



CHEMISTRY CONNECT

IIT (ISM) DHANBAD

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CHEMISTRY NEWSLETTER*

MESSAGE FROM THE DESK OF HOD

I am pleased to present the January 2026 edition of our departmental newsletter. It is a privilege for me to serve as the newly appointed Head of the Department of Chemistry and Chemical Biology at Indian Institute of Technology (Indian School of Mines) Dhanbad since 8 January 2026. I look forward to working closely with our faculty members, students, staff, and alumni to further strengthen the academic and research excellence of our department.

This edition highlights several significant activities and achievements from our department. Our faculty members continue to contribute impactful research across diverse areas of chemistry, including photoredox synthesis, sustainable catalysis, advanced materials for environmental applications, and computational approaches to drug discovery. These research

Acknowledging Leadership and Welcoming the New HoD

The Department of Chemistry and Chemical Biology at Indian Institute of Technology (Indian School of Mines) Dhanbad witnessed an important leadership transition at the beginning of 2026. Prof. S. K. Padhi has taken over as the Head of the Department from January 2026. The department sincerely acknowledges the dedicated leadership and valuable contributions of Prof. Parthasarathi Das, who served as the Head of the Department from 2021 to 2026 and is currently serving as the Dean (Research & Development) at the institute.



During the tenure of Parthasarathi Das, the department achieved several important academic milestones. A major development was the introduction of the BS–MS programme in Chemical Science, which significantly strengthened the academic structure of the department and attracted talented students toward integrated higher studies in chemistry. In addition, the M.Tech programme in Pharmaceutical Science and Engineering reached greater heights during his tenure, with notable progress in academic activities, research engagement, and student participation.

The department also witnessed consistent growth in research output, publications, and academic initiatives, further enhancing its academic and research profile.

As S. K. Padhi assumes the responsibility of leading the department, we look forward to building on the strong foundation established in recent years and continuing to advance excellence in teaching, research, and innovation. With the collective efforts of faculty members, students, staff, and alumni, the department aims to achieve new milestones in the coming years.

efforts are reflected in recent high-quality journal publications and recognitions. We are also pleased to note invited lectures delivered by our faculty in academic programs and short-term courses, which showcase the growing visibility of our department at the national level.

The department also witnessed important academic developments and events. We are delighted to welcome Dr. Bikash Garai as a Ramanujan Fellow, whose research on advanced porous materials and sustainable technologies will further enrich our research environment. In addition, our Ph.D. scholars continue to make steady progress in their research, as reflected in recent thesis submissions and seminars.

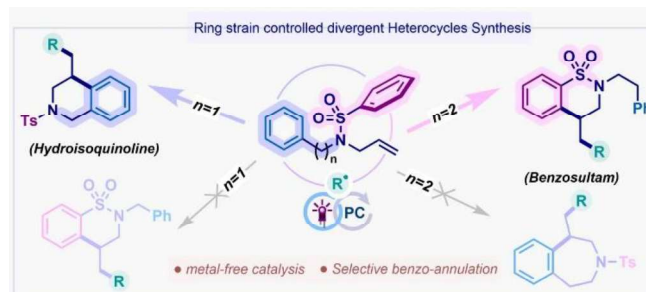
Our students have also achieved notable success. We congratulate our M.Sc. students Dipanwita Nag and Divya Kumari for qualifying UGC-JRF and CSIR-NET LS, a commendable achievement that reflects the strong academic foundation of the department. We are equally proud to see our students gaining global exposure, such as the recent educational visit to NASA by one of our BS-MS students, which represents the expanding academic horizons of our learners. We are also happy to feature our alumni in this issue, highlighting their professional journeys and continued connection with the department. Such interactions strengthen the bond between academia and industry and inspire our current students.

These achievements and activities demonstrate the vibrant academic culture of our department. As we move forward in 2026, I encourage everyone to continue contributing actively to teaching, research, innovation, and collaboration. Together, we can further enhance the academic reputation and impact of our department. Wishing everyone a productive and successful year ahead.

