



ChemE Chronicles

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DEPARTMENTAL NEWSLETTER*

FROM HOD's DESK

PROF. ADITYA KUMAR

Dear friends and well-wishers,



Welcome to the fifth issue of “**ChemE Chronicles**”! We are about to complete six months of our journey towards publishing the departmental newsletter, and it has been a phenomenal journey to say the least!

We are humbled to learn that what started out as a distant, far-fetched dream to encourage the next generation of chemical engineers, has indeed become a popular newsletter across the chemical engineering student community. We introduced several innovative sections like “**Alumni ChEnect**”, “**Chemical Engineering News**”, “**ChemE Trivia**” “**Feature Article**”, etc. – all these sections were primarily meant to serve a common mission – help the students learn and appreciate the versatility that chemical engineering offers. The need to highlight the same cannot be overemphasised in today's era, where core engineering education (not only chemical engineering) is facing a significant challenge in India, especially in Tier-2 and Tier-3 institutions. We sincerely feel that the best way to tackle it is to raise comprehensive awareness at all levels,

starting from the parents, to the media, and different other sections of the civil society. The “**Chemical Engineering News**” section of the present issue aptly highlights the immense impact that chemical engineering is having on our lives on a regular basis, by covering news related to decarbonisation and novel insecticides, among others.

Our flagship section, “**Alumni ChEnect**”, features a candid interview with one of our MTech alumni from the second batch of MTech, who is currently a faculty at IIT.

On another note, on one hand, space is something that fascinates the young and the old alike; the “**ChemE Trivia**” section of this issue features the science and engineering of rocket propulsion, and the key factors dictating the same. On another hand, one of the greatest challenges of present times is to achieve efficient energy storage; the “**Feature Article**” section explains the same from the basics, as well as the significant role played by chemical engineers towards developing such technologies.

Other important events like the Annual Research Day, Institute R&D Fair, and visits of eminent personalities to the department have also been covered in this issue, among other things. Please do give it a read and let me know your thoughts on the present issue!

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Chemical Engineering News

Decarbonising ammonia production

A Boston-based start-up named Addis has devised a new method to produce ammonia cleanly & cheaply. This method involves injecting iron-rich rock with nitrate-containing water, where the water reacts with iron to produce hydrogen, which then bonds with nitrogen to form ammonia. This method is a better alternative to the Haber-Bosch process for ammonia production. [Read more](#)



Best Value Chem opens a fully automated plant in Gujarat

Best Value Chem (BVC), one of India's leading fragrance & flavor chemical manufacturing companies, has unveiled a Rs 550 crore (\$60 million) fully automated plant at Dahej in Gujarat employing 300 people across 30 acres.

[Read more](#)



BASF to launch novel rice insecticide Prexio Active in India

BASF has launched registration for Prexio Active, a new insecticide targeting all four rice hopper species. It has no known cross-resistance & is classified as a Group 4E insecticide by IRAC. Pending approvals, its first launch is expected in India by second quarter 2025 for the important Kharif season.

[Read more](#)

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Alumni ChEnect

DR. CHANDANTARU DEY MODAK
(MTECH, 2015-2017)



Welcome to the “Alumni ChEnect” interview series! Please tell us in detail about your current job.

Thank you for having me! I currently work as a Marie Curie Postdoctoral Researcher at the Laboratory of Biophysics and Evolution, Institut Pierre-Gilles de Gennes (IPGG), ESPCI-PSL Paris, France. My current research interests revolve around microfluidics and biotechnology. I am working on developing a drug screening microfluidic device that mimics the human model and eliminates the need for animal studies.

Please tell us about your academic journey, starting from school days.

I did my schooling from Chinmaya Vidyalaya Bokaro, where I developed an early interest in science, particularly in physics and mathematics. After Class 12, I pursued my passion for engineering by enrolling in Birsa Institute of Technology (BIT) Sindri's chemical engineering program. Later, I joined a company but soon left the job and step up to master's program in chemical engineering from IIT (ISM) Dhanbad. The research work and guidance by faculty member at ISM Dhanbad made me realised to pursue research career and led me to pursue doctorate degree at IISc Bangalore, in Nanoscience and Engineering.

