

CURRICULUM VITAE

Dr. Soumabha Bag, PhD

Assistant Professor
Department of Industrial Chemistry
Mizoram University
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Educational Qualification

Ph. D.: 2014, Department of Chemistry, Indian Institute of Technology Madras (IIT M, India)

Thesis title: Ultralow Energy Ion Scattering at Ice Surfaces: Instrumentation and Unusual Reactivity

Supervisor: Prof. T. Pradeep, Department of Chemistry, IIT Madras

Research Interests

- ❖ **Developmental:** Development and modification of the analytical instruments for the study of chemical reactions.
 - ❖ **Nanostructured Materials:** Novel physical and chemical synthesis, characterization, and applications of amorphous, nanocrystalline and crystalline materials and alloys.
 - ❖ **Applications:** (a) Exploration of the physical, chemical, and electrochemical properties of nanostructured materials (high-entropy materials and oxides).
(b) Solid waste management (e.g., e-wastes) chemistry in water, such as, polymer fragmentation.
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Academic Achievements

- ❖ Selected in the INSA Visiting Scientist Program in 2024.
 - ❖ Selected for the INSPIRE Faculty Award from DST, India in 2017.
 - ❖ Qualified in NET examination in Chemical Sciences and secured fellowship from CSIR, India (2008 - 2013).
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Professional Experiences

Mizoram University

Department of Industrial Chemistry, School of Physical Sciences
Assistant Professor

Mizoram, India

14th July 2021 –

Ruhr-Universität Bochum

Institut für Werkstoffe, Materials Discovery and Interfaces

Bochum, Germany

1st September 2020 – 10th July 2021

Postdoctoral researcher

Karlsruhe Institute of Technology
Institute of Nanotechnology
Postdoctoral researcher

Karlsruhe, Germany
October 2016 – June 2020

IIT Madras
DST Unit on Nanoscience, Department of Chemistry
Project Officer

Chennai, India
March 2016 - September 2016

Purdue University
Aston Labs, Department of Chemistry
Postdoctoral Researcher

West Lafayette, USA
2013 - 2015

Ongoing Research Projects

- ✦ **Start-up Research Grant:** From SERB, DST, Govt. of India (2022 - 2024)
- ✦ **Research Promotion Grant:** From Mizoram University (2022 - 2024)
- ✦ **Collaborative Research Scheme:** From UGC-DAE CSR (2023 - 2025)

Student Guidance

- ✦ 2 Ph. D. students

Publications

Independent career:

- Advances in red/near infrared carbon dots in bioimaging, sensing, and phototherapeutic applications, P. Phukan, M. Hatimuria, **S. Bag***, A. Pabbathi, J. Das, *Inorg. Chem. Commun.* **2024**, 163, 112389 (*corresponding author).
- A review on the fate of microplastics: Their degradation and advanced analytical characterization, S. Bandaru, M. Ravipati, K. Babu Busi, P. Phukan, **S. Bag***, B. Chandu, G. K. Dalapati, S. Biring, S. Chakraborty, *J. Polymer. Environ.* **2024**, 32, 2532. (*corresponding author).
- Recent advances in the use of laccase enzyme in deep eutectic solvents. M. Hatimuria, J. Das, K. Gavvala, S. Bag, A. Pabbathi, *Sustainable Chemistry and Pharmacy*, **2023**, 33, 101148.
- Green carbon dots: Applications in development of electrochemical sensors, assessment of toxicity as well as anticancer properties, M. Hatimuria, P. Phukan, **S. Bag**, J. Ghosh, K. Gavvala, A. Pabbathi, J. Das, *Catalysts*, **2023**, 13, 537.
- Fluorescent nanodiamond for nanotheranostic applications, G. Pramanik, **S. Bag**, S. Chakraborty, *Microchimica Acta*, **2022**, 189, 447.