Research Activites

One Precursor, Many Paths: Divergent Heterocycle Synthesis

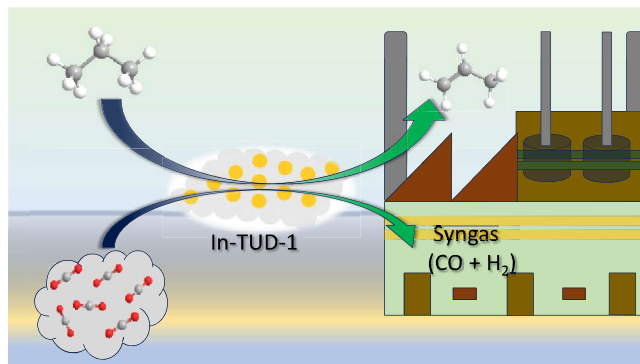
Prof. Soumitra Maity and his team have introduced a light-driven toolkit that changes one starting material into two valuable drug building blocks: hydroisoquinolines and benzosultams. By adjusting the length of the molecular chain, researchers can direct



radical cyclization pathways to create these complex structures. This method offers a quicker and more efficient route to developing new life-saving medicines. (*Organic Letters* **2026**, 28, 617-622.

<https://pubs.acs.org/doi/full/10.1021/acs.orglett.5c04344>).

Propane Dehydrogenation: A CO₂-Mediated Approach Using mesoporous 10In-TUD-1 catalysts



Prof. Biswajit Chowdhury and team have proposed a new sustainable method of propene synthesis through propane dehydrogenation using CO₂ as a soft oxidant. The method, driven by a sol-gel synthesized 10In-TUD-1 catalyst, has been successful in suppressing coke formation and energy consumption, making the process much greener for industrial-scale production. (*Chemistry—An Asian Journal*, **2026**, 21, e00928. <https://aces.onlinelibrary.wiley.com/toc/1861>

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Photocatalytic antibiotic degradation: An interfacial engineering approach

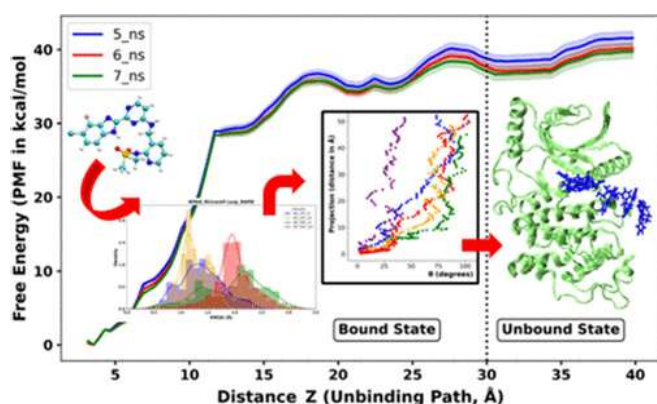
Prof. Sagar Pal and team introduced a greener method to synthesize powerful ternary n-p-n hyperjunctions at room-temperature. These can be used to wipe out 96.3% of toxic antibiotic waste over a time period of 90 minutes. By carefully aligning LDH nanosheets and polydopamine microspheres, researchers have boosted interfacial charge transfer,



creating a high-performance material that cleans water and kills bacteriamore efficiently than ever before.

(ACS Applied Engineering Materials, 2026, <https://pubs.acs.org/doi/full/10.1021/acsaen.m.5c01096>.)

A molecular blueprint for next-generation cancer therapeutics

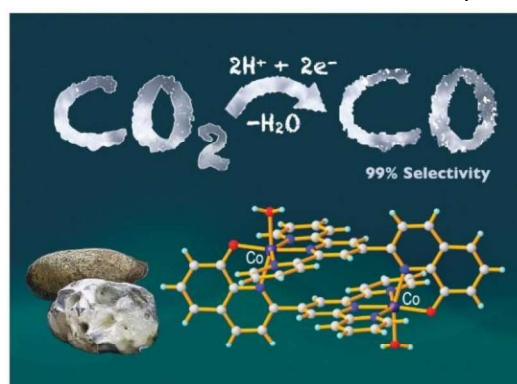


By using advanced computational simulations like molecular dynamics and alchemical free energy perturbations, **Prof. Niladri Patra** and team have introduced a "molecular blueprint" showing how potential drugs can block cancer-driving proteins. This study reveals exactly how inhibitors compete with ATP to

stop harmful protein interactions, while tracking inhibitor exit dynamics to help scientists design medicines that stay. (The Journal of Physical Chemistry B, <https://doi.org/10.1021/acs.jpcc.5c06425>).

