

## Meet Dr. Prakash Chandra Mondal, Thieme Chemistry Journals Awardee 2025!



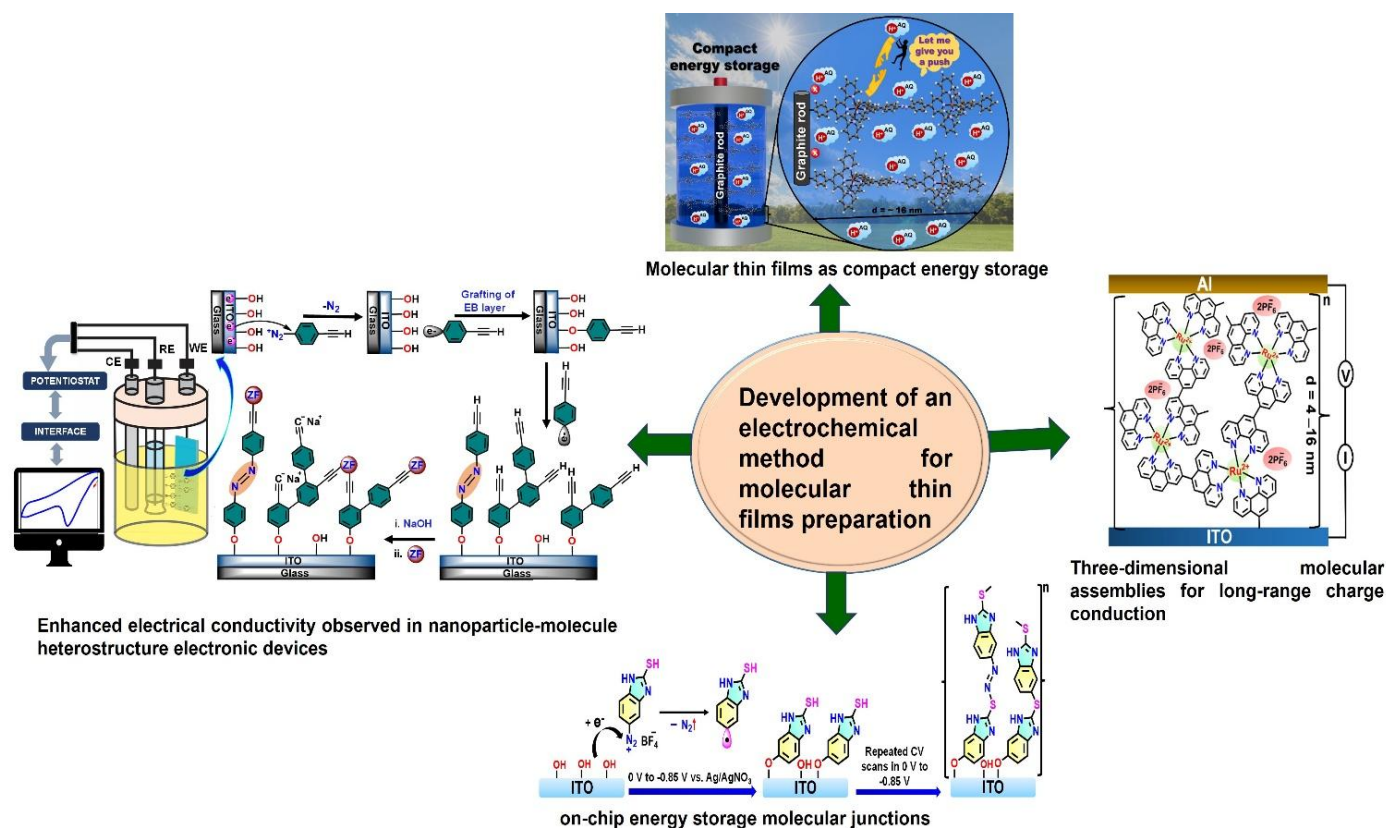
**Dr. Prakash Chandra Mondal** received his BSc (Honours) and MSc degrees in chemistry from Jadavpur University, Kolkata, and IIT Kharagpur, India, respectively. After qualifying for the CSIR-NET (JRF), he pursued his PhD at the University of Delhi, India. He then moved to the Weizmann Institute of Science, Israel, where he worked as a postdoctoral fellow. In 2016, he joined the National Institute for Nanotechnology (NINT), University of Alberta, Canada, to further his studies, and in 2017 was a Marie Curie Postdoctoral Fellow at the Institut de Ciència Molecular (ICMoL), University of Valencia, Spain. In April 2019, he joined the Department of Chemistry at the Indian Institute of Technology (IIT) Kanpur as an assistant professor, and was a visiting associate professor at the Nanoscience Centre, University of Jyväskylä, Finland, in 2023, prior to being promoted to associate professor in July 2024.