Postdoctoral:

- Structural insights into metal-metalloid glasses from mass spectrometry, A. Baksi[§], **S. Bag^{§*}**, R. Kruk, S. H. Nandam, H. Hahn, *Sci. Rep. (Nature)* **2020**, 10, 17467. (*corresponding author) ([§]equal contribution)
- Ni₆₀Nb₄₀ nanoglass for tunable magnetism and methanol oxidation, A. Baksi, S. H. Nandam, D. Wang, R. Kruk, M. Reda Chellali, J. Ivanisenko, I. Gallino, H. Hahn, **S. Bag^{*}**, *ACS Appl. Nano Mater.* **2020**, 3, 7252. (*corresponding author)
- Nonenzymatic glucose sensing using Ni₆₀Nb₄₀ nanoglass, **S. Bag^{*}**, A. Baksi, S. H. Nandam, D. Wang, X. Ye, J. Ghosh, T. Pradeep, H. Hahn, *ACS Nano* **2020**, 14, 5543. (*corresponding author)
- Iron assisted formation of CO₂ over condensed CO and its relevance to interstellar chemistry, Rabin Rajan J. M., J. Ghosh, R. G. Bhui, **S. Bag**, G. Ragupathy, T. Pradeep, *Phys. Chem. Chem. Phys.* **2020**, 22, 8491. (Hot article)
- Combination of pulsed laser ablation and inert gas condensation for the synthesis of nanostructured nanocrystalline, amorphous and composite materials, **S. Bag^{*}**, A. Baksi, D. Wang, R. Kruk, C. Benel, M. Reda Chellali, H. Hahn, *Nanoscale Adv.* **2019**, 1, 4513. (*corresponding author)
- Tribochemical degradation of polytetrafluoroethylene in water and generation of nanoplastics, A. Nag, A. Baksi, J. Ghosh, V. Kumar, **S. Bag**, B. Mondal, T. Ahuja, T. Pradeep, *ACS Sustainable Chem. Engg.* **2019**, 7, 17554. (appeared in cover page)
- Mechanistic elucidation of the structure and reactivity of bare and hydride-protected Ag₁₇⁺ clusters, A. Baksi[§], M. Jash[§], **S. Bag[§]**, Satish Kumar M.[§], Md. Bodiuzzaman, D. Ghosh, G. Paramasivam, V. Subramanian, T. Pradeep, *J. Phys. Chem. C* **2019**, 123, 28494. ([§]equal contribution)
- Analysis of bacteria using zero volt paper spray, P. Wei[§], **S. Bag[§]**, C. J. Pulliam, D. T. Snyder, R. M. Pielak, R. G. Cooks, *Anal. Methods.*, **2016**, 8, 1770. ([§]equal contribution)
- Extraction of silver by glucose, A. Baksi, M. Gandhi, S. Chaudhari, **S. Bag**, Soujit Sen Gupta, T. Pradeep, *Angew. Chem. Int. Ed.*, **2016**, 55, 7777.
- Diffusion and crystallization of dichloromethane within the pores of amorphous solid water, R. G. Bhui, Rabin Rajan J. M., **S. Bag**, T. Pradeep, *J. Phys. Chem. C*, **2016**, 120, 13474.
- Zero volt paper spray ionization and its mechanism, M. Wlekinski, Y. Li, **S. Bag**, D. Sarkar, R. Narayanan, T. Pradeep, R. G. Cooks, *Anal. Chem.*, **2015**, 87, 6786.

- Biogenic aldehyde determination by reactive paper spray ionization mass spectrometry, **S. Bag**, P. I. Hendricks, J. C. Reynolds, R. G. Cooks, *Analytica Chimica Acta*. **2015**, 860, 37.
- Using ambient ion beams to write nanostructured patterns for surface enhanced Raman spectroscopy, A. Li, Z. Baird, **S. Bag**, D. Sarkar, A. Prabhath, T. Pradeep, R. Graham Cooks, *Angew. Chem. Int. Ed.* **2014**, 53, 12528.