HOT Article Recognition (Dalton Transactions, 2025)

Prof. Sumanta K. Padhi's group published a highly acclaimed HOT Article elucidating mechanistic insights into electrochemical CO₂ reduction using dinuclear Cobalt complex, integrating experimental studies with DFT based computational analysis. (Dalton Transcation, DOI: 10.1039/D5DT02003D).



Showcasing research from Professor Sumanta Kumar Padhi's Artificial Photosynthesis Laboratory, Department of Chemistry and Chemical Biology, Indian Institute of Technology (Indian School of Mines) Dhanbad, Jharkhand, INDIA.

Selective electrochemical CO₂ reduction to CO by a Co₂ dimer catalyst by metal-ligand cooperativity

Electrochemical CO₂ reduction offers a promising route to mitigate greenhouse gas emissions. We report a cobalt dimer catalyst that selectively converts CO₂ to CO in DMF/H₂O (4.8:0.2 v/v) with 94 ± 2% Faradaic efficiency, 99% selectivity and TOF_{CO} = 2575 s⁻¹ at a 760 mV overpotential. Mechanistic studies (DFT, IR, SEC, ITC) reveal ECCE and ECEC pathways involving stepwise proton-electron transfer and metal-ligand cooperativity. Reduction-induced ligand protonation enables CO₂ activation, providing mechanistic insights for designing advanced CO₂-to-CO molecular electrocatalysts.

Image reproduced by permission of Sumanta Kumar Padhi from Dalton Trans, 2025, 54, 16662.

As featured in:

Dalton Transactions

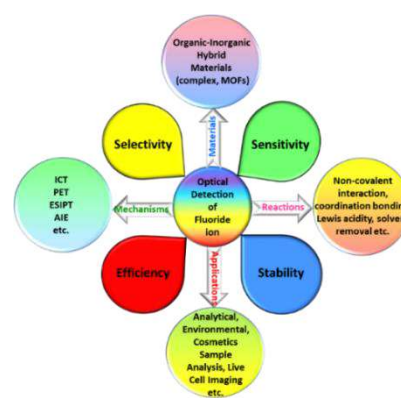
DOI: 10.1039/D5DT02003D

Sumanta Kumar Padhi et al., Dalton Trans, 2025, 54, 16662

ROYAL SOCIETY OF CHEMISTRY

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2026 Inorganic Chemistry Frontiers hot article



Prof. Swapan Dey and his group worked on development of metal-complex-based

receptors, including metal-organic frameworks, for selective recognition of fluoride. This review will particularly work on fluoride sensing, essential to maintain safe, optimal levels in drinking water and biological systems.

(*Inorganic Chemistry Frontiers*, 2026, <https://doi.org/10.1039/D5QI02060C>).

Faculty Spotlight

Dr. Bikash Garai has joined the Department of Chemistry and Chemical Biology as a Ramanujan Fellow in Jan, 2026. His research will focus on the development of advanced porous materials for



photothermal conversion, catalysis, and water purification. Prior to joining the department, he worked as a postdoctoral researcher at Technische Universität Dresden, Germany and an Associate Research Scientist at New York University Abu Dhabi, UAE where he studies structural properties of porous frameworks and developed stimuli-responsive porous materials to advance sustainable energy and environmental technologies.



Student Spotlight

Sanchita Sahu has joined the department to work on solid state chemistry of ionic conductors with Prof. Ananya Banik as a PhD student.

NPDF awarded

Dr. Rahul Dev Mandal has joined as ANRF-NPDF under the mentorship of Prof. Soumitra Maity.

Dr. Manik Shit joined as NPDF under the Mentorship of Prof. Sagar Pal.