Why did you choose chemical engineering? Was it out of passion, or driven by circumstances? Please walk us through your thoughts as a Class 12 pass-out.

Choosing chemical engineering was a mix of passion and practical consideration. I had an inclination toward mechanical engineering but could not pursue it due to my rank. Chemical engineering was my second option, but I was happy to accept it as I secured admission to one of Jharkhand's prestigious state government colleges. Moreover, I knew that the chemical engineering syllabus provided exposure to industrial processes similar to those in mechanical engineering.

In a way, I was determined to build my career in process engineering and explore science, rather than following the trend of pursuing computer science like most of my peers. As a Class 12 graduate, I saw this as the starting point of my career, a phase where I suddenly became independent and began to understand the importance of science. At that time, I felt a bit nervous about my knowledge and capabilities, but over time, my love for science gave me the confidence to pursue an engineering degree.

I believed that chemical engineering uniquely connects core science subjects like mathematics, physics, chemistry, and biology, offering diverse career opportunities when pursued with dedication.

How has IIT (ISM) Dhanbad helped you in this journey? How did the BTech/MTech/PhD programme here help shape your career path? How did the academic environment and campus life contribute to your personal growth?

IIT (ISM) Dhanbad played a crucial role in shaping my career and personal growth. I joined the institute after leaving corporate life, driven by a passion for pursuing a master's degree and engaging in research. This time, it was my top choice. I chose to continue in chemical engineering because I liked the multidimensional course curriculum the program offers. From fluid mechanics to partial differentiation to process calculations, the program provided a comprehensive learning experience. I became so fascinated by the field that I started conducting research in the second semester of my master's program. The extraordinary support and guidance from my advisor, Prof. Soubhik

Kumar Bhaumik, played a crucial role in this journey. It was during my time at IIT (ISM) Dhanbad that I developed a strong inclination toward pursuing research as a career. The encouragement I received from faculty members, colleagues, and friends at IIT (ISM) motivated me to continue my academic journey, eventually leading to a postdoctoral position.

Beyond academics, the institute offered several extracurricular activities that I thoroughly enjoyed. I often played badminton at the institute gymkhana and participated in various festivals and events organized by different groups. After classes or during evening snack breaks, we would head to the Main Gate or Ram Dhani tea stall for long chai breaks. These moments of relaxation and participation in activities were essential for me, as they helped relieve stress and re-energize my mind. Even now in Paris, I follow the same principle of taking breaks with colleagues.

Last but not least, the support from the faculty and access to excellent research facilities helped me complete my master's thesis on time. Although we were only the second batch of master's students and the department was still in its early stages of development, the environment was incredibly motivating and inspiring. My time at IIT (ISM) Dhanbad will always hold a special place in my heart, as it was where I published my first journal article based on my master's work.

What is your typical work-day like?

A typical day involves replying to emails, conducting experiments, reviewing data, guiding students, and attending meetings with collaborators. I also teach a practical class for master's students, which takes place once a week. The dynamic nature of my work keeps me motivated, as each day brings new challenges and learning opportunities.

The best part of working in France is that I can maintain a good work-life balance. Later in the day, I often cook for myself, and while I enjoy it, trust me, it's not something I look forward to every day (hahaha!). On weekdays, I explore different activities like swimming, climbing, and playing badminton, which help me stay fit and healthy.

What are the pros and cons of the profession in your honest opinion?

The best aspects of this profession are the opportunity to work on cutting-edge technologies and processes, diverse career paths across industries such as energy, pharmaceuticals, and materials, and the satisfaction of solving real-world problems. However, the work can sometimes be demanding, with tight deadlines and high-pressure situations

How has your career evolved since you graduated, and what advice would you give to current chemical engineering students aspiring to follow a similar path?

