOI: 10.26434/chemrxiv-2025-tdf14.
- **Suryawanshi, H.**, Agrawal, B., Kumari, N., & Dasgupta, T. (2024). Developing a Multiband Electronic Band Structure Model and Predictive Maps for Bismuth-Rich $Mg_3(Sb_{1-x}Bi_x)_2$ Thermoelectric Materials. *ACS Applied Materials & Interfaces*, 16(2), 2263–2269.

Conferences

- Oral presentation: "Deciphering Zinc Deposition Pathways in Ionic Liquid Electrolytes: Morphological Evolution on Microelectrodes", **248th ECS Meeting**, Chicago, 2025
- Oral presentation: "High-Throughput Investigation of Zinc Electrodeposition Morphology Using Microelectrode Arrays"; Session Chair, "A03: Electrolytes 0", **247th ECS Meeting**, Montreal, 2025
- Poster presentation: "Direct Observation of Overpotential in NMC Cathodes at Single- and Poly-crystalline Levels under Various Discharge Rates", **Cell Symposia: Technology Barriers to Electric Vehicle Implementation**, 2024
- Oral presentation: "Developing a Multiband Electronic Band Structure Model for Bismuth-Rich $Mg_3Sb_{2-x}Bi_x$ Thermoelectric Materials", **International Conference on Materials for Advanced Technologies (ICMAT)**, Singapore, 2023

Leadership Experience

DOE Early Career Network Representative for ESRA Hub **Oct 2025 – Present**
*Selected to represent ∼**70** early-career researchers in the DOE BES Early Career Network*

- Serve as a point-of-contact for early-career researchers, communicating BES opportunities and organizing events

Secretary, Electrochemical Society Student Chapter, University of Michigan **Aug 2025 – Present**
Lead initiatives to build a stronger electrochemistry research community at the University of Michigan

- Coordinate seminars and networking events connecting students with industry, national-lab, and faculty researchers

Head, Department Academic Mentorship Program (D-AMP), IIT Bombay **Apr 2022 – Apr 2023**
*Led **32** mentors providing academic support to **150+** undergraduate and dual-degree students*

- Implemented targeted summer programs/special TAs that helped **10+** under-performing students recover academically

Horizons Coordinator, Mood Indigo, IIT Bombay **Mar 2019 – Mar 2020**
Led the organizing team for "Eloquence", a flagship literary event track at Asia's largest college cultural festival

- Managed **15+** organizers and ideated and executed events featuring national-level speakers

Honours and Awards

- **Rackham Conference Travel Grants**; Awarded $1,400+ in travel support from University of Michigan **2024-2025**
- **Conference Travel Grant**; Awarded $1400+ in travel support to attend ICMAT 2023 from IIT Bombay **2023**
- **GATE Scholar**; Awarded GATE Scholarship for Teaching Assistantship at IIT Bombay **2022**
- **NTSE Scholar**; Government of India, awarded to top 1000 students nationwide **2015**

Research Experience

Zn Electrodeposition for Metal Batteries **Aug 2023 – Present**

Graduate Student Researcher — University of Michigan *Advisor: Yiyang Li*

- Investigated zinc electrodeposition morphology in ionic liquid electrolytes using high-throughput microelectrode arrays
- Analyzed current-controlled deposition to distinguish mossy, compact, and dendritic morphologies and correlate them with Coulombic efficiency using optical microscopy, SEM, EDS, and XPS
- Modeled the electrochemical system using **COMSOL** using extracted diffusion coefficient and exchange current density
- Predicted optimal current density for ionic liquids to get **99 % reversibility**, providing insights into Zn anode design strategies, leading to development of safer and more efficient zinc-based energy storage systems

Thermoelectric Materials and Devices **Nov 2021 – Jun 2023**

Graduate Student Researcher — IIT Bombay *Advisor: Titas Dasgupta*

- Developed n-type $Mg_3Sb_{0.6}Bi_{1.4}$ for waste-heat thermoelectrics, with thermoelectric efficiency (zT) comparable to Bi_2Te_3
- Synthesized Te-doped (0–3%) compositions and measured conductivity, Seebeck coefficient, and Hall coefficient
- Developed a multiband electronic band-structure model and 3D predictive map (doping, temperature, zT), revealing a broad high-zT region that improves **temperature-averaged efficiency** and widens the processing/stability window

Magnesium Alloys for Automobile Industry **Jun 2021 – Aug 2021**

Summer Research Intern — ARAI, Pune *Advisor: Prasanna Deshmukh*

- Evaluated AZ91D Mg alloys as lightweight replacements for Al components in automobiles to improve fuel economy
- Linked microstructure to mechanical properties and estimated that a 10% weight reduction can yield ∼**5%** fuel savings

Teaching and Mentorship Experience

Undergraduate Mentor, Li Research Group, University of Michigan **May 2024 – Present**

Supervised undergraduates in projects on Zn electrodeposition and battery materials

- Mentored undergraduates on automating electrodeposition using PCB design and Na-air cells using microelectrodes
- Mentees:
  - Chad Gilbert – Materials Science Ph.D. student, University of Illinois Urbana–Champaign
  - Gonnie Ben-Tal – Undergraduate in Electrical Engineering, Wayne State University
  - Charlotte Zeng – Undergraduate in Electrical and Computer Engineering, University of Michigan

Teaching Assistant, Electronic Properties of Metals **Jan 2023 – May 2023**

Junior undergraduate core course, IIT Bombay

- Led weekly tutorials, clarified core concepts in electronic transport, and supported exam preparation for ∼120 students

Teaching Assistant, Instrumentation & Process Control Theory **Aug 2022 – Dec 2022**

Senior undergraduate core course, IIT Bombay

- Conducted problem-solving sessions and graded assignments and exams for ∼120 students in a lab-intensive course

Academic Mentor, Student Mentorship Program, IIT Bombay **Jun 2020 – May 2023**

Selected mentor supporting freshmen and sophomores in academic planning, adjustment, and long-term goal setting

- Mentored ∼18 students through academic challenges, course decisions, and overall transition to institute life

Technical Skills

- **Materials & Electrochemistry:** COMSOL Multiphysics, Electrochemical analysis (GCPL, CV), microscopy (SEM, EDS, XPS), FullProf, HighScore Plus, ImageJ, OVITO.
- **Computation & Programming:** Python, MATLAB, C/C++, R; data analysis and modeling (Origin), HTML, SOLIDWORKS, AutoCAD.

Extracurriculars

- Delegate, Harvard US–India Initiative Conference 2021 (selected ∼500 out of 3000+ applicants)
- Secured 2nd place in the Manch Group Project Competition by Deutsche Bank as part of a 3-member team
- Trained in Hindustani classical music (Harmonium, vocals); performed at the 57th Convocation of IIT Bombay