Doctoral:

- Development of ultralow energy (1-10 eV) ion scattering spectrometry coupled with reflection absorption infrared spectroscopy and temperature programmed desorption for the investigation of molecular solids, **S. Bag**, R. G. Bhuin, Rabin Rajan J. M., L. Kephart, J. Walker, K. Kuchta, D. Martin, J. Wei, T. Pradeep, *Rev. Sci. Instrum.* **2014**, 85, 014103.
- Atomically precise silver clusters as new SERS substrates, I. Chakraborty, **S. Bag**, U. Landman, T. Pradeep, *J. Phys. Chem. Lett.* **2013**, 4, 2769.
- Distinguishing amorphous and crystalline ices by ultra-low energy collisions of reactive ions, **S. Bag**, R. G. Bhuin, T. Pradeep, *J. Phys. Chem. C* **2013**, 117, 12146.
- Probing molecular solids with low energy ions, **S. Bag**, R. G. Bhuin, G. Natarajan, T. Pradeep, *Annu. Rev. Anal. Chem.* **2013**, 6, 97.
- Formation of H₂⁺ by ultra low energy collisions of protons with water ice surfaces, **S. Bag**, Martin R. S. McCoustra, T. Pradeep, *J. Phys. Chem. C* **2011**, 115, 13813.
- Size tuning of Au nanoparticles formed by electron beam irradiation of Au₂₅ quantum clusters anchored within and outside of dipeptide nanotubes, P. Ramasamy, S. Guha, E. Shibu, T. S. Sreeprasad, **S. Bag**, A. Banerjee, T. Pradeep, *J. Mater. Chem.* **2009**, 19, 8456.
- Low energy ion scattering investigations of *n*-butanol-ice system in the temperature range of 110 - 150 K, G. N. Kumar, J. Cyriac, **S. Bag**, T. Pradeep, *J. Phys. Chem. C* **2009**, 113, 14258.

Conferences

National:

- Poster presentation at 11th ISMAS-TRICON - 2009, Hyderabad, India (**received best poster award**).
- Oral presentation at *CiHS* - 2012 held at Department of Chemistry, IIT Madras, Chennai, India.
- Oral presentation at Emerging Interfaces of Molecular Materials - 2013 at IIT Madras, Chennai, India.
- Participated in the 'Water Challenges during and post COVID-19' webinar in 2020.
- Invited webinar (talk) titled as, 'Applications of Mass Spectrometry in Chemistry and Beyond' on 19th September, 2020, BMSITM, Bengaluru, India

- Invited webinar (talk) titled as, 'Applications of Mass Spectrometry in Chemistry and Beyond' on 20th January, 2021 in the GITAM University, Visakhapatnam, India.
- Participated in the online workshop on "Thematic popularization of NEP 2020" on 2nd November, 2021.
- Attended the "National Intellectual Property Awareness Mission" webinar held on 3rd March, 2022.
- Poster presentation at the "Frontier Symposium in Chemistry (FS-CHM 2022)", organised by IISER Thiruvananthapuram, Kerala, India, April 8-10, 2022.
- Poster presentation at the "Chemical Research Society of India 30th National Symposium in Chemistry (CRSI NSC-30)", organised by Chemical Research Society of India (CRSI) & RSC at JNU campus, New Delhi, India, February 4-8, 2023.