After graduating, I joined the nanoscience department to pursue my doctorate degree. Here, I worked in an interdisciplinary domain that combined knowledge of electronics, biotechnology, and fluid mechanics, which formed a major part of my research. The experience of learning beyond my core subject was highly beneficial to me.

Firstly, it kept me motivated throughout my doctoral studies, as there was always something new to learn. Secondly, it expanded my expertise across various fields, making my profile more versatile. This proved helpful later in my journey when searching for postdoctoral positions, as my broader interdisciplinary background appealed to researchers.

To current students, my advice is to focus on building strong fundamentals, actively seek internships, and network with professionals in your field. Always strive to learn new things, whether they are related to science or not. Never stop learning, and don't hesitate to explore interdisciplinary areas.

ChemE Trivia

- The first liquid-fueled rocket was launched by Robert H. Goddard in 1926, laying the foundation for modern rocketry. Besides him Konstantin Tsiolkovsky, Hermann Oberth, and Wernher von Braun also designed powerful rockets for space exploration and military use.
- Rocket propulsion is essential for space travel, satellite launches, and defense. It works by burning fuels to create thrust, and chemical engineers play a key role in developing efficient and safer rocket fuels.
- Rocket operate using different types of Chemical propellants (fuel + oxidizer). Liquid Chemical propellants, like Liquid Hydrogen (LH2) and RP-1, require cryogenic storage.
- Chemical propulsion provides high thrust, making it ideal for launch vehicles. While electric propulsion is highly efficient in fuel consumption, it offers low thrust, making it unsuitable for escaping Earth's gravity. Nuclear propulsion, on the other hand, presents challenges related to safety, making chemical propulsion the most suitable option for launch vehicles.
- Liquid fuels like Hydrogen require extreme cooling to remain in liquid form. Chemical engineers design insulation materials and storage technique to prevent fuel loss due to evaporation.
- Rocket exhaust can reach temperatures hotter than Lava. The combustion of chemical propellants generates temperatures exceeding 3,000 degree Centigrade.
- Water is the major byproduct of Rocket combustion. When liquid hydrogen & liquid oxygen burn together, they primarily produce water vapor.
- Metal powders like aluminum or boron particles improve rocket fuels performance on adding to solid fuels and increases energy output.

Feature Article**Energy Storage Technologies**

- Over the last century, along with food, water, and shelter, energy has become an essential commodity. Today, global energy demand stands at around 20 TW, with ~65% met by fossil fuels—raising serious concerns due to their contribution to climate change. Fortunately, nature offers a clean alternative: solar energy. At any moment, about 86,000 TW of solar power strikes Earth's surface, with approximately 0.7% (600 TW) being harvestable. Meeting just 3–4% of this harvestable energy would suffice to fulfill global demand. Yet, only ~0.3% (~2 TW) is currently being harvested.
- A major hurdle in fully relying on solar (or other renewable) sources is their inherent intermittency, which makes them unreliable. This is where electrochemical energy storage technologies become critical. Paired with solar cells, they can ensure a dependable power supply. Proven at smaller scales—like lead-acid batteries in UPS systems and Li-ion batteries in mobile phones—batteries and super-capacitors offer promise, but significant progress is needed before they can store energy on the MW scale.
- Contrary to the common impression that the electrochemical systems have only to do with knowledge of electrochemistry (such as redox reactions), these systems are of a complex multiphysics nature. Working with such systems requires a thorough understanding of chemistry (e.g., material science), physics (e.g., electrostatics), electrical engineering, chemical engineering (e.g., thermodynamics, reaction kinetics, transport phenomena: heat, mass, momentum, and charge transfer), and mathematics. Thus, chemical engineers are uniquely positioned to study such systems. And hence, don't be surprised if the next breakthrough in the area of climate change/global warming comes from chemical engineers.

