

allotrope

One laboratory | Different forms

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CSIR-NCL ARCHIVES & SCIENCE MUSEUM

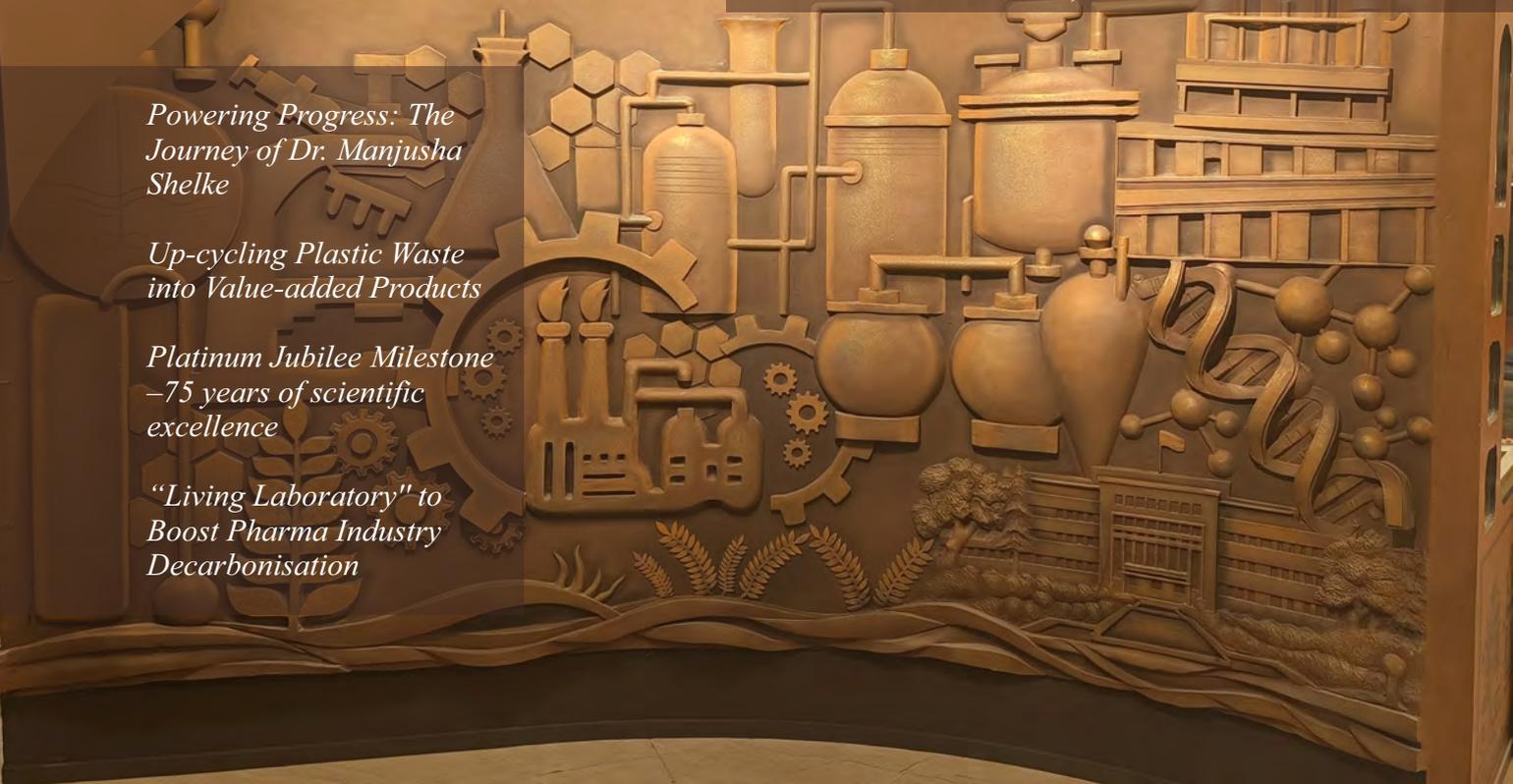
PRESERVING THE PAST, INSPIRING THE FUTURE

*Powering Progress: The
Journey of Dr. Manjusha
Shelke*

*Up-cycling Plastic Waste
into Value-added Products*

*Platinum Jubilee Milestone
–75 years of scientific
excellence*

*“Living Laboratory” to
Boost Pharma Industry
Decarbonisation*





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This issue captures CSIR-NCL's vibrant celebration of 75 years of scientific excellence and its forward-looking vision. It begins with a cover story on the Archives & Science Museum, established in commemoration of the laboratory's platinum jubilee, a captivating tribute to the institution's rich legacy and its transformative impact on India's scientific landscape. Following this, our new section "Our Curious Minds" features a compelling story of women in science, spotlighting the journey of Dr. Manjusha V. Shelke - a renowned scientist and entrepreneur whose trajectory exemplifies the seamless blend of academic excellence and market-driven innovation. Alongside her story, we highlight several path-breaking research and technology-based developments of the quarter, as well as updates on technologies licensed, MoUs signed, training sessions, lectures, outreach activities, and student engagements.

Through this magazine, we aim to bring out the latest updates from the laboratory by creating a pathway that will help the readers connect closely with us.

The theme of this magazine is based on the concept of allotropes. Like allotropes are different forms of the same element, NCL, apart from being a premiere research laboratory, also takes up different forms at times. It acts as a dynamic knowledge hub that shapes the upcoming technologies, a capacity-building center, a common meeting ground for industrialists, scientists, and policy-makers, and a Launchpad for early bird researchers. The theme-oriented, output-driven research of the laboratory is multifaceted too. This magazine gives an overview of the laboratory's ongoing research and technological innovations. It also represents the other forms of NCL.

This issue celebrates not only the preservation of scientific heritage but also the unstoppable spirit of inquiry and innovation embodied by scientists who turn research into impact. ***Hope this turns out to be an interesting read for you.***

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INVITATION FOR ARTICLES

We invite your contributions for Allotrope in the following capacities:

Research stories

Explain your research/ ongoing experiment in a simplified manner

Science articles

Describe a contemporary science topic, a scientific concept, technology, or a scientist of interest.

Individual experiences

Write about your personal field research/ travel experiences, conferences, paper/ poster presentations, PhD journey, or others. Senior scientists and staff members are invited to write about their work experience and insights.

Visual narrations

Showcase your research or technology with the help of a schematic or a graphic. Photographs related to NCL are also welcome.

The word limit for writing stories and articles is 500 words.

Kindly send your entries to: allotrope@ncl.res.in

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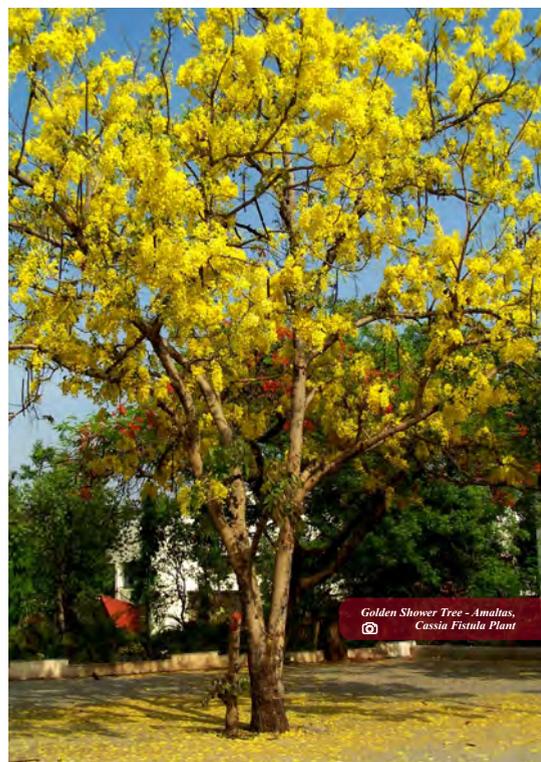
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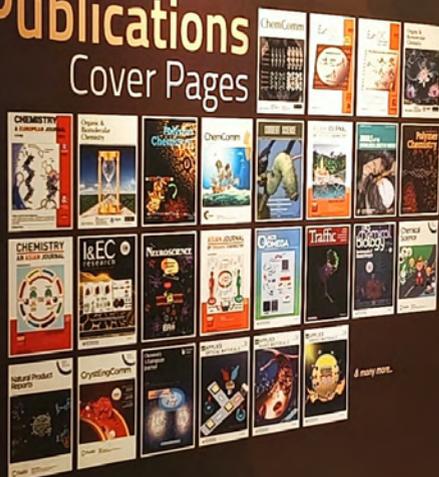
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CSIR-NCL ARCHIVES & SCIENCE MUSEUM PRESERVING THE PAST, INSPIRING THE FUTURE

Anjali Singh, Jithin Jacob K., Nikhlesh Yadav, Sunita Barve, Tanmoy Patra, and Varun Natu

The archives and Science Museum embodies CSIR-NCL's legacy of excellence and relevance by showing not just the exceptional scientific capabilities of the laboratory in chemical and applied sciences, but also its significance contributions to India's chemical sector by translating the scientific knowledge into innovative, globally competitive and sustainable technologies in close partner with the industry.

Dr Ashish Lele, Director, CSIR-NCL.



Nestled within the National Chemical Laboratory, Pune, the new CSIR-NCL Archives & Science Museum stands as a living testament to seven decades of transformative science. Established in commemoration of the laboratory's platinum jubilee, this museum is a dynamic space designed to inspire scientists, innovators, students and the general public alike.

Curated by the **CSIR-NCL Library** in partnership with the **Nehru Science Centre** under the National Council of Science Museums, the museum is the result of over a year of collaborative work. It drew resources from Film Archives of India (Pune), National Archives (New Delhi), Deccan College (Pune), CSIR-Central Glass & Ceramic Research Institute (Kolkata), CSIR-National Institute for Science Communication and Policy Research (New Delhi), various newspaper repositories, and oral histories of NCL alums. The goal? To preserve institutional memory while democratising scientific knowledge for future generations.

Inaugurated as part of the NCL's platinum jubilee celebrations on February 20, 2025, by **Dr. Kiran Mazumdar-Shaw**, Executive Chairperson and Founder of Biocon Ltd., the museum commemorates CSIR-NCL's global impact in chemistry and allied sciences.

As CSIR-NCL approached its platinum jubilee, its leadership envisioned more than a retrospective exhibition. They sought a narrative journey - one that would draw connections across centuries, disciplines and innovations. From early chemical knowledge systems in India to modern-day clean energy and

biotech breakthroughs, the museum captures the continuum of scientific thought and action.

Entering the museum, we encounter a striking mural: themes of chemistry, catalysis, chemical engineering, material science and biochemical sciences are set against imagery of pilot plant installations and reactor systems - symbolising NCL's research ethos.

The Ancient Indian Chemistry section delves into India's long scientific traditions. A Rasashala diorama, inspired by Nagarjuna's

alchemical laboratory, brings ancient experiments to life. Exhibits include perfume-distillation devices, archaeological finds of iron ore and slag dating to 1000 BCE, a replica zinc-smelting furnace and authentic zinc retorts from Zawar, Rajasthan. Punch-marked coins from the Satavahana and Kardamaka dynasties illustrate early minting and alloying methods. An engaging multilingual multimedia kiosk introduces yantras - ancient geometric instruments - alongside detailed descriptions in Marathi, Hindi and English.

This gallery reminds us that today's high-technology labs stand on millennia of chemical tradition, from medicinal alchemy to craft metallurgy, perfumery and cosmology-informed material science.

The second gallery follows CSIR-NCL's institutional ascent, beginning with the Board of Scientific Advice (1902) and tracing milestones through the Indian Industrial Commission (1916), Industrial Intelligence & Research Bureau (1935), Board of Scientific and Industrial Research (1940), CSIR (1942) and finally NCL's formal establishment in 1950.

Through archival film reels spanning the 1950s to the 2000s, visitors witness periods of institutional reconstruction, breakthrough science and national application. Displays feature zeolites used in MiG-29 jet engines, polymeric resins developed for the BrahMos missile program and vitamins, antiretroviral and anticancer drugs born of NCL's multidisciplinary labs.

Special sections - Empowering Industries and Fostering Innovations - showcase how science meets societal need: membranes for Swachh water filters, plant tissue culture breakthroughs, and the chemical profiling of Alphonso mangoes. The gallery also recognises NCL's role during the Bhopal Gas Disaster, honouring scientists who contributed to remediation and policy shaping. Award corners celebrate NCL luminaries - Shanti Swarup Bhatnagar laureates, Padma award recipients and Fellows of the Royal Society.