Our heartiest congratulations to all the NPDP awardees for their success.

Alumni Corner

Dr. Avinash Chettri

Postdoctoral Researcher, University of Potsdam, Germany

Dr. Avinash Chettri completed his M.Sc. from the Department of Chemistry and Chemical Biology at IIT (ISM) Dhanbad and later moved to Germany, where he is now a Postdoctoral Researcher at the University of Potsdam. His path to international academia wasn't planned — it unfolded through opportunity and persistence. In this conversation, he shares his experiences of research life abroad and offers guidance for students aiming for higher studies.

Could you briefly describe your academic journey at IIT (ISM) Dhanbad and how it shaped your research career?

IIT (ISM) Dhanbad provided an environment where I could explore the area I wanted to pursue. Classes were precise and in-depth, yet the flexible attendance system allowed me to spend more time on subjects I was truly interested in. That freedom became a steppingstone toward becoming a researcher.

What motivated you to pursue research abroad, and how did you prepare yourself during/after M.Sc. for international opportunities?

I had not intended to pursue research abroad. I initially wanted to become a scientific officer in India, and my M.Sc. thesis was nominal, so I assumed it would be difficult. However, an acquaintance in Germany told me about a PhD opening in his group. I applied hesitantly — luck was on my side — and I was accepted as a PhD student in Germany.

However, students should not rely on luck. A



strong thesis and solid fundamentals are important. Publications help demonstrate focus and dedication but are helpful rather than mandatory.

After moving abroad from India, what challenges did you face initially in accommodation and settling into daily life?

There is a cultural shift in communication and daily life. I did not face major problems, but students should start accommodation searches early and contact the university's international office or welcome center. Learning the language and observing the culture helps greatly. Taking a German course early makes settling into everyday life much easier.

Which research area are you currently working in, and what motivated you to pursue this specialization?

I study ultrafast dynamics and structure of proteins using two-dimensional infrared (2D-IR) spectroscopy, which offers higher time resolution than 2D-NMR.

During my PhD I worked on excited-state dynamics of photosensitizers in photodynamic therapy. Since visible light cannot detect structural biomolecular changes, infrared spectroscopy bridges that gap — which motivated me to continue into 2D-IR research.

How different is the research culture abroad compared to India in terms of independence, expectations, and work-life balance?

Projects are usually funded and predefined, but shaping the project is the researcher's responsibility. There is independence along with structured planning.

Failed experiments are also valuable learning. With planning and regular communication, work-life balance is achievable. Clear targets and feedback form the backbone of good research.

For students from outside Germany, how does the fellowship and funding system work there for PhD and Postdoctoral research?

PhD contracts typically run three years with possible extension, and postdocs usually last two to three years depending on funding. My postdoc was 20 months, while my PhD extended to five and a half years through renewals. Independent fellowships such as the Humboldt and Walter Benjamin fellowships are

also available for about two years.

During your early research career, what was the most difficult phase — experiments failing, publishing papers, or career uncertainty — and how did you handle it?

The best way is incremental progress. I design experiments that are achievable yet slightly challenging to stay motivated. Breaking large experiments into smaller steps prevents repeated failure and helped me publish consistently while managing uncertainty.

In your opinion, is it better to continue a Postdoc in the same research field or shift to a different field? What challenges arise in both cases?

It depends on the individual. Learning something new is beneficial but should remain within one's learning curve. Ideally, join a group where you can apply existing expertise while developing new skills as a fallback plan. If interests differ from the group theme, applying for independent grants is a good option.

If someone plans to return to India after completing a Postdoc, what difficulties should they be prepared for?

There are fewer positions than applicants, so luck plays a role. Address relevant scientific questions, publish consistently, and stay connected to the Indian research community through conferences and networking.

Any final message or motivation you would like to share with students aspiring to pursue research and academia?

Research addresses the fundamental "How" and "Why." Large questions can be divided into smaller ones that motivate daily work. Though time-consuming, the reward is fulfilling. Academia also allows you to give back by teaching, discussing open questions, and inspiring curiosity in students.