Prof. Mahendra N. Nandanwar



FIPI Hackathon 2025

IIT (ISM) Dhanbad has made an indelible mark at the prestigious FIPI Hackathon, a highlight of the India Energy Week 2025, held from February 11th to 14th. Competing under the theme of Carbon Capture, Utilisation, and Storage (CCUS), the team from IIT (ISM) Dhanbad showcased remarkable innovation through their patented project: "A Process for the Low-Cost Production of Nitrogen-Doped Multilayer Graphene Nano powder for CO₂ Adsorption and Conversion."

This visionary project presents a sustainable and cost-effective approach to one of the most urgent global challenges—CO₂ emissions. By using bamboo powder as a raw material, the team has developed a process to create advanced graphene-based materials that are not only environmentally friendly but also highly efficient in carbon capture and conversion. These nitrogen-doped multilayer graphene nanostructures possess a layered and porous morphology, offering enhanced surface area and reactivity, making them ideal candidates for CO₂ adsorption applications.

Their method stands out not only for its technical merit but also for its practicality and scalability, making it suitable for widespread industrial use. The innovation aligns strongly with the broader mission of enabling green technology solutions that are accessible, affordable, and impactful.

This outstanding effort was led by a multidisciplinary and passionate team of students Sayantika Thandar (MTech, Chemical Engineering, 2nd year), Riya Jaiswal (MTech, Chemical Engineering, 1st year), Mohammad Faheem (BTech, Chemical Engineering, 3rd year), Modassir Ashraf (BTech, Chemical Engineering, 3rd year) under the expert guidance and mentorship of Prof. Ejaz Ahmad and Dr. Afaq Ahmad Khan, the team not only demonstrated strong academic and technical capabilities but also showed how research can be translated into meaningful real-world impact. Crowning their achievement was the honour of presenting their innovation to the Hon'ble Minister of Petroleum & Natural Gas on February 14th at Yashobhoomi, Delhi. This recognition further solidifies IIT (ISM) Dhanbad's position as a leader in energy innovation and environmental sustainability.

Congratulations to the team for this stellar accomplishment, showcasing how innovation and collaboration can lead the way toward a sustainable future.



Annual R&D Fair 2025

The Department of Chemical Engineering, IIT (ISM) Dhanbad had an enthusiastic and wholehearted participation in the Annual R&D Fair 2025 of the Indian Institute of Technology (Indian School of Mines), Dhanbad. The fair was held on 01 February 2025 adjacent to the Penman Quadrangle premises, alongside the Industry-Institute-Interaction 2025 (III-2025) event. The stall of our department showcased some of the recent research and innovation happening at the department.



Prof R.R. Sonde's visit

Prof. Ramakrishna Sonde (commonly referred to as R.R. Sonde), currently a Professor of Practice at Indian Institute of Technology, Delhi, recently visited the Department of Chemical Engineering, IIT (ISM) Dhanbad on 2 February 2025, and interacted extensively with the faculty members of the Department. Prof. Sonde is a veteran in the energy domain, and was formerly the Executive Vice President, CTO, and Member of Board of Executive Council at Thermax Limited. Prior to that, he served in various prominent capacities, including being an Outstanding Scientist at the Atomic Energy Commission, India, & an Executive Director at NTPC Limited



Annual Research Day

The Annual Research Day Symposium - 2025 of the Department of Chemical Engineering, IIT (ISM) Dhanbad was held on 8 February 2025. As part of the symposium, the postdoctoral scholars, doctoral scholars and masters students of the Department showcased their research via oral and poster presentations.



Publications

1. Babuni Prasad, Runa Dey, and Arunkumar Samanta, Facile Synthesis, Characterization, and Performance Study of a Low-Cost Structured Adsorbent for CO₂ Capture, Ind. Eng. Chem. Res. 2025, 64, 1274–1285
2. Vaibhav Pandey, Priyanshu Pratap Singh, Kamal Kishore Pant, Sreedevi Upadhyayula, Siddhartha Sengupta, Promotional role of methanol and CO₂ in carbon dioxide-rich syngas hydrogenation over slurry reactor utilizing combustion induced Cu-based catalysts. Materials Today Sustainability 29, 2025, 101082

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