The third gallery, organised around seven strategic themes - Clean Energy, C1 Chemistry, Circular Economy, Biomass Conversion, Agritech, Bio-therapeutics and Industrial Microbiology - reveals NCL's vision for sustainable, AI-integrated science. Interactive exhibits include a 3D-printed model of India's first hydrogen fuel cell-powered catamaran, pilot plant models derived from NCL innovations, and a transparent touchscreen embedded with a working PEM fuel cell, allowing visitors to peer into its inner workings.

A digital kiosk offers access to over 15,000 archival items - photographs, documents, patent records, journal covers, news clippings - bridging archive and access. Another display spotlights the National Collection of Industrial Microorganisms (NCIM), underscoring the lab's microbial resource leadership.

Venture Center - India's first deep-tech incubator - receives special attention, showcasing NCL's spin-offs and startup ecosystem. The gallery highlights AI/ML-driven efforts in materials design, process intensification, and bioinformatics.

WHY THE MUSEUM MATTERS

In an age where science evolves rapidly, the Archives & Science Museum anchors visitors in a continuum - from ancient metallurgy and perfumery systems to hydrogen-powered vessels and microbial repositories. It links scholarship, industry, public science and heritage.



Every artifact, exhibit, and story is an invitation: to students, entrepreneurs, and researchers alike; to envision how fundamental chemical science becomes transformative technology. By spotlighting NCL's spin-offs, patents, and industry collaborations, the museum underscores the ethos that innovation thrives at the intersection of public research and industrial application.

This museum exemplifies inclusive engagement through Arabic, Marathi, Hindi, and English labels, interactive kiosks, and multimedia storytelling. It transforms laboratories into public spaces and scientific archives into everyday stories.

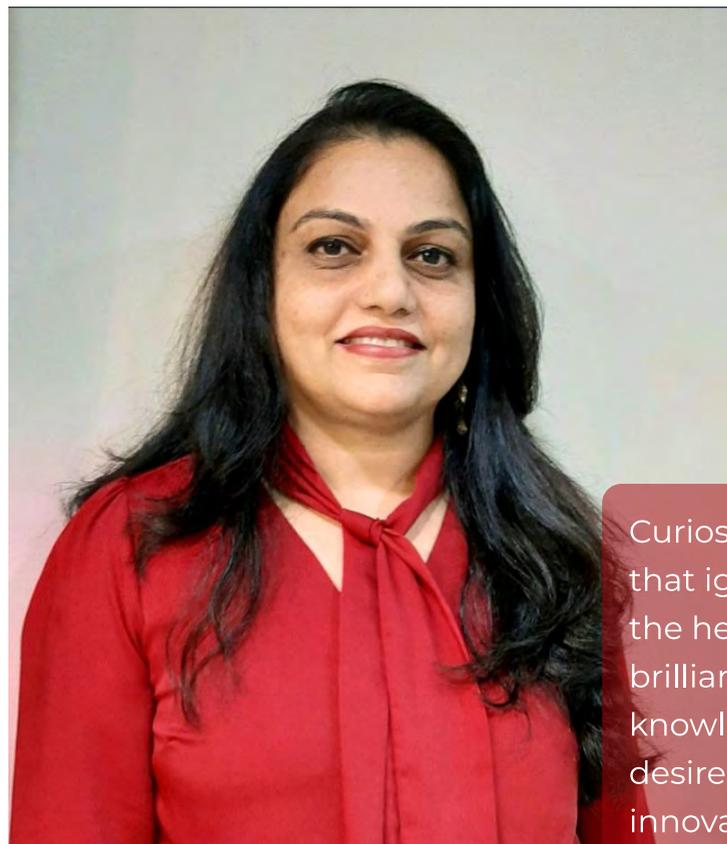
Clean energy, circular economy, biomass valorisation, and agritech reflect NCL's commitment to sustainable chemistry. The museum doesn't just talk about solutions - it models them through exhibits, protocols, and public messaging.



Institutions across India can draw inspiration from NCL's model: leveraging public archives, collaborating with multiple institutions, and building open-access repositories. The centralised resource, digital and physical, will serve academic research, policy analysis and public education for years to come. Furthermore, by engaging across disciplines - from archaeology to advanced chemical engineering - the museum stands as a rare interdisciplinary hub in India's scientific ecosystem. As CSIR- NCL looks ahead to new scientific frontiers - clean energy, bio-therapeutics, circular chemistry - the museum stands ready as both beacon and archive. It offers India a narrative of scientific evolution: rooted in ancient wisdom, shaped by public research, and propelled toward sustainable innovation. Whether you're a curious student, a story-seeking tourist, an industry innovator, or a policymaker shaping India's scientific future, the CSIR-NCL Archives & Science Museum invites you to explore a journey. From centuries-old furnaces to AI-driven labs, from ancient yantras to hydrogen-powered catamarans, this is more than a museum - it's a dialogue across time.

LEGACY BEYOND WALLS





"POWERING PROGRESS: THE JOURNEY OF DR. MANJUSHA SHELKE"

In an apartment in Pune, wrapped in the quiet hum of scientific precision, there's a balcony bursting with life. A tiny jungle grown by a woman whose hands also build batteries and is quietly engineering India's next big leap in clean energy storage. This juxtaposition is the essence of Dr. Manjusha Shelke: scientist, entrepreneur, mother, and nature-lover. A MRSI-awardee, she serves as Senior Principal Scientist at CSIR-NCL, Pune, and Co-founder of Recharging Energy.

Dr. Shelke's journey didn't begin with a grand vision or global ambition. It started with curiosity. With a love for science nurtured in a small town in Maharashtra. With questions about water pollution. With a PhD she almost didn't pursue. And with a decision to build something of her own in a system that wasn't always built for her.

"I didn't even know there was a job where you could *do research* when I was in college," she admits with a smile, recalling her early days in Nanded, Maharashtra. While peers opted for medical or engineering paths, Shelke chased her passion for science. The world of lab coats and lithium cells came much later, after marriage, a move to Bhopal and a leap of faith into a PhD.

Curiosity is the spark that ignites discovery. At the heart of our work are brilliant minds driven by knowledge and a deep desire to understand, innovate, and transform the world through research and innovation. These are the explorers of the unseen, the ones who see possibility in every molecule and progress in every reaction.

Today, she stands as one of the most formidable minds in India's energy landscape, blending deep scientific inquiry with bold entrepreneurial spirit. From her humble beginnings analysing pollutants in Bhopal's lakes to building her own battery lab at Pune's National Chemical Laboratory (NCL), every chapter of Dr. Shelke's story is stitched with curiosity, courage, and conviction.

THE SPARK THAT STARTED IT ALL

Her earliest research was environmentally driven, detecting carcinogens from immersed festival idols in lakes. But the journey to the lab was far from linear.

After completing her master's in science, she got married and moved to Bhopal, Madhya Pradesh. She registered for her PhD at CSIR-AMPRI and began her scientific career there. Her first research project focused on microfluidic devices to detect water pollutants, a subject deeply personal to her. In a city known for its lakes, Shelke developed innovative lab-on-chip devices to detect harmful aromatic amines formed from chemical idol immersions - work that combined material science with environmental urgency. This concern for nature soon led her toward energy materials.

FORGING HER PATH IN BATTERIES

A turning point came when she casually applied for an interview at NCL, encouraged by her PhD guide. She was selected for a Scientist B position in 2004 - her first-ever interview - and joined NCL's Organic Chemistry division. After a postdoctoral stint in France, she returned to NCL and shifted to physical chemistry, diving into fuel cells and, later, batteries.

Shelke became a part of India's national initiative to develop indigenous lithium-ion batteries. Her work wasn't just groundbreaking; it was strategic. Recognising India's dependency on imported raw materials, particularly from China, she began working on alternatives like sodium-ion and lithium-sulfur batteries.

Sodium-ion batteries were, at that point, unglamorous, largely overlooked. But they held potential. The chemistry was similar to that of lithium. The materials were more available. The cost, far lower. She began to experiment. Patented electrode materials. Built coin cells. But taking the leap from lab to market was another world entirely.

THE ENTREPRENEUR

While the science was flourishing, Shelke realised that the road from lab to market was full of gaps. She began exploring the idea of entrepreneurship. Collaborating with a UK-based industrial partner led to the foundation of her startup – focused on sodium-ion batteries. Through CSIR's Scientist Entrepreneurship Scheme and



guidance from NCL's Venture Centre, she founded Rechargion alongside her husband, who left his tenured professorship to become CEO and lead operations full-time.

The startup secured a pilot plant and funding from the Ministry of Heavy Industries and organisations like Social Alpha. In June 2024, they inaugurated their pilot plant. From 20 large format pouch cells a week, they aim to build 500 sodium cells daily. Now, the company is preparing to scale operations to a pre-manufacturing stage.

WOMAN. SCIENTIST. LEADER. HUMAN.

Dr. Shelke has spent her career balancing science with sensitivity. She speaks openly about the barriers women face. "Yes, biases exist. But not everything is gendered. You have to decide which battles are worth fighting," she asserts.

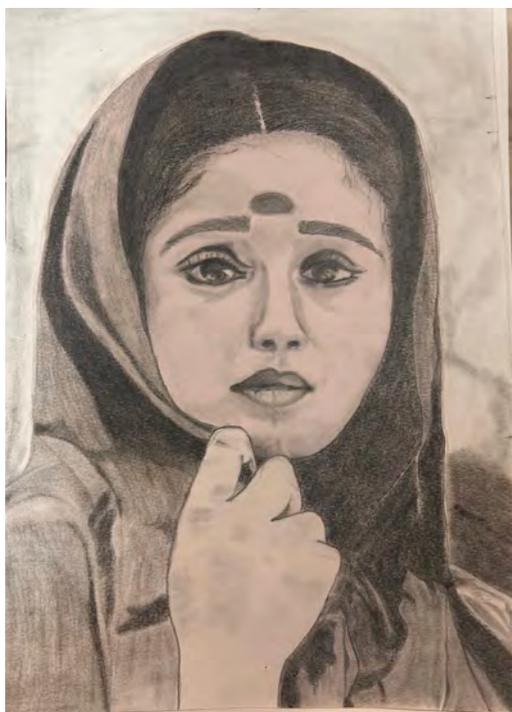
Her leadership style is thoughtful, inclusive, and rooted in dignity. She credits her growth to the support she received from mentors, colleagues and her students and believes deeply in mentoring her own students, guiding them through scientific and personal challenges.

Recognised as one of the "75 Women in Chemistry," she has become a beacon for aspiring female scientists. Yet, she questions why awards still need gender labels. "Why not just the best researchers in chemistry?" she asks.

This duality runs through her life. She is proud but critical. Grateful but unafraid to speak out. As one of the few women in battery research, she has seen how women are often brought into leadership conversations too late or too little.

Motherhood, too, shaped her profoundly. Shelke believes in living a full life. She nearly gave up on her PhD when her son was born. But family, especially her husband, stood by her. With their son grown and studying abroad, she balances work with moments of quiet domestic joy.

"Experience everything: love, motherhood, ambition." She also advises her students to stay grounded and to prioritise happiness while balancing performance pressure.



WHY SHE MATTERS

In a world obsessed with scale, speed, and flashy metrics, Dr. Manjusha Shelke offers something else: intention.

She does not measure her achievements by publications or awards. "Success," she says, "is being happy. It's when you're proud of what you've built, inside and out."

Outside the lab, she finds joy in painting, cooking, and gardening on weekends. Posting recipes to Instagram, watching films on a projector.

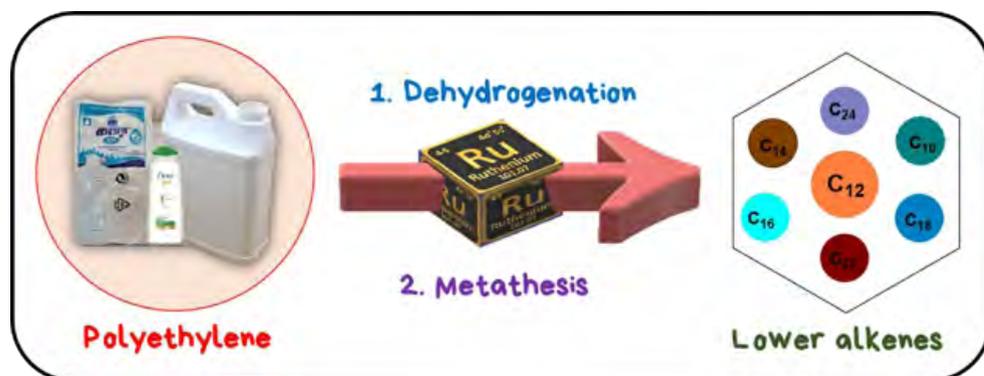
She doesn't regret the opportunities she passed up. Every decision, she insists, was made with clarity - a careful weighing of career, family, and peace of mind.