International:

- Poster presentation at 59th ASMS Conference on Mass Spectrometry and Allied Topics - 2011, Denver, CO, USA.
- Poster presentation at 62nd ASMS Conference on Mass Spectrometry and Allied Topics – 2014, Baltimore, MD, USA.
- Participated in seventh annual workshop in Centre for Analytical Instrumentation Development (CAID): Instrumentation for Forensics, Nanoscience, and Pharmaceutical Science – 2014 at Purdue University, IN, USA.
- Oral presentation at European Materials Research Society - 2018 at Warsaw University of Technology, Warsaw, Poland.
- Poster presentation at Nano-BW symposium – 2018, Karlsruhe, Germany.
- 7th International Conference on Advanced Nanomaterials and Nanotechnology (ICANN2021) at IIT Guwahati, Assam, India held on 14-17 December, 2021.
- Poster presentation in the "International symposium on emerging trends in chemical sciences (ETCS 2023)" at Department of Chemistry, North-Eastern Hill University (NEHU), Shillong, India, March 3 – 5, 2023.
- Organized "International Conference on Science and Technology for Innovative and Sustainable Development (STISD- 2023)", at Dept. of Chemistry & Dept. of Industrial Chemistry, Mizoram University, Aizawl, Mizoram, India, June 28 – 30, 2023.
- Participated and organized "International Conference on Molecular Matter – Emerging Directions of Sustainability (ICMM 2023)", at the Dept. of Chemistry, IIT Madras, Chennai – 600036, India, December 16 – 18, 2023.

Patents

- Method of extraction of silver by glucose, Inventors: T. Pradeep, A. Baksi, M. Gandhi, S. Chaudhari, **S. Bag**, S. Sen Gupta, patent no. 302630, date: 30/12/2014, India (granted on 30th October 2018).
- Tribochemical method for degradation of polymers in water, Inventors: T. Pradeep, A. Nag, A. Baksi, J. Ghosh, V. Kumar, **S. Bag**, B. Mondal, T. Ahuja, patent no. 378255, date: 13/08/2019, India (granted on 29th September 2021).
- Zero volt mass spectrometry probes and systems, Inventors: R. G. Cooks, M. S. Wlekinski, **S. Bag**, Y. Li, patent no. US 9786478 B2, date: 10/10/2017, USA.

Professional Membership

- Life member of Chemical Research Society of India (CRSI).
 - Member of Royal Society of Chemistry (MRSC), London, UK.
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Instrumental Experience

- Developmental:
 - During Ph.D.: Developed an ultralow energy ion scattering mass spectrometer, maintained at ultrahigh vacuum (UHV) and can produce 10 K temperature. It is also fitted with low energy ion gun, temperature programmed desorption (TPD) and *in-situ* RAIRS to conduct surface spectroscopy (home built, operating temperature: 10 – 800 K) at ice
 - During Postdoc (KIT, Germany): Picosecond pulsed laser (Class 4) inert gas condensation (IGC) system to produce amorphous alloy materials
- Low Energy Ion Scattering Mass spectrometer (home built, operating temperature: 100 – 300 K)
- Commercial:
 - Spectroscopy
 - WITec GmbH, Alpha-SNOM CRM 200 Confocal Raman Spectrometer
 - Confocal Raman Microscope (WITec GmbH & RENISHAW inVia)
 - confocal Raman Microscope
 - Photoelectron Spectrometer (XPS, Al and Mg source and UPS) from Omicron and SPECS GmbH
 - UV/Vis and IR spectrometer (PerkinElmer Pte. Ltd.; Bruker GmbH)
 - Microscopy
 - Field-emission SEM (Zeiss GmbH, FEI GmbH)
 - Mass Spectrometry
 - Balzer ThermoStar Mass Spectrometer (Pfeiffer Vacuum GmbH)
 - Miniaturized Ion Trap Mass Spectrometer (Mini - 12)
 - Liner Ion Trap Quadrupole Mass Spectrometer (LTQ) (ThermoFisher Ltd.)
- Sputtering systems:
 - Magnetron Sputtering (PVD) system [DC and RF] to produce thin film
- X-ray diffractometer (Cu and Mo source) from Bruker GmbH, Philips

Ultralow energy ion scattering mass spectrometer and PL-IGC setup were built *in-house* as a part of an academic project.

Overseas Visit for Academic Purpose

USA, Germany, Poland