Editorial Note: Dr. Chettri's journey reminds students that research careers rarely follow a fixed plan. Persistence, curiosity, and readiness to seize opportunities often shape the path as much as preparation itself — a reassuring message for anyone considering higher studies beyond campus.

Dr. Rajkamal

**Research Scientist, Sapala Organic Pvt. Ltd.
(A Unit of Cohance Life Sciences), Hyderabad**

Dr. Rajkumar completed his academic journey at IIT (ISM) Dhanbad under the guidance of Prof. Somnath Yadav. He now works in the pharmaceutical sector focusing on manufacturing and process optimization. In this conversation, he reflects on the connection between academic foundations and professional practice.

How did your academic journey at IIT (ISM) Dhanbad shape your career?

My academic journey at IIT (ISM) Dhanbad was extremely good and transformative. The curriculum provided a strong foundation in core scientific and engineering principles. Beyond academics, exposure to research culture, teamwork, technical fests, discipline, and resilience significantly shaped my professional decision-making and leadership style.

How was your transition from academia to industry?

In industry, especially in pharmaceutical manufacturing and R&D, problems are dynamic, multifactorial, and time-sensitive. However, the strong fundamentals and



problem-solving mindset developed during my academic training made the transition smoother over time.

How aligned was your academic training with real-world pharmaceutical practices?

In real-world pharmaceuticals, validation

protocols, scale-up challenges, and cost-effective synthesis are very important considerations. The theoretical foundation I received from my department and my guide Dr. Somnath Yadav was excellent. The questions asked by my teachers — ‘How’ and ‘Why’ — were very helpful in improving my understanding.

What motivates your current professional path?

I am currently working in the pharmaceutical sector, focusing on manufacturing and process optimization at Cohance Life Sciences – Sapala Organic Pvt. Ltd., Hyderabad. I chose this path because it combines science with health-related impact — ensuring safe and effective medicines reach patients at scale.

What skills should students develop?

A strong foundation in core subjects, data analysis, scale-up awareness, process optimization, communication and documentation skills, teamwork, and most importantly discipline and morality towards work.

Is industry-academia collaboration sufficient today?

Collaboration has improved through internships. However, industry-academic collaboration is still not sufficiently strong at present.

Your advice to students?

Students should participate in research projects or industry-sponsored work. They should network with alumni and industry professionals, engage in internships early, and explore diverse roles.

Awards and Recognitions

Dipanwita Nag and **Divya Kumari** (M.Sc 2024-2026 Batch) for qualifying UGC-JRF& CSIR NET LS.

Ms. Segufa Rahaman from Prof. Swapan Dey's research group has presented her Ph.D thesis work entitled ‘Synthetic Methodologies for Cross- Dehydrogenative Coupling Reaction and C-N Bond Scission of Imidazo[1,2-a]pyridine Derivatives’ 14th January 2026.

The Pre-submission seminar on Ph.D. work entitled "Synthesis, Properties and Catalytic Activities of Polynuclear Lanthanide Clusters" of **Ms. Kajal**, IIT(ISM) from Prof. Hari Pada Nayek's group was held on January 21, 2026.

Research Talk

We were delighted to host **Dr. Biplab Manna** from National Institute for Materials Science (NIMS) in Tsukuba, Japan for his seminar titled "MOF nanospace chemistry: Fundamentals and pathways to a sustainable world" at the



Department of Chemistry and Chemical Biology, IIT (ISM) Dhanbad. The session featured engaging discussions and insightful exchanges, and we thank all participants for contributing to its success.

Academic Visits



Prof. S. K. Padhi felicitating **Prof. N. Singh** for delivering an invited lecture at MTIC-XXII, 2025. **Prof. S. K. Padhi** getting felicitated for chairing a session at MTIC-XXII, 2025.

Prof. Sumanta K. Padhi chaired a session at the 22nd International Conference on Modern Trends in Inorganic Chemistry (MTIC-XXII) organised by the University of Delhi (India) from 18th to 21st December, 2025.