Today, she stands at a remarkable intersection - a scientist whose research could reshape energy infrastructure, an entrepreneur making that research real, and a woman who navigates all of this with quiet, deliberate courage.

Her balcony jungle remains untouched, ever-growing.

A symbol, perhaps, of what can flourish when rooted in care, resilience, and the belief that even the smallest spaces can be sites of great transformation.

UP-CYCLING PLASTIC WASTE INTO VALUE-ADDED PRODUCTS



“Researchers have developed a two-step chemical process to upcycle polyethylene, transforming plastic waste from everyday items ranging from grocery bags to shampoo bottles into valuable long-chain alkenes.”

Polyethylene (PE), the material behind everything from grocery bags to packaging wrap - is both a marvel and a menace. Durable, lightweight and cheap, PE is also stubbornly resistant to breakdown as its sturdy C-C backbone makes recycling difficult, piling up in landfills and oceans.

Researchers at the CSIR-National Chemical Laboratory in Pune, led by Dr. Samir Chikkali and Dr. Nagaraju Barsu, have developed a two-step chemical process to convert polyethylene waste into valuable long-chain alkenes, particularly dodecene (C₁₂), a versatile feedstock chemical used for various applications in industries.

The team employed a homogeneous ruthenium catalyst to facilitate the dehydrogenation of polyethylene (PE), achieving approximately 3.38% incorporation of double bonds along the polymer chains through a hydrogen-atom transfer mechanism. These strategically introduced double bonds served as molecular weak points, enabling selective cleavage and bypassing the high-energy demands typically associated with thermal recycling.

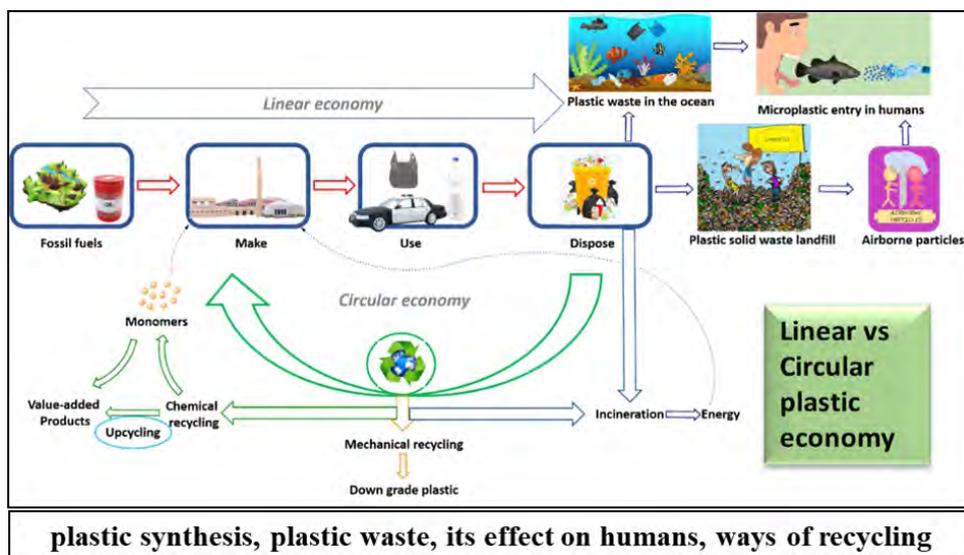
Subsequently, they performed an ethylene metathesis reaction using the Hoveyda–Grubbs II (HG-II) catalyst. Acting like molecular scissors andreassemblers, this catalyst in presence of ethylene gas cleaved the polymerchains at the newly formed double bonds and recombined the fragments into mid-length olefins predominantly dodecene (C₁₂). Impressively, dodecene constituted

about 58% of the product distribution, accompanied by other long-chain alkenes. The terminal-to-internal olefin ratio was measured at approximately 1:0.8.

The entire process was conducted under mild conditions, offering a smooth and modular approach without harsh reaction environments or complex purification steps. Each stage was thoroughly characterized: nuclear magnetic resonance (NMR) spectroscopy confirmed double bond formation; gel permeation chromatography (GPC) tracked polymer chain scission; and differential scanning calorimetry (DSC) revealed thermal changes indicative of unsaturation and fragmentation.

This method offers several advantages. It provides a way to recycle plastic waste into valuable chemicals, reducing environmental pollution. Instead of producing generic fuels or low-grade oil, the process yields economically valuable α -olefins, essential for detergents, lubricants, or specialty polymers. The dual-catalyst strategy, combining dehydrogenation and metathesis, could be adapted for other polyolefins, widening its reach.

Avoiding harsh thermal or hydrogenolysis conditions, the reaction preserves valuable material and reduces energy costs. It exemplifies circular economy principles; turning rigid plastic waste into reusable chemical feedstocks. The process offers an end-of-life sustainable solution to plastic waste management and chemical production.



“The process of converting waste polyethylene into dodecene represents more than efficient recycling; it offers a pathway to a circular economy where materials are upcycled into superior products.”

Ganeshdev Padhi, Kishor V. Khopade,
Nageswararao Moyilla,
Raghavendrakumar Rangappa,
Samir H. Chikkali*, Nagaraju Barsu*

Ruthenium-Catalyzed Deconstruction of Polyolefins: A Strategy to Up-cycle Waste Polyethylene to Value-Added Alkene

First published: 22 January 2025

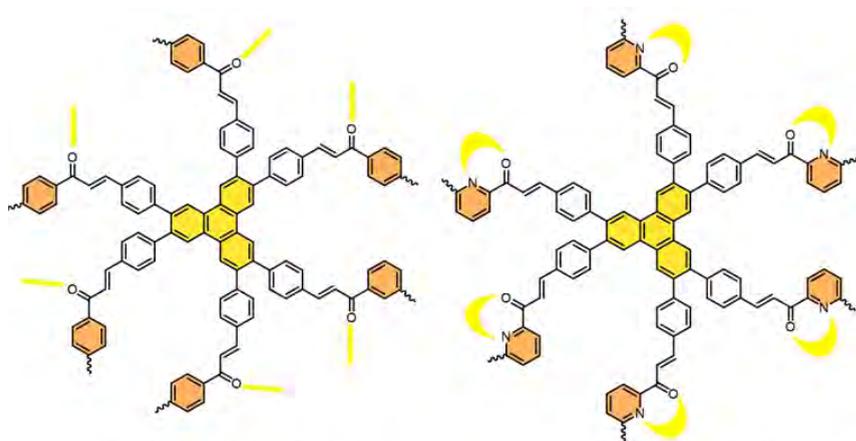
DOI:

<https://doi.org/10.1002/anie.202422609>

This work establishes a novel and effective catalytic process for the chemical up-cycling of polyethylene (PE) into high-value alkenes. By delivering precision-targeted transformation of waste PE into valuable chemical intermediates under mild conditions, this approach demonstrates significant advantages over traditional hydrogenolysis or pyrolysis methods.

While promising, several hurdles remain. The use of ruthenium and HG-II catalysts introduces cost considerations and demands efficient catalyst recovery strategies. Potential future directions include adapting the process to yield selective olefins (like C₁₀ to C₁₄), improving catalyst recyclability, and integrating within existing recycling infrastructures.

CHALCONE-LINKED NANOGRAPHENE COFS TO ENHANCE LITHIUM-SULFUR BATTERY EFFICIENCY



One point attraction with polysulfide

Two points attraction with polysulfide

Kayaramkodath Chandran Ranjeesh, Bharathkumar H. Javaregowda, Safa Gaber, Preeti Bhauriyal, Sushil Kumar, Tina Skorjanc, Matjaž Finšgar, Thomas Heine, Kothandam Krishnamoorthy,* Dinesh Shetty*

Heteroatom-Synergistic Effect on Anchoring Polysulfides In Chalcone-Linked Nanographene Covalent Organic Frameworks for High-Performance Li-S Batteries

First published: 25 February 2025

DOI:

<https://doi.org/10.1002/adv.202415897problem>
known as shuttle effect.

Imagine your electronics lasting days instead of just hours or electric cars driving hundreds of miles on a single charge. Today the smartphones, electric cars, and solar storage systems mostly use lithium-ion batteries. But there's a problem; they are expensive, limited in capacity and not always environmentally friendly. That's where lithium-sulfur (Li-S) batteries come in.

Lithium-ion batteries are great, but they're hitting physical limits. In contrast, Li-S batteries could store up to 4-5 times more energy. They also use sulfur, which is inexpensive and abundant. Sounds perfect, right? So why aren't we using them already? One big challenge, they wear out too quickly. Inside a Li-S battery, energy is stored and released through chemical reactions

involving sulfur and lithium. During this process, soluble lithium polysulfides (LiPSs) form and start to float around inside the battery. Due to loss of active material, the battery loses its energy, a To solve this problem, Dr K.

Krishnamoorthy and his team at CSIR-NCL and Professor Dinesh Shetty's group at Khalifa University have built a new material made from carbon-based building blocks called covalent organic frameworks that are structurally similar to nanographenes. These flat sheets are excellent conductors of electricity and have tiny pockets that can trap the troublesome polysulfides.

But there's more, they have also added heteroatoms, like oxygen and nitrogen, into the COF design. These atoms are naturally good at grabbing and holding onto lithium polysulfides, keeping them in place and stopping the shuttle effect.

Backed by Computer Simulations; the researchers also used advanced computer models, known as density functional theory (DFT), to understand how the material works on a molecular level. These simulations showed how the sticky atoms attract and hold onto the lithium polysulfides, explaining the excellent performance.

In a nutshell, by building molecular “sponges” with right chemical “hooks” and electrical channels, scientists have created a smart material design that; captures escape-prone sulfur compounds, stops performance loss over time and boosts energy storage power. The findings in this study could lead to commercially viable Li-S batteries that are cheaper, lighter and longer-lasting.

“Li-S batteries can store much more energy than traditional lithium-ion batteries. They're also cheaper to make and better for the environment.”

CO PRODUCTION FROM CO₂ USING CU-CO CATALYST ON CERIA-ZIRCONIA

Imagine turning harmful carbon dioxide into a valuable gas - even when hydrogen is in short supply. At CSIR-NCL in Pune, Dr. C.P. Vinod and his team have created an efficient catalyst system that does exactly that - converting CO₂ to carbon monoxide (CO). The catalyst uses tiny nanoparticles of copper (Cu) with just a tiny addition of cobalt (Co) (0.05 %), anchored on a ceria-zirconia (CZ) support enriched with oxygen vacancies.

While copper is known to drive the reverse water-gas shift (RWGS) reaction - turning CO₂ and H₂ into CO and water, cobalt generally helps make hydrocarbons like methane. By combining Cu in very low Co loading, the team tuned copper's electronic structure ("d-band center") to favor RWGS even when hydrogen is limited. CO generated via RWGS is a key component in syngas chemistry, feeding into processes that produce methanol or long-chain hydrocarbons through Fischer-Tropsch synthesis.

Anuradha Vijay Jagtap, Mahesh Kumar Bamnia, Ashakiran Maibam, Jyotsna Paliwal Bajpai, Sharad Gupta, Sharon K Thomas, Niteen B Dabke, C.P. Vinod*

Unravelling the Cu-Co Nanoparticle Synergy over Ceria-Zirconia Support toward Efficient Reverse Water Gas Shift (RWGS) Conversion under H₂ Lean Conditions

First published: 16 February 2025

DOI: <https://doi.org/10.1016/j.cej.2025.160705>

"By incorporating minimal cobalt in Copper catalysts, the overall activity is improved without compromising on the selectivity, aligning with sustainable practices in catalyst design."

"The catalyst's ability to operate efficiently under hydrogen-lean conditions makes it ideal for integrating with renewable energy sources."

The tiny addition of cobalt adjusts the d band centre of copper, reorganising how H₂ and CO₂ react and CO releases at the catalyst surface. This fine-scale tuning pushes the reaction toward CO rather than methane. The CZ support provides active sites – in the form of oxygen vacancies that facilitate CO₂ molecular activation. These vacancies are hallmarks of ceria-zirconia's high oxygen storage capacity and redox behaviour.