### Thieme: Which field of organic chemistry are you interested in the most and why?

**Dr. Mondal:** I am deeply fascinated by the exciting field of “organic electronics”, where the remarkable diversity of molecules offers an unparalleled opportunity in studying the “proof-of-principle” of the prototype systems for which a small or macromolecule needs to be confined in space and time to achieve better control over the molecular dynamics. A striking example lies in the functional organic molecules such as aryl diazonium compounds, which can effortlessly be electrochemically grafted on diverse electrodes, including conductive carbon and metallic electrodes (such as Au, Cu, Ni, magnetic permalloy, which we fabricate in our laboratory). This approach enables us to prepare molecular ultra-thin films with meticulously tailored thickness, composition, and properties. Such exquisite platforms are exploited for understanding electrical characteristics (current–voltage, I–V response) as functions of temperature, molecular layer thickness, structures, and compositions in two-terminal electronic devices as a promising alternative to existing complementary metal-oxide-semiconductor (CMOS) technology.

### Thieme: Following that, what is the focus of your current research activity?

**Dr. Mondal:** Our primary research focuses on understanding and mimicking CMOS electronic functions by utilizing “molecules as circuit elements”. We investigate the charge-transport phenomena under external stimuli such as magnetic fields, solvents, and light to tune the electrical conductance of the molecular junctions. A famous statement, “*There's plenty of room at the bottom*”, by Prof. Richard Phillips Feynman (Nobel Prize in Physics in 1965), and a penetrating insight, “*the number of transistors in an integrated circuit (IC) doubles about every two years*”, by Gordon Moore (co-founder of Intel Corporation), triggered the nanoelectronics research. Inspired by them, our young and vibrant team at IIT Kanpur emphasizes molecular-scale nanoelectronics for varied applications, including non-volatile memory, diodes (that convert AC to DC electrical signals), capacitors, and display technology (see Figure 1).



**Figure 1** Research theme of Mondal's group, focused on the development of an electrochemical method for molecular thin films towards varied nanoelectronic, and energy applications. Portions of this graphic are partly adapted from the following publications: *Chem. Sci.* **2025**, *16*, 3560–3570; *Nano Lett.* **2023**, *23*, 10998–11005; *Adv. Funct. Mater.* **2024**, *35*, 2415740; *Small* **2024**, *20*, 2403108.

We utilize the electrochemical method as a tool to make controlled molecular thin-films for molecular spintronic such as spin-valve devices. Our research activities can be found at <https://mondalpc.wixsite.com/mondalresearchgroup/team-leader>.

**Thieme: What do you think about the modern role and prospects of organic chemistry?**

**Dr. Mondal:** In the realm of organic electronics, organic chemistry serves as a cornerstone in the development of flexible, lightweight, and cost-effective materials for applications like OLEDs, organic solar cells, and transistors. Advances in molecular engineering, including the development of conductive polymers, have expanded the prospects for sustainable energy, wearable technology, and bioelectronics. With ongoing research, organic electronics promise greener alternatives to conventional semiconductors, revolutionizing industries from healthcare to consumer electronics.

**Thieme: Which difficulties are there for young upcoming chemists in your field? Do you have any tips?**

**Dr. Mondal:** Young researchers have always been the key players in any research laboratory. With a constant deluge of new research emerging daily, it's impossible to catch up with the latest research directions. I advise young chemists to stick to the basics, make the fundamentals as strong as possible, read textbooks, and research articles to understand research gaps, and then make plans towards a well-defined and purposeful scientific endeavor. As Albert Einstein said, "Imagination is more important than knowledge," so be creative and improve your imagination along with your communication skills.

**Thieme: What is your most important scientific achievement to date and why?**

**Dr. Mondal:** Our group is at the forefront of surface chemistry, molecular electronics, energy storage, electrochromic, and molecular spintronic research. The surface chemistry journey started during my PhD work, and later it was advanced to molecular electronics and spintronics. One of my unique research areas was to understand the electric field modulation in mobile ions containing molecular junctions, achieved with Prof. Richard McCreery at the University of Alberta, Canada (*J. Am. Chem. Soc.* **2018**, *140*, 7239–7247). Our recent pioneering spintronic work describes a covalent molecular film that can show efficient spin pumping (*Angew. Chem. Int. Ed.* **2023**, *62*, e202307458).

**Thieme: Could you tell us something about yourself outside the lab, such as your hobbies or extra-work interests?**

**Dr. Mondal:** Beyond the lab, I find enjoyment in reading literature and exploring classical Bengali and Hindi music. I have a keen interest in philosophy and world history as well. On weekends, I play with my 5-year-old daughter, Evana. These passions not only offer respite from research but also enrich my approach to thinking innovatively.

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