Prof. Soumitra Maity delivered an invited Talk on "Manipulating Reactivity Paradigms by

Light" in International Conference on Recent Trends in Organic Chemistry (RTOC-2026), at NIT Jamshedpur; 16-17 March 2026.



Prof. Sagar Pal delivered an Invited Lecture on "Recent Advances in Functional Polysaccharide-Based Materials for Biomedical Applications", at ICFM-2026, IIT



Kharagpur, during 5–7 January 2026.



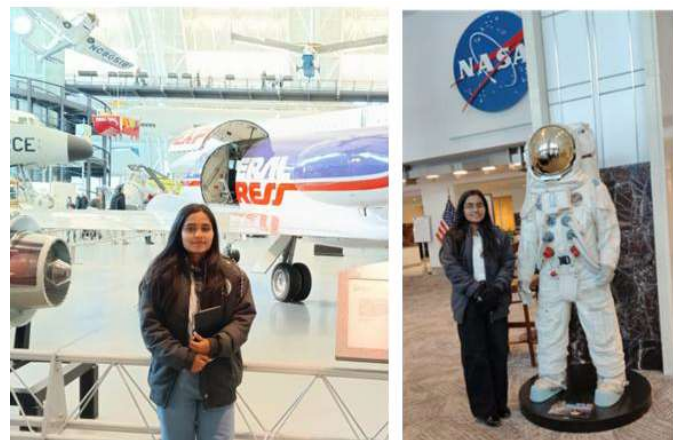
Prof. Ananya Banik delivered an Invited

Lecture in 2nd International Conference on Advanced Materials and Manufacturing (ICAMM 2.0): January 8th & 9th, 2026 on Layered Disorder in Lithium-Ion-Conducting Solid Electrolytes, $\text{Li}_3\text{Y}_{1-x}\text{In}_x\text{Cl}_6$.

Prof. Madhulika Gupta graced “Library Week – Curiosity Quench 2026” at Dhanbad Public School as the Chief Guest. Through her



engagement and address, she motivated young minds to view reading as a gateway to innovation, empathy, and lifelong learning in an ever-evolving knowledge landscape.



Akanksha from BS-MS 2025 visited the NASA Headquarters in Washington, D.C., the Smithsonian Institution, including the National Air and Space Museum, and the Kennedy Space Center in Orland sponsored by Omkar Pawar CEO Zilla Parishad, Nashik.

Upcoming events

5-Day Workshop (Hybrid Mode) on “Recent Advances in Microscopy and Spectroscopy”

February 23-27, 2026.

Celebration of **National Science Day on February 28th.**

Research Publications

Prof. Niladri Patra

1. Diship Srivastava, Shreya Mukherjee, Muskan Begom, **Niladri Patra**, Effect of Cholesterol on the Gramicidin A Induced Membrane Curvature and Order Parameter, *Physical Chemistry Chemical Physics*, 2026, 27, e202500755.
2. Shreya Mukherjee and **Nildari Patra**, Elucidating the Role of Protein-Protein Interactions in Modulating Inhibitor Affinity and Release Mechanisms in Serine Arginine Protein Kinase, *The Journal of Physical Chemistry B*, 2026, <https://pubs.acs.org/doi/full/10.1021/acs.jpccb.5c06425>.

Prof. Madhulika Gupta

3. Ankit Joshi, **Madhulika Gupta**, Regulatory role of O_3 acetylation as a molecular switch in xylan-cellulose interactions, *Cellulose*, 2026, <https://doi.org/10.1007/s10570-026-06960-1>.
4. CS Keerthana, Tripti Kundu, Muskan Beura, Suvarghya Chakraborty, Vipin Verma, Deebea Kamil, **Madhulika Gupta**, Veda Krishnan, Conformation-driven extraction strategies for lentinan: integrating subcritical water techniques and molecular simulations for high-value functional food development towards a sustainable bioeconomy, *Proceedings of the Indian National Science Academy*, 2025, <https://doi.org/10.1007/s43538-025-00573>.