The Cu-Co nanoparticles sit close to the oxygen vacancy sites. This strong synergy between the metal particles and their oxygen-rich support dramatically boosts the catalyst's efficiency and selectivity.

Operating at temperatures below 500 °C, the catalyst delivers almost pure CO, even under hydrogen-limited conditions, with minimal methane or other by-products.

If scaled effectively, it opens doors to clean CO₂-emitting plants and could operate on-site using captured Co₂.

While lab-scale results are compelling, pilot-scale reactor trials are needed to assess scaling impacts and real-world viability.

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Prof. B. D. Tilak Memorial Science Day Lecture

FORMATION MECHANISMS OF MICRO AND NANOPLASTICS



In tribute to Prof. Bal Dattatreya Tilak, who directed CSIR–National Chemical Laboratory (NCL) in Pune from 1966 to 1978 and led the institution's early advances in home-grown organic chemical technologies, the NCL Research Foundation established the *Prof. B. D. Tilak Memorial Lecture Series in Chemical Sciences* in 2003.

This year's lecture, delivered on February 24, 2025, by Prof. Sanat Kumar, the Bykhovsky Professor of Chemical Engineering at Columbia University, USA, dove into one of the most urgent environmental challenges - the formation mechanisms of microplastics and nanoplastics.

Prof. Kumar began by placing his talk within the broader theme of National Science Day 2025;

“Empowering Indian Youth for Global Leadership in Science and Innovation for Viksit Bharat”, and laid out alarming statistics: approximately 500 million metric tons of plastic waste are generated annually, only 14% is collected for recycling, and merely 2% is actually recycled, while about 70% ends up in landfills where it fragments into persistent micro and nanoplastic particles.

Drawing upon his lab's experiments with semi-crystalline polymers such as PVC water pipes and PET, Prof. Kumar explained how mechanical stresses cause fragmentation: only the crystalline lamellae embedded in amorphous matrices produce polydispersed stacks of nanoplastics, whereas amorphous fragments degrade over time, leaving behind resilient crystalline particles that persist in the environment.



The highly interactive session saw lively discussion on sustainable strategies to combat micro- and nanoplastic pollution, including minimalistic design to reduce plastic waste, the use of bio-based polymers, and reengineering material microstructure to prevent nano-fragmentation at the source. Prof. Kumar

emphasized the need for interdisciplinary collaboration, uniting chemistry, materials science, mechanics, and environmental research, to better predict and mitigate plastic fragmentation. In a symbolic gesture connecting past and future, he also presented the NCL-RF Research Scholar Awards 2024 to meritorious doctoral students of CSIR-NCL, recognizing their promise in continuing science that bridges legacy and innovation.

The lecture not only honoured Prof. Tilak's contributions to indigenous chemical innovation but also affirmed CSIR-NCL's evolving mission: nurturing Indian scientific leadership equipped to address pressing global challenges like plastic pollution through rigorous research, thoughtful design and youth-led ingenuity.

ADVANCES IN SEPARATION TECHNOLOGIES

On 24 March 2025, the esteemed CSIR-National Chemical Laboratory (CSIR-NCL) in Pune hosted the Dr. L. K. Doraiswamy Memorial Lecture, a prestigious event held in the NCL Auditorium to honor the legacy of one of India's most pioneering chemical engineers. On this occasion, Prof. Man Mohan Sharma, Emeritus Professor of Eminence at ICT Mumbai and a Padma Vibhushan awardee, delivered a thought-provoking lecture titled “**Advances in Separation Technologies**”. The program commenced with an inspiring introduction by Dr. Ashish Lele, Director of CSIR-NCL, who underscored the importance of this annual lecture in remembering Dr. L. K. Doraiswamy's pioneering contributions to chemical engineering. Dr. Lele praised Prof. Sharma's six decades of leadership in the Indian chemical sector and mentorship of thousands of engineering professionals at ICT Mumbai. He also urged young researchers to nurture a spirit of innovation, advising them not to dismiss unusual experimental data, for such anomalies may well contain the seeds of groundbreaking discoveries.



Prof. Sharma's lecture traced the trajectory of separation technologies in chemical engineering, beginning with transformative improvements in distillation technology. He highlighted the benefits of reactive distillation and divided wall columns, which have significantly boosted energy efficiency and reduced capital costs. He also emphasized the growing use of heat pumps and ion-exchange resin catalysts, technologies that are reshaping traditional distillation toward more sustainable and cost-effective processes. Expanding beyond distillation, he examined advances in extraction and adsorption, noting how reactive extraction is crucial for recovering high-value chemicals in the petrochemical industry. He further explored the



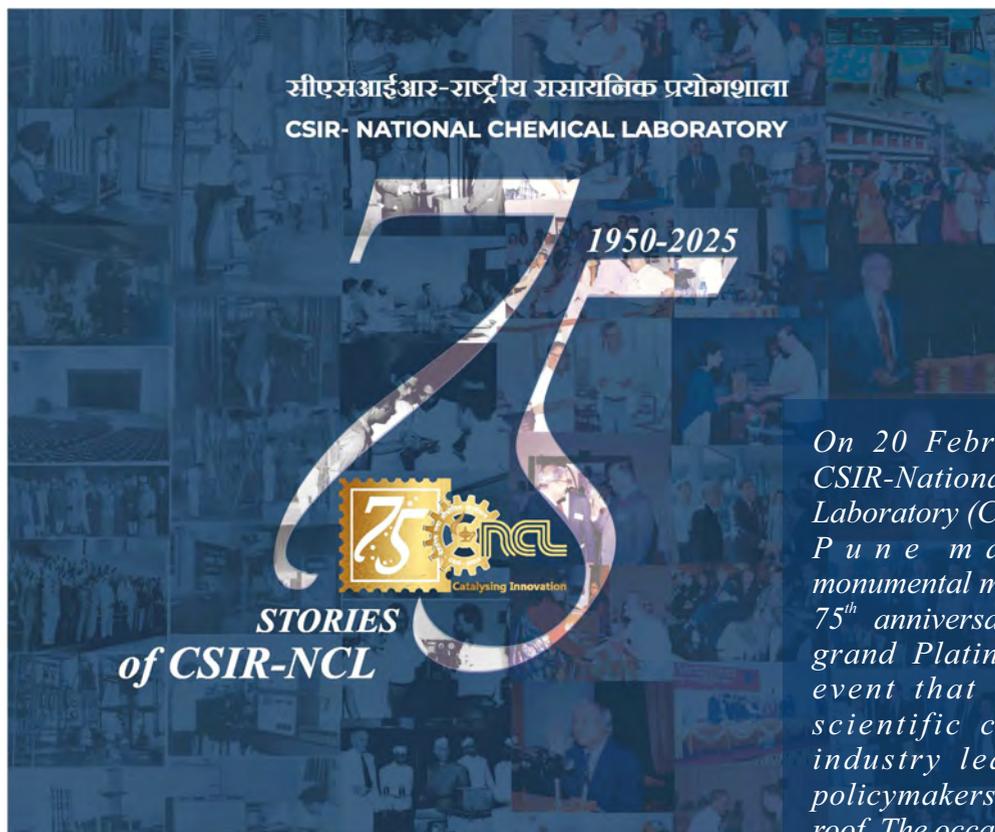
Continuing his exploration, Prof. Sharma delved into recent progress in membrane separation and crystallization technologies. He described developments in nano-filtration membranes capable of withstanding harsh operational conditions, with transformative implications for pharmaceutical and specialty chemical industries. In crystallization, he highlighted the importance of precise control over particle size, polymorphism, and solubility, which is essential for manufacturing high-purity chemical products. Across all these domains, Prof. Sharma's message was clear: innovation in separation technologies holds the key to delivering process efficiency, sustainability, and industrial competitiveness for the future.

The lecture attracted a distinguished audience of researchers, academicians, and industry professionals, while also being streamed live to engage a broader online community. With events like the Doraiswamy Lecture, CSIR-NCL continues to position itself at the forefront of scientific excellence, inspiring the next generation of scientists and engineers to carry forward its tradition of innovation and impact.



CSIR-NCL FOUNDATION DAY

Platinum Jubilee Celebrations



On 20 February 2025, CSIR-National Chemical Laboratory (CSIR-NCL) in Pune marked a monumental milestone - its 75th anniversary - with a grand Platinum Jubilee event that united the scientific community, industry leaders, and policymakers under one roof. The occasion stood as both a celebration of seven and a half decades of pioneering research and a bold statement of the laboratory's ambition for future impact.

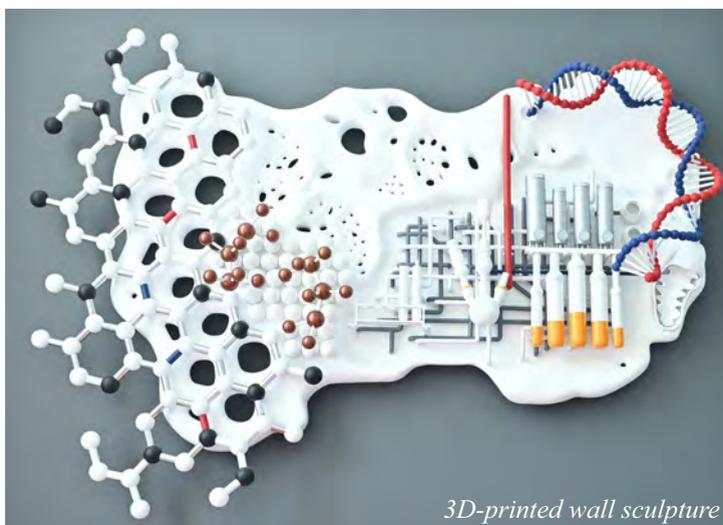
The day's backdrop featured the debut of an art-scientific marvel titled “Interfaces” - a stunning 3D-printed wall sculpture melding science, engineering, and art in one immersive visual narrative. It offered a fitting prelude to the event's theme: CSIR-NCL's dedication to interdisciplinary innovation and bridging diverse spheres of inquiry.

In his keynote opening, Dr. Ashish Lele, Director of CSIR-NCL, presented a comprehensive review of the

institute's achievements in 2024, while unveiling its ambitious Science,

Innovation, and Technology Roadmap for 2021–2030. He highlighted major contributions in chemistry, materials science, and transformations within industrial applications, while outlining future challenges and strategic interventions to ensure continued excellence.

The event's distinguished attendees included Padma Bhushan Dr. Kiran Mazumdar-Shaw, Chairperson of Biocon Group, as Chief Guest, and Padma Vibhushan Dr. Raghunath Mashelkar, former Director General of CSIR, as Guest of Honour. Dr. Mazumdar-Shaw began her address by recalling her first visit to CSIR-NCL in 1989, praising its longstanding culture of innovation. She underscored the urgency for India to develop *new medicines and advanced technologies*, pointing out that India's cost-efficient innovation environment provides a competitive edge in the global arena. Her address also spotlighted the transformative potential of Artificial Intelligence (AI) and Quantum



3D-printed wall sculpture



Computing in biosciences, urging researchers to embrace these disruptive technologies as India enters a golden era in healthcare and biotechnology.

Dr. Raghunath Mashelkar followed with reflections on CSIR-NCL's enduring contributions to science and society. He enumerated five foundational breakthroughs that originated at the lab and emphasized its role in addressing critical industrial crises—most notably the Bhopal gas tragedy and the Maharashtra Gas Cracker Complex blast. Beyond crisis management, Dr. Mashelkar praised NCL's leadership in India's Intellectual Property Rights (IPR) movement and noted the lab's distinction in securing a World Bank consultancy contract, observing that ground-breaking ideas, not the size of the budget, drive real impact.

A major highlight of the celebration was the release of Platinum Jubilee special publications, including *CSIR-NCL 75 Stories – Coffee Table Book*, the 3rd edition of *Flora and Fauna on CSIR-NCL Campus*, and *Allotrope's Platinum Jubilee Special Issue*. During the ceremony, the NCL Research Foundation Awards were also presented to individuals and teams who made notable contributions in research, innovation, and institutional initiatives throughout the year.

The celebrations culminated with the inauguration of CSIR-NCL's "Archives and Science Museum," which captures the laboratory's rich legacy in both physical and digital formats. The museum showcases the early origins of chemistry in India, the birth of CSIR-NCL coinciding with India's independence, significant achievements over the past 75



years, current research and technology development focus, and aspirations for the future.

The Platinum Jubilee celebrations not only honoured CSIR-NCL's accomplishments but also set the stage for future endeavours in scientific discovery and societal impact.

UK-INDIA PARTNERSHIP LAUNCHES "LIVING LABORATORY" TO BOOST PHARMA INDUSTRY DECARBONISATION



In a groundbreaking collaboration, the UK's Centre for Process Innovation (CPI) and India's CSIR-National Chemical Laboratory (CSIR-NCL) inaugurated a state-of-the-art 'Living Lab' on 20th February 2025. This facility is poised to revolutionize pharmaceutical manufacturing by providing a testbed for advanced, sustainable technologies that aim to significantly reduce greenhouse gas emissions and enhance productivity.

The 'Living Lab' is a joint venture between CPI and CSIR-NCL, supported by funding from both the UK and Indian governments, as well as industry partners. CPI, a deep-tech innovation organization and a founding member of the Innovate UK Catapult Network, leads the UK efforts in this initiative. CSIR-NCL, a premier research and development institute in India, leads the Indian efforts. Together, they aim to de-risk and scale up advanced manufacturing technologies that support the pharmaceutical industry's move towards net-zero targets.

The facility focuses on two key areas: continuous manufacturing and solvent-free manufacturing methods. Continuous manufacturing is recognized as a more sustainable and efficient alternative to traditional batch manufacturing. Incorporating solvent-free reactions is expected to significantly reduce the quantity of hazardous waste generated during pharmaceutical manufacturing. These greener practices will enable companies to adhere to Scope 3 targets by reducing indirect greenhouse gas emissions, thereby facilitating access to European markets. Several pharmaceutical companies have already joined the partnership, including Sun Pharma, Aarti Industries, Alivus

Life Sciences, USV, Anthem Biosciences, Corning, and GMM-Pfandler. These companies will collaborate with CPI and CSIR-NCL to develop world-leading manufacturing practices. The involvement of mid-size companies in the Industry Consortium of Continuous Manufacturing further underscores the collective effort to experience

Dr. Arun Harish, Chief Strategy Officer at CPI, emphasized the significance of the 'Living Lab' as a new collaborative model that enables the real-world demonstration and scaling of greener technologies, with the potential to significantly advance industrial decarbonization and productivity. Dr. Ashish Lele, Director of CSIR-NCL, described the lab as a pioneering testbed that will help Indian industries transition from traditional batch processes to more efficient continuous manufacturing, reducing emissions and effluents. Supporting



this perspective, Sudarshan Jain, Secretary-General of the Indian Pharmaceutical Alliance, highlighted continuous manufacturing as a key enabler of operational excellence. He noted the increasing global regulatory acceptance, citing the FDA's approval of over a dozen CM-based drugs and expressed confidence that the Living Lab will further catalyze smart automation, innovation and global leadership in pharma manufacturing.

The inauguration of the 'Living Lab' marks a significant step towards sustainable pharmaceutical manufacturing. By providing a platform for companies to explore and implement advanced manufacturing technologies, this initiative not only aims to reduce environmental impact but also enhances the efficiency and competitiveness of the pharmaceutical industry. Innovations such as these are crucial in meeting the growing demand for medicines while adhering to sustainability goals.

REPUBLIC DAY 2025



CSIR-National Chemical Laboratory (CSIR-NCL), Pune celebrated India's 76th Republic Day on January 26, 2025, with a flag hoisting ceremony held at its campus. Dr. Ashish Lele, the Director of CSIR-NCL, hoisted the national flag during the event.



NATIONAL SAFETY WEEK

From March 4–10, 2025, CSIR-National Chemical Laboratory in Pune observed National Safety Week under the banner *“Safety and Well-being: Crucial for Viksit Bharat”* (‘सुरक्षा और कल्याण: विकसित भारत के लिए अनिवार्य’), aligning the awareness initiative with India's vision of a safe, healthy, and developed nation. More than just a calendar event, the week was a deliberate effort to embed safety as a core cultural value within the institution.

Opening the week's activities, Dr. Ashish Lele, Director of CSIR-NCL, delivered a powerful message on the role of Environment, Health & Safety (EHS) as indispensable to organisational integrity. He cautioned that even minor lapses could damage reputation, shut down operations, or eliminate livelihoods, urging that safety not be treated as a procedural obligation, but rather an ingrained everyday ethos: *“Safety should not be an afterthought—it must be learned, internalized, and applied in daily life.”*

The highlight of the event was the Safety Awareness Talk by Mansukh Patel, Head of Sustainability & Corporate EHS at Hikal Limited. He threw light on the urgent national scale of safety concerns, citing that road accidents in India claim around 150,000 lives annually, while industrial mishaps add another 50,000–55,000 deaths each year. Patel stressed that safety is a shared responsibility and that true safety culture arises when individuals internalize behaviors that transcend compliance. He detailed four stages of cultural maturity Reactive, Dependent, Independent, and Interdependent arguing that progress only comes when safety becomes instinctive and collective. Quoting Alvin Toffler, he reminded the audience that the 21st-century equivalent of illiteracy is the inability to *learn, unlearn, and relearn* especially in safety practices. Throughout the week, CSIR-NCL hosted an array of engaging activities to drive participation and awareness. The program began with a



Safety Pledge, underscoring collective commitment. Creative touches such as safety-themed banners, informational standees, video screenings, a drawing competition, and even a safety meme contest made safety both engaging and memorable. A professional safety drill demonstrated preparedness in action, while evaluation committees toured laboratories and honoured teams that exemplified best safety practices.

CSIR-NCL's approach during National Safety Week reflected a deeper institutional philosophy: that safety transcends compliance - it signals respect for life and an organisation's ethical core. Dr. Lele emphasized that safety reflects human value, not just

operational protocols, and that neglecting it jeopardizes both people and performance. He urged everyone - scientists, technicians, and support staff - to integrate safety into their daily habits, ensuring that well-being is prioritized alongside innovation and productivity.





This wasn't a standalone event. CSIR-NCL's commitment to safety is built into its structure: the institution maintains a statutory Safety Committee chaired by the Director, along with nine divisional safety committees that meet regularly to review risks and update protocols.

Researchers undergo 16 hours of mandatory safety training every six months, while routine audits cover housekeeping, PPE compliance, chemical inventories, and emergency preparedness.

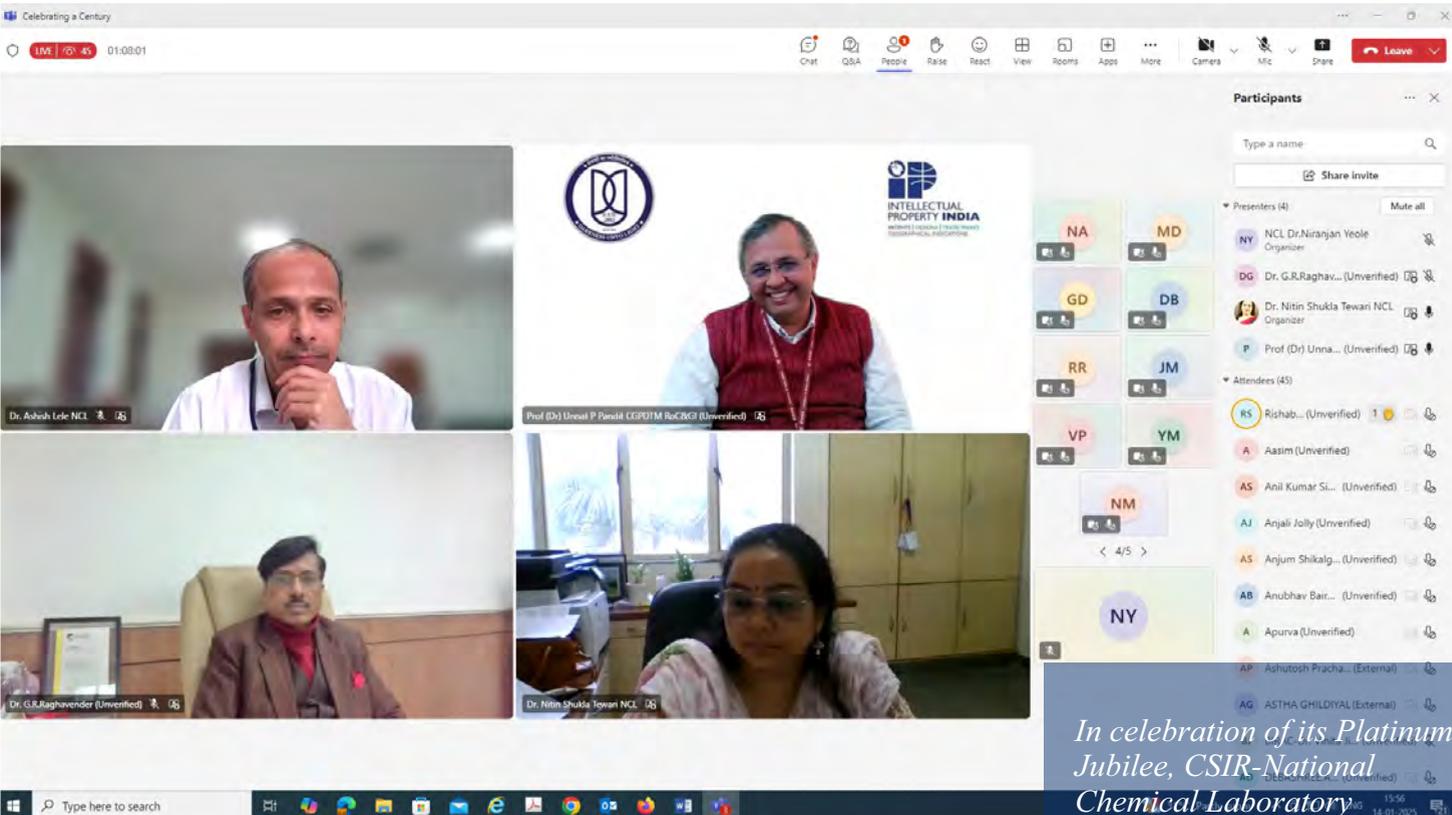
As National Safety Week 2025 concluded, CSIR-NCL left no doubt about its message: safety is foundational, never optional. By blending leadership insights, expert guidance, creative engagement, and institutional rigor, the laboratory showcased a holistic template for cultivating a safety-first culture. In doing so, it made a powerful case: as India charts a path to "Viksit Bharat," safety and well-being must be inseparable from scientific and industrial advancement.

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NATIONAL SAFETY WEEK



NATIONAL INTELLECTUAL PROPERTY AWARENESS MISSION 2.0



Spanning all 26 states, including remote regions like Leh-Ladakh, Andaman & Nicobar Islands, and Lakshadweep, the initiative trained over 10,000 participants, from academic institutions such as 12 IITs, 5 NITs, and 3 IISERs, to 15 schools, particularly targeting underrepresented Tier 2 and Tier 3 locations to democratize IP awareness.

The campaign concluded with an online valedictory session on 14 January 2025, featuring Prof. Unnat P. Pandit, Controller General of Patents & Trademarks, and Dr. Raghavender G. R., Senior Consultant at DPIIT, alongside Dr. Ashish Lele, Director of CSIR-NCL. They collectively highlighted the essential role of IP in achieving the Sustainable Development Goals and building a “Viksit Bharat”, emphasizing the transformative power of protecting and commercializing innovation.

A follow-up session on “Careers in IP”, moderated by Dr. Nitin Tewari, Head of CSIR-NCL's Intellectual Property Group, responded to participant interest by showcasing

paths in patent drafting, technology transfer, startup IP strategy, and advisory roles. Experts including Rajneesh Kumar (BITS Pilani), Shweta Uttam (IISER Pune), Dr. Shikha Rastogi (CSIR), and Dr. Vinita Jindal (DBT-BIRAC) shared insights about career opportunities and skillsets needed in this dynamic field.

By reaching deeper into India's academic and geographic heartlands, CSIR-NCL's IP campaign under NIPAM 2.0 went beyond awareness, it laid the groundwork for inclusive innovation. It underscores the lab's evolving mission to serve as a catalyst nurturing equitable scientific advancements that reach every corner of the nation.