Prof. Sagar Pal

5. Shaon Dey, Abanindra Nath Sarkar, Padmapani Pradhan, Kalipada Manna, Govind Chouhan, Sheeja Jagadevan, **Sagar Pal**, Sunlight-Driven Degradation of Antibiotics and Dyes Using Polyaniline/Layered Double Hydroxide Nanosheet/ $\text{Co}(\text{OH})_2$ Nanosheet Z-Scheme Photocatalytic Nanocomposite for Wastewater Treatment, *ACS Applied Nano Materials*, 2025, 8, 38, 18348-18367.
6. Anirban Dolai, Kalipada Manna, Subha Samanta, Gourisankar Roymahapatra, **Sagar Pal**, Reversible Light-Controlled Sol-Gel Transition of an Ionic Hydrogel, *Langmuir*, 2025, <https://doi.org/10.1021/acs.langmuir.5c02433>.

Prof. Soumitra Maity

7. Avik Kr Das, Rabindranath Lo, Soumitra Maity, Unified Photoredox Strategy for Selective Access to Hydroisoquinoline and Benzosultam via Tether Modulation of Allylamine, *Organic Letters*, 2026, <https://doi.org/10.1021/acs.orglett.5c04344>.
8. Biswajit Saha, Arijit Das, Abhay Sankar Patra, **Soumitra Maity**, DFT-guided development of polar collector to enhance oxidized coal flotation, *International Journal of Coal Preparation and Utilization*, 2025, <https://doi.org/10.1080/19392699.2025.2609724>.

Prof. Biswajit Choudhary

9. Anindya Ghosh, Akash Mandal, Debjani Nag, Pratik Swarup Dash, Siddhartha Misra, Kaushik Sen, **Biswajit Chowdhury**, Carbon-Induced Crystallization of SiO₂ at Low Temperature: N-Doped Carbon-Modified α -Cristobalite as a Photocatalyst for CO₂ Conversion, *ACS Applied Nano Materials*, 2026, <https://doi.org/10.1021/acsanm.5c05262>.
10. Aniruddha Singha, Akash Mandal, Bhabani Malakar, Asim Bhaumik, **Biswajit Chowdhury**, Oxidative Dehydrogenation of Propane (ODHP) to Propene Using CO₂ as a Soft Oxidant Over In-TUD-1 Catalyst, *Chemistry-An Asian Journal*, 2026, 21, e00928.
11. Akash Mandal, Sumanta Mondal, Aniruddha Singha, Akash Surajlal Rane, Sourav Ghosh, Ranjit Thapa, Asim Bhaumik, **Biswajit Chowdhury**, Synthesis of 2-imidazolidinone from ethylenediamine using CO₂ as a C1 building block over the SnO₂/gC₃N₄ catalyst, *Chemical Communications*, 2026, <https://doi.org/10.1039/D5CC05882A>.

Prof. Swapan Dey

12. Segufa Rahaman, Suhag Singh Sahay, Priti Khan, **Swapan Dey**, Oxidative Esterification via Cleavage of C(sp²)-N Bond of Imidazo[1,2-a]pyridine: Access to the α -Ketoester and Late-Stage Modification, *The Journal of Organic Chemistry*, 2025, 90, 18272-18285.

- Suhag Singh Sahay, Segufa Rahaman, Rwishanya Das, **Swapan Dey**, Iodine-Assisted
13. Regioselective C3-H Chalcogenation of 4-Phenyl Aminocoumarin: Access to Unusual Dual Selenylation of N-Substituted Derivatives, *European Journal of Organic Chemistry*, 2025, 28, e202401163.

Patents

1. Kingshuk Debsharma and **Swapan Dey**, "Yellow-to-NIR-I Emissive Reversed AIEgens for Simultaneous Hybrid ROS Generation and Physiological Biosensing" applied (Provisional) at the Indian Patent Office (application no. 20253113117, 2025).

Editorial Board: **Chief Editor:** Prof. S. K. Padhi (HOD), **Editor:** Prof. Ananya Banik, **Student Editors:** Sanchita Sahu, Raj Rani, Shashank Shekar Nandan, Shashi Raj, Ashutosh Maji, Anuj, Rinkaj Kumar, Mahika Sethia, Tanmay Kumar Khandelwal.