INTERNATIONAL WOMEN'S DAY 2025

In line with the 2025

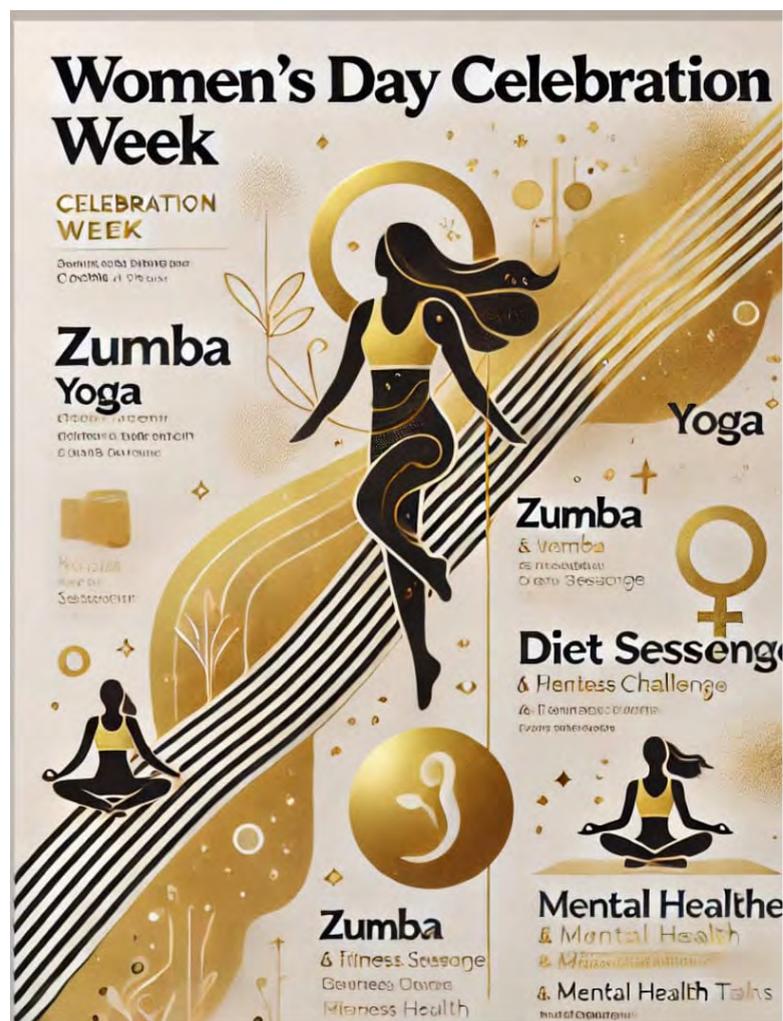
International Women's Day

theme, “Accelerate Action,” CSIR–National Chemical Laboratory (NCL) in Pune marked the occasion through a dynamic week of women centred activities, including a Women's Day Wellness Week and the Vidushi, 2025. These thoughtfully curated events promoted holistic wellness among women scientists and staff spanning physical health, mental resilience, nutritional balance, and community cohesion.

Rather than a ceremonial nod, NCL transformed the call for action into a living celebration: investing in women's overall well-being and empowerment. Through wellness workshops, health screenings, nutrition-focused sessions and shared experiences, they fostered a strong sense of community and mutual support. In doing so, the institute turned a global theme into meaningful steps toward dismantling systemic barriers and nurturing an inclusive, supportive environment for women professionals.

WOMEN'S DAY WELLNESS WEEK

The International Women's Day celebrations began Women's Day Wellness Week from March 10th-14th March, 2025. Day 1 started with an electrifying Zumba session led by Mrs. Shilpa, filled with infectious energy, upbeat music and vibrant movements that set a spirited tone for the entire celebration. On Day 2, Dr. Mansi Deshmukh delivered a thoughtful talk on mental wellness, focusing on stress management, emotional resilience, and self-care;



sparkling meaningful conversations about the importance of prioritizing mental health. Midweek, Day 3 offered a serene and grounding yoga and breathwork session by Mrs. Smita Godbole, introducing simple asanas and breathing techniques to support daily mindfulness and flexibility. Day 4 featured Dr. Varsha Pherwani, who guided participants through a practical discussion on nutrition, debunking myths and offering actionable advice to foster healthier dietary habits. The week culminated on Day 5 with a dynamic Fitness Challenge arranged by Dr. Pooja Raut, comprising exercises designed to test stamina, strength, and flexibility - instilling a sense of camaraderie and friendly competition among all participants.

Participants lauded the event's enthusiastic tone, noting a renewed focus on physical activity, emotional balance, and community bonding. The blend of dynamic workouts, reflective sessions, and practical health guidance created a comprehensive wellness experience.



This celebration resonated deeply with the IWD mission: moving from pledge to practice, from awareness to action. From high-energy Zumba and yoga poses to thoughtful discussions and fitness triumphs, the week's photos beautifully captured moments of joy, unity, and learning - reminding us that wellness and empowerment are intertwined.

NCL Pune's Women's Day Wellness Week embodied the essence of "Accelerate Action" - turning global aspirations into local, meaningful experiences. By fostering well-being, resilience, and community, NCL isn't just celebrating women - it's empowering them to thrive.

Pooja Raut
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VIDUSHI-2025

In collaboration with the Indian National Young Academy of Science (INYAS), the CSIR-National Chemical Laboratory (CSIR-NCL) organised a special event titled *Vidushi 2025*, dedicated to uplifting women in STEM. Held on March 12, 2025, at the Biochemical Sciences Division, the program brought together around 80–90 M.Sc. and Ph.D. students, along with faculty from various institutions, for an afternoon of inspiration, insight, and interaction.

The event commenced with a keynote from Dr. Sharmila Mande, who reflected on her rich experiences in interdisciplinary research and her impactful transition into industry - underscoring the synergy between academic inquiry and practical application. Next, Dr. Karishma Kaushik candidly shared the lessons and hurdles she encountered while carving out her distinctive



CSIR-National Chemical Laboratory &
Indian National Young Academy of Science jointly organizes



Vidushi-2025

An inspiring event dedicated to empowering the next generation of women in science! This special program will feature renowned women scientists sharing their journeys, challenges, and achievements to motivate M.Sc. and Ph.D. students.

Why Attend?

- ✓ Gain insights from trailblazing women in STEM
- ✓ Get inspired by real-life success stories
- ✓ Network with mentors and peers
- ✓ Celebrate women's leadership in science

Speakers



Dr. Sharmila Mande
Advisor, TCS Research,
Tata Consultancy Services Ltd.



Dr. Anuja Nisal
Founder and CEO
Serigen Mediproducs



Dr. Karishma Kaushik
Executive Director
IndiaBioScience



Dr. Minal Dekhavo
Medical Affairs Lead
Dognozis

Date: 12th March 2025
Venue: Lecture Hall, Biochemical Sciences Division, CSIR-NCL
Time: 2.30 to 5.00 PM

Open to all...



scientific career, resonating deeply with emerging scholars forging their own paths.

The session continued with Dr. Minal Dakhve, whose personal and professional growth narrative emphasized the power of resilience and the importance of lifelong learning. She inspired attendees with her steadfast commitment to self-improvement. Finally, Dr. Anuya Nisal concluded the series with an engaging talk on her journey as a scientist-entrepreneur, exploring the dynamic interplay between research and innovation-driven enterprise.

The event provided a rare platform for young female researchers to engage directly with accomplished women scientists, ask questions, and glean wisdom from their experiences. Attendees expressed enthusiastic praise for the diverse spectrum of talks and the inspiration drawn from each speaker's story.

By fostering an environment rich in encouragement and motivation, the program ignited renewed dedication among young researchers, reinforcing their commitment to pursuing impactful careers in STEM.

Vidushi-2025 proved to be a significant and impactful event that encouraged and empowered the next generation of women in STEM. It also strengthened the collaborative efforts between CSIR-NCL and INYAS in promoting gender equity and excellence in scientific research. The success of the event underscores the importance of such initiatives in fostering an inclusive scientific community and inspiring future leaders in STEM.

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SYMPOSIUM, CONFERENCE, WORKSHOP

ONE-DAY WORKSHOP ON INTELLECTUAL PROPERTY RIGHTS (IPR)

CSIR-NCL, in collaboration with the Indian Institute of Chemical Engineers (IICChE), Pune Regional Center, successfully organised a one-day IPR Workshop on 21 February 2025. Aimed primarily at research scholars and newly joined scientists, the event featured expert speakers from industry along with NCL's in-house IPR team.

The workshop explored core aspects of intellectual property, including patent filing, enforcement, technology transfer, and commercialization strategies. Through interactive case studies and practical insights, participants gained valuable exposure to navigating IP frameworks and safeguarding innovations.

Participants were guided through case studies showcasing successful IP commercialization and the role of IP in fostering innovation. The event emphasized actionable insights and encouraged engagement through Q&A sessions.

IICChE-Pune Regional Center
In association with
CSIR-National Chemical Laboratory, Pune
(As a knowledge partner)
organizes

One Day Workshop
on
Intellectual Property Rights (IPR)
21st February, 2025

Topics to be Covered

- Forms of Intellectual Property
- Reading a Patent Document
- Search Engines
- Patentability
- Filing, Examination, and Prosecution
- Enforcement of IP
- Technology Transfer

Who should attend

- Students
- Researchers and Academicians
- Startups and Entrepreneurs
- Industry/Corporate Professionals
- Inventors and Innovators

Speakers

Mr. Ashutosh Prachand
Regional Head, IICChE
Division, Intellectual Prop. Pvt. Ltd., Pune

Dr. M. D. Kulkarni
IICChE, Pune

Dr. Manjit Lall
Tech Transfer Officer,
NCL, Pune

Dr. Niranjani Yeole,
National Intellectual Property Division,
CSIR-NCL, Pune

Mr. Nilesh Pandit
Lead IPR Specialist,
Tech Commercialization Services, Pune

Dr. Nikin Tewari,
Senior Research Scientist & Head,
IP Group, CSIR-NCL, Pune

For detailed program schedule and profile of experts, kindly visit our website www.ijcprc.com

Registration Fees

Faculty / Scientist / Industry Professionals: Rs. 1500
Postgraduate Students & PhD Scholars: Rs. 1000
Undergraduate Students: Rs. 700
10% discount for IICChE Members

Registration fees to be deposited in account:
Account Name: MR ICE (PRC)
Bank Name: State Bank of India
Branch: Kaveri Nagar, Pune
Account No.: 1146421247

Note: All registered participants will receive a participation certificate upon attending the program.

Organizing Committee

Dr. Sanjay Kambale
Principal Scientist, NCL, Pune

Dr. Suresh Kumar Tarafkar
Asst. Prof. And Dean SA, IICChE, Pune

Dr. Shaohank Galwad
Scientist, NCL, Pune

Dr. Manik Deosarkar
Prof. & Head Chemical, IIT Pune

Dr. Utkarsh Maheshwari
Secretary, IICChE-PRC

Dr. Vinay Bhandari
Chairman, IICChE-PRC

Venue: CSIR-National Chemical Laboratory, Hosi Bhabha Road, Pashan, Pune

Contact details: Mobile: 9423055351, email: sugptarafkar@gmail.com

For details visit: www.ijcprc.com

9TH GREEN & SUSTAINABLE CHEMISTRY CONFERENCE 2025

The 9th Green & Sustainable Chemistry Conference, organized by Elsevier in collaboration with CSIR-NCL, convened leading scientists, researchers, and industry experts from around the world at the CSIR-NCL auditorium in Pune. Held from 4 to 6 March 2025, the conference featured a comprehensive program encompassing keynote lectures, technical sessions, poster presentations, and workshops.

The event commenced with an opening address by Rob van Daalen from Elsevier. The conference covered a wide array of topics, including sustainable chemistry and climate

mitigation, energy conversion and storage, chemical recycling of waste, and the hydrogen economy. Speakers shared insights into sustainable practices and innovations in their respective fields. A significant highlight was the presentation of the Elsevier Foundation Chemistry for Climate Action Challenge finalists, showcasing innovative solutions addressing climate change through chemistry.

The standout element of the conference was its interactive poster sessions, where researchers presented their latest findings in green and sustainable chemistry. The event concluded with a Reaxys workshop and a closing lecture, followed by the announcement of prize winners, marking a successful gathering that reinforced the global commitment to advancing green and sustainable chemistry.

SYMPOSIUM ON RECENT ADVANCES IN ORGANIC CHEMISTRY AND CATALYSIS-2025

On March 19, 2025, the Organic Chemistry Division of CSIR-NCL organised a mini-symposium titled “Recent Advances in Organic Chemistry and Catalysis-2025”. The event featured two dynamic speaker sessions chaired by esteemed colleagues from CSIR-NCL and IISER Kolkata.

Session 1, chaired by Dr. Benudhar Punji, opened with Prof. Devarajulu Sureshkumar (IISER Kolkata) delivering an insightful talk, followed by Dr. Ramesh C. Samanta (CSIR-NCL), and concluded with Prof. Biplab Maji (IISER Kolkata). Session 2, under the guidance of Dr. Santhosh Babu S., resumed with Dr. Nagaraju Barsu (CSIR-NCL), followed by Prof. Debabrata Mukherjee (IISER Kolkata), and wrapped up with Dr. Kishor Handore (CSIR-NCL). Participants delved into various topics spanning photoredox catalysis, depolymerization, innovative synthetic methodologies, natural-product synthesis, and C–H

activation. Overall, the symposium brought together leading researchers from both CSIR-NCL and IISER Kolkata to discuss the latest developments and innovations in various areas of organic chemistry and catalysis.



SYMPOSIUM



FEATURED TECHNOLOGY OF THE QUARTER

CSIR-NCL'S ECO-FRIENDLY BIOSURFACTANT, AN ALTERNATIVE TO SYNTHETIC SURFACTANT

The Problem

Surfactants, or surface-active agents, play a crucial role in various industries and day-to-day life. They possess unique properties that allow them to reduce the surface tension between different surfaces such as liquids, gases, or solids. This allows surfactants to facilitate emulsification (mixing of immiscible liquids), foaming, wetting, and cleaning processes. They have dual nature with both water-loving (hydrophilic) and water-repelling (hydrophobic) parts. This enables them to engage with both water and oil, thereby facilitating their dispersal and removal. However, the synthetic surfactants are made from petroleum sources. They are toxic and harmful to the environment, as they do not break down easily. So, there's a need for alternatives that are non-toxic, break down naturally, and can be made from renewable resources.

***Synopsis:** CSIR-National Chemical Laboratory (CSIR-NCL) has developed a cost-effective method utilizing marine bacterial species to create thermostable bio-surfactants, providing an eco-friendly substitute for synthetic surfactants derived from petroleum. These bio-surfactants demonstrate outstanding characteristics suitable for applications in agriculture, oil recovery, and bioremediation. This technology represents a noteworthy and cost-efficient step towards a sustainable future, mitigating environmental risks linked to synthetic surfactants.*

Biosurfactants are surface-active biomolecules that are mainly produced at the microbial cell surface and offer biodegradability and lower toxicity as compared to synthetic surfactants. They work well in a wide range of operating conditions. However, they're not widely used in market space due to high production costs. Therefore, the discovery of novel biosurfactants that perform effectively in diverse environments and are economically viable to produce could be a transformative breakthrough

The Solution:

CSIR-NCL has developed an economical process for the production and recovery of novel thermostable bio-surfactants. The production is achieved within a 12-hour timeframe in a single-component medium, using a bacterial species. The resulting biosurfactants exhibit exceptional emulsification and oil displacement properties across a broad temperature range of 30 to 160°C, pH levels from 6 to 12, and high salinity up to 50 g/L NaCl. Notably, these biosurfactants prove highly effective as spreaders for pesticide formulations. They are available in both solution and dry powder forms, presenting promising applications in agriculture, oil recovery, and bioremediation.

Details of technological offerings:

- Isolation and characterization of a safe and efficacious bacterial strain
- Evaluation/Screening of surfactant activities
- Assessment for oil displacement, emulsification, and surface tension properties over time
- Determination of toxicity and biodegradability under varying conditions
- Wettability and Enhanced oil recovery studies for applications in diverse fields
- Optimized, validated, and scaled-up process to a 14-liter fermenter, ready for larger production

Value proposition:

- **Economical Process:**
 - Utilizes low-cost raw materials
 - Single media component simplifies the production process, reducing complexity
 - A short incubation time of 12-24 hours enhances efficiency and accelerates production.

Technology Management Group

asktmg@ncl.res.in

- **Thermostable Biosurfactant:**
 - Exhibits thermostable properties, maintaining stability over a wide temperature range.
 - Demonstrates resilience across varying pH levels
 - Stable in high salinity environments up to 50 g/L NaCl
- **Superior Spray Coverage:**
 - Provides superior spray coverage with low volume
 - Enhances the efficiency of application
- **Deposition and Retention Properties:**
 - Shows better deposition and retention properties on plant surfaces when used with agricultural chemicals.
 - Facilitates improved adherence and prolonged effectiveness of agricultural chemicals on treated surfaces.

These features makes this technology suitable for applications in agriculture, ensuring efficient coverage, stability under various conditions, and enhanced performance.

Market Potential:

The global biosurfactants market size is expected to grow from USD 1.25 billion in 2022 to USD 3.16 billion by 2030. It is estimated to grow at a CAGR of 12.3% during the forecast period 2022-2030

Applications:

The present invention relates to bio-surfactants with excellent emulsification and oil displacement activity for applications in agriculture (to reduce the amount of pesticide used without compromising its efficiency) and, oil recovery and bioremediation (to separate oil from contaminated sand along with water resources)

Current status of innovation

The process for the production and recovery of a bio-surfactant extract from microbial origin has been

demonstrated. The process is scaled up to a 14L fermenter batch. The consistency of the product has been validated.

Future perspective:

CSIR-NCL has protected this innovation with national and international patents. This technology offers the potential to fulfill the need for an economical production process of a biosurfactant with efficient activity. In summary, biosurfactant developed by CSIR-NCL provides a sustainable solution to the environmental risks associated with synthetic surfactants derived from petroleum. This cost-effective production process, utilizing a marine bacterial species, yields thermostable biosurfactants with broad applications in agriculture, oil recovery, and bioremediation.

MOUs/ MOAs SIGNED (Jan to Mar 2025)

Sr. No.	Client Name	Title of MoU/ MoA	Project Leader
1	Horiba India Private Limited	Electrolyser Multi-cell/Short Stacks Testing Platform	Dr. Rajesh Kanawade
2	Sun Pharma Laboratories Limited	To develop Approaches for decarbonization of Indian chemical industry (Fine & Specialty Chemicals & Pharmaceutical Industry)	Dr. Amol Kulkarni

TECHNOLOGY TRANSFERS

Sr. No.	Client Name	Title of MoU/ MoA	Project Leader
1	Hydrozen Future Tech Private Limited	Fuel Cell Test Station for Testing of LTPEMFC and HTPEMFC Fuel Cell Stacks	Mr. Swapnil Aherrao
2	Prakruti Environmental Engineers LLP	Vortex Diode and Surface Coated Cavitation Reactors for Water and Waste Water Treatment	Dr. Sanjay Kamble
3	Alivus Lifesciences Limited	Continuous Process for the Production of Paracetamol using Acetic anhydride	Dr. Amol Kulkarni
4	Alivus Lifesciences Limited	Continuous Production of Metformin Hydrochloride	Dr. Amol Kulkarni
5	Horiba India Private Limited	Electrolyser Multi-cell/Short Stacks Testing Platform	Dr. Rajesh Kanawade

TECHNOLOGIES AVAILABLE FOR LICENSING

Sr. No.	Technology	Sector
1	Continuous catalytic process for the production of 4,4' Bisphenol-A (BPA)	Chemical
2	Novel, Eco-friendly & Autocatalytic process for the synthesis of Tributyl citrate (TBC)	Chemical
3	A patented catalytic process for making Diphenylmethane (DPM)	Chemical
4	Novel process platform for the manufacturing and purification of biosimilar rHu Ranibizumab	Biopharma
5	Novel process platform for the manufacturing and purification of Anakinra	Biopharma
6	Targeted glycosylation modulating process for recombinant proteins (Including monoclonal antibodies)	Health
7	Efficient manufacturing process For Na-LSX (13 X) & Li-LSX Zeolite	Specialty materials
8	Continuous process for manufacturing precision Silver Nanowires at scale	Specialty materials
9	Continuous & tunable process for the large-scale synthesis of Mesoporous & Nanoporous Silica	Specialty materials
10	Simple, eco-friendly catalytic delignification process for sugarcane bagasse (SB)	Biomass valorisation
11	Dietary Supplement Formulation of Probiotic Strain for Organic Poultry Production	Agriculture/ poultry
12	Efficient catalytic process & novel reactor design for hydrogen sulfide (H ₂ S) removal from different gas streams	Gas separation
13	Process for the novel thermostable Biosurfactant production	Environmental
14	Efficient recovery process for metals from Spent Li-ion batteries (LIBs)	Environmental

Contact:

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INSTITUTE HONORS

Institute Honors

उत्कृष्ट राजभाषा कार्यान्वयन हेतु प्रथम पुरस्कार और हिंदी पत्रिका "एनसीएल-आलोक" हेतु द्वितीय पुरस्कार

First Prize for Excellent Official Language Implementation and Second Prize for Hindi Magazine "NCL-Alok"

FACULTY RECOGNITIONS

Name of Faculty

Dr. C. P. Vinod was invited to serve as an Editorial Board Member of the journal Materials Today Sustainability, an Elsevier publication.

STUDENT ACCOMPLISHMENTS

Award and Event

Mr. Yogeshwar P. Aher received First Prize at the National Conference on New Frontiers in Polymer Chemistry for Sustainable and Green Future, organized by the Department of Chemistry, Women's Christian College, Chennai, during January 23-24, 2025.

Ms. Sonali Naik received second prize for a thesis presented at the "Saransh 2024 - 3 Minutes Thesis Competition" in the Engineering Sciences category.

NATIONAL CHEMICAL LABORATORY RESEARCH FOUNDATION



NCL RF AWARDS FOR SCIENTISTS – STAFF FOR 2023-24

The **NCL Research Foundation Awards** for 2023–24, honoring scientists, staff and research scholars, were presented by **Dr Kiran Mazumdar-Shaw** on February 20, 2025 during the Foundation Day function at CSIR-NCL.

NAME OF AWARD	AWARD WINNER
NCL RF Scientist of the Year Award For scientists in the age group above 40 years.	<p>Dr. Raja Thirumalaiswamy For his stellar contributions to heterogeneous catalysis: alkane activation and pilot-scale dehydration studies.</p> <p>Dr. Santhosh Babu Sukumaran For his pioneering synthesis of nonplanar nanographenes and graphene nanoribbons for luminescence and electrochemical applications.</p>
NCL RF Scientist of the Year Award For scientists in the age group below 40 years.	<p>Dr. Rakesh S. Joshi For his innovative work on genome to lead pathways for next generation insecticide discovery.</p>
NCL RF Award for the Best Process of the year	<p>Dr. Amol A. Kulkarni, Dr. Rajashri Jundale Dr. Nandini Devi, Shri Jayesh Sonawane Shri Anil Palghadmal (Team Members) For the process “Continuous process for mesoporous silica”.</p>
NCL RF Award for Best Commercialised Technology of the Year	<p>Dr. Amol A. Kulkarni, Dr. Gunwant Mule (SRF) Shri Sourabh Kulkarni For the process: “Continuous process for nitration of naphthalene”</p> <p>Dr. Sanjay Kamble, Dr. Sunil Bhongale Dr. Shashank G. Gaikwad, Shri Subhash B. Wanjale Shri Radhakrishna Chandekar (Team Members) Miss. Nishigandha Patil, Senior Research Scholar Dr. Rohit Shetty, PhD Research Scholar Mr. Kapil Dhotre, PhD Research Scholar Mr. Abhishek Pathak, PhD Research Scholar Miss. Komal Tarade, PhD Research Scholar Mr. Anil Patil, Senior Research Scholar Mr. Mayur Patil, Senior Research Scholar Mr. Rajendra Sanap, Senior Research Scholar Miss. Amruta Morone, Postdoc Researcher For the process: “Commercial Plant for the Continuous Production of Paracetamol”</p>

NAME OF AWARD	AWARD WINNER
NCL RF Award for “New Initiative taken by R&D Support System”	<p>Dr. Rajesh Gonnade Central Analytical Facility (CAF) Team Smt. Vaishali Yadav Network Administration Unit (NAU) In acknowledgements of their efforts to streamline analytical facilities through a transparent one-window system <i>via</i> the web portal, and their commitment to delivering services that promote research collaboration, provide technical assistance, guidance and training to their stakeholders, while addressing all their analytical requirements.</p>
NCL RF Individual Merit Award	<p>Shri Harishchandra Jagtap In acknowledgement of his dedicated and sincere service, including technical support in maintaining the infrastructural facilities of the catalysis pilot plant.</p> <p>Smt. Rea Vaidya In recognition of her dedicated commitment to successfully managing and executing the responsibilities and duties of the entire PME group.</p> <p>Shri M. B. Vadnere In appreciation of his dedicated and sincere efforts in efficiently managing the processing of salary bills and tax remittances for regular employees, as well as for all students.</p> <p>Dr. Swati Chadha In recognition of her diligent and dedicated efforts in successfully implementing the Hindi (Rajbhasha) programs, and coordinating various activities related to parliamentary inspections, invited talks, administrative and scientific programs as well as serving as the secretary of TOLIC.</p> <p>Shri Deepak Bendale In appreciation of his dedicated and sincere service in effectively overseeing the civil renovations of the laboratory premises, including laboratories and offices, in coordination with engineers, architects, contractors and scientists.</p>
NCL RF Director's Commendation Award	<p>Shri Gati Nayak, Shri Ratnesh Kumar Jha From General Administration For willingly taking up many additional responsibilities and displaying exceptional multi-tasking abilities</p> <p>Shri Mohan Suryawanshi, Shri Virendra Patil From Stores and Purchase For going beyond their normal call for duty in helping the Pune Hydrogen Valley in selection of large capex items using public procurement policy</p> <p>Shri Bhushan More From Finance and Accounts For his sincerity, dedication and meticulous work attributes in ensuring financial reconciliation and alignment of the evolving banking protocols and financial transactions with CSIR's AMS tool</p> <p>Shri. Chandrakant B. Kadbane, Mr. Siddarth Gaikwad As representatives of the Engineering Services Unit The ESU team is awarded for planning and executing large quantum of renovation work in the lab, colony, guest house and additionally, for the Platinum Jubilee celebrations.</p> <p>Shri. Sunil Patel , Dr. Pooja Raut As representatives of OWOT team. This recognition is for a team spread across multiple service groups which successfully executed the One Week One Theme event</p>

NAME OF AWARD	AWARD WINNER
NCL RF Director's Commendation Award	<p>Dr. Yogesh Mahajan, Shri Vinay Kale From Horticulture For the collection and compilation of the new edition of the book titled " Platinum Blossoms: Flora and Fauna of CSIR-NCL", and for tree plantations preferably of native tree species and ensuring the maintenance of our beautiful landscape gardens.</p> <p>Smt. Vaishali Yadav, Shri Avinash Deotale As representatives of the Network Administration Unit to the NAU team is recognized for successfully achieving ISO 27001:2022 certification for Data Centre 1, which enables physical security, cybersecurity controls, risk management, and continuous monitoring for the protection of network infrastructure and lab data.</p> <p>Smt. Shalaka Gaikaiwari , Smt. Ratnamala Vasawe As representative of NCIM team The NCIM team is being recognized for efficient management of the facility, making it one of the highest revenue earner for CSIR-NCL.</p> <p>Smt. Aruna Tapkir, Smt. Jyoti Gupta As representatives of the Medical Centre The Medical Centre team went beyond their call for duty in efficiently executing the data collection drive of CSIR's Phenome Cohort project.</p> <p>Dr. Niranjana Yeole, Dr. Nitin Tewari From Intellectual Property Group for conducting more than 100 IP awareness programs across 26 states of the country including major islands, and training over 10,000 participants. This initiative was voluntarily taken up under the National Intellectual Property Awareness Mission 2.0</p> <p>Dr. Tejas R Gaydhankar As representative of The Event Management Team For providing exceptional support to the organization of a large number of events during the Platinum Jubilee celebrations throughout the year.</p> <p>Dr. Nikhilesh Yadav As representative of the Publication and Science Communication Group For the creation of the new Allotrope quarterly magazine and production of the excellent coffee table book about CSIR-NCL on the occasion of the Platinum Jubilee.</p> <p>Dr. Wafia Masih, Dr. Vincent Paul, Dr. P. R. Suresha For organizing exciting outreach events for hundreds of school children and hands-on skill development programs for fresh undergraduates throughout the year.</p> <p>Shri Shankar Jadhav From Transport Section: for providing exceptional support to Director's office beyond the call of his normal duty.</p> <p>Dr Sunita Barve, Dr. Varun Natu, Dr. Tanmoy Patra As representatives of Archives and Museum team For going beyond their call for duty to conceptualize and execute the Archives and Museum project,</p> <p>Dr. Anu Raghunathan For going beyond her call for duty conceptualizing and executing the Interfaces mural</p> <p>Dr. Mangesh Vetal As representative of the TMG team The recognition is for team TMG for working closely with NCL scientists, Headquarters and various clients to successfully negotiate and close a large number of agreements and contracts resulting in significantly enhanced ECF for the lab</p>

BEST RESEARCH SCHOLARS - 2024

NAME OF AWARD	AWARD WINNER
Mrs. Uma Devaguptapu And Prof. Ashwini Kumar Nangia Award "best Woman Research Scholar In Interdisciplinary Research"	Ms. Neha Dambhare and, Ms. Subhashree Kanungo Best Woman Research Scholar In Interdisciplinary Research
Keerthi Sangoram Memorial Endowment Award For "best Research Scholar" In The Area Of Physical Chemistry / Materials Science, Biological Sciences, Chemical Sciences, Catalysis And Engineering Sciences.	Ms. Priyanka P. P. Physical Chemistry / Materials Science Ms. Chandini Pradhan Chemical Sciences Mr. Kailash Singh and Mr. Sreejith S. Catalysis Mr. Nitin Thorat Engineering Sciences Mr. Ashish Jagtap Biological Sciences

BEST RESEARCH PAPERS – 2024

NAME OF AWARD	AWARD WINNER
"dr. Rajappa Award" to Research Scholars / Project Assistants for "Best Published Research Paper in Organic Chemistry" with highest impact factor for the year 2024.	Ms. Kajal Title: Uncovering diverse reactivity of NHCs with diazoalkane: C–H activation, C C bond formation, and access to N-heterocyclic methylenhydrazine Journal: Chemical Science
Nanai Natu Award" to Research Scholars / Project Assistants for "Best Published Research Paper in Organic Chemistry" with second highest impact factor for the year 2024.	Mr. Vishal M. Zade Title: Synthesis of Benzofuran-6-carboxylic Acid, an Intermediate of Lifitegrast with Low-Carbon Footprints Journal: ACS Sustainable Chemistry and Engineering
Gupta – Pardeshi - Sainani Award" to Research Scholars / Project Assistants for "Best Published Research Paper in Biological Sciences" with highest impact factor for the year 2024.	Mr. Vinay Rajput Title: Early detection of KP. 2 SARS-CoV-2 variant using wastewater-based genomic surveillance in Pune, Maharashtra, India Journal: Journal of Travel Medicine
Dr. Krishnan Award to Research Scholars / Project Assistants for "Best Published Research Paper in Materials Science" with highest impact factor for the year 2024.	Ms. Priyanka P. P. Title: Cathode Electrolyte Interface Engineering by a Hydrogel Polymer Electrolyte for a 3D Porous High-Voltage Cathode Material in a Quasi-Solid-State Zinc Metal Battery by In Situ Polymerization Journal: Small

NAME OF AWARD	AWARD WINNER
<p>Dr. Krishnan Award to Research Scholars / Project Assistants for "Best Published Research Paper in Computational Sciences" with highest impact factor for the year 2024.</p>	<p>Mr. Nikhil Samudre</p> <p>Title: Quasi-molecular hydrogen storage capacity of graphene quantum dots: A dispersion corrected DFT study</p> <p>Journal: Journal of Energy Storage</p>
<p>Dr. Joshi – Dr. Sivaram Award to Research Scholars / Project Assistants for "Best Published Research Paper in Polymer Science & Organic-Inorganic Hybrid Materials" with highest impact factor for the year 2024.</p>	<p>Ms. Swati R. Dilwale</p> <p>Title: Phytic Acid Customized Hydrogel Polymer Electrolyte and Prussian Blue Analogue Cathode Material for Rechargeable Zinc Metal Hydrogel Batteries</p> <p>Journal: Small</p>
<p>Dr. B. D. Kulkarni Award to Research Scholars / Project Assistants for "Best Published Research Paper in Chemical Engineering/ Technology" with highest impact factor for the year 2024.</p>	<p>Mr. Jayesh Ramesh Sonawane</p> <p>Title: Model predicted optimization of experimental set-up and process conditions for microwave-assisted synthesis of Silver Nanowires</p> <p>Journal: Chemical Engineering Journal</p>
<p>Dr. Paul Ratnasamy And Dr. Ms. Suneeta B. Kulkarni Award to Research Scholars / Project Assistants for "Best Published Research Paper in Catalysis" with the highest impact factor for the year 2024.</p>	<p>Mr. Sidharth Barik</p> <p>Title: Breaking the Pt Electron Symmetry and OH Spillover towards PtIr Active Center for Performance Modulation in Direct Ammonia Fuel Cell</p> <p>Journal: Small</p>
<p>"dr. Pattayil Joy Award" to Research Scholars / Project Assistants for "Best Published Research Paper in Physics" with Publication in highest H-index journal for the year 2024.</p>	<p>Mr. Ehtesham Anwar</p> <p>Title: Exploring the soft pinning effect in the dynamics and the structure–dynamics correlation in multicomponent supercooled liquids</p> <p>Journal: The Journal of Chemical Physics</p>
<p>Dr. Sourav Pal Award to Research Scholars / Project Assistants for "Best Published Research Paper in Physical Chemistry/Chemical Physics" with Publication in highest H-index journal for the year 2024.</p>	<p>Ms. Athira Babu</p> <p>Title: Interlayer Space Engineering-Induced Pseudocapacitive Zinc-Ion Storage in Holey Graphene Oxide-Bearing Vertically Oriented MoS₂ Nano-Wall Array Cathode for Aqueous Rechargeable Zn Metal Batteries</p> <p>Journal: The Journal of Chemical Physics</p>

BEST PH.D THESIS AWARD – 2024

<p>Best Ph.d. Thesis Award" For The Year 2024</p>	<p>Dr. Geeta P. Kharabe</p> <p>Title: Supported Nanostructured Materials and Gel Polymer Electrolytes for Interface Engineering of Oxygen Electrocatalysts for Energy Storage and Conversion Devices Research Guide: Dr. Sreekumar Kurungot</p>
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Crafting Clarity: A Workshop on Research Article Excellence



Dr. Santhosh Babu

Mastering the Art of Clarity in Scientific Communication

17 - 01 - 2024 : 11.30 AM
SSBLT Hall-PAML Building



Exciting Prizes



The ACSIR Science Club @ CSIR-NCL



The ACSIR Science Club “SciLogY” at CSIR-NCL successfully organized a workshop on 17 January, aimed at enhancing scientific communication and writing skills among students. The event commenced with an insightful seminar on research article writing delivered by our esteemed faculty member, **Dr. Santosh Babu Sukumaran**. Dr. Sukumaran shared valuable guidance on the nuances of academic writing and effective strategies for reading and comprehending scientific literature. The seminar witnessed an enthusiastic response, with over 80 students in attendance.

Following the seminar, a hands-on workshop on **Summary Writing** was conducted, where participants were tasked with reading and summarizing a scientific article within a span of 45 minutes. The activity saw participation from **15 teams**, each comprising three students. The session was evaluated by a distinguished panel of judges, including **Dr. Santosh Babu Sukumaran, Dr. Kumar Vanka, and Dr. Benudhar Punji**.

Based on the quality and clarity of the written summaries, winners were selected by the judging panel. The top three teams were awarded cash prizes as follows:

- **First Prize:** ₹800 per student
- **Second Prize:** ₹500 per student
- **Third Prize:** ₹300 per student

The event concluded on a high note, with participants expressing appreciation for the opportunity to learn and engage. The Science Club remains committed to organizing similar events in the future to foster a strong scientific spirit and skill development among students.



SciLogY

Amrutha P. R

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Recognizing the need for a skilled and high-quality workforce relevant to current and emergent industries, CSIR-NCL has implemented a Skill Development Program under CSIR's Integrated Skill Development Initiative programs. These specifically designed and expert-led courses have been offered to upskill unemployed graduate and postgraduate students, industry staff and workers, scientists, inventors, etc. During this quarter, 4 courses were conducted which were attended by 63 participants.



Chromatographic techniques (21st December to 10th January)

This course covered in-depth hands-on training sessions and lectures on extensively used chromatographic techniques like HPLC, LC-MS, GPC, and GC-MS. At the end of this course participants were proficient in deploying these techniques for purification and separation of the constituents in a chemical compound.

Food Safety and quality assessment (3rd – 14th February)

This course focused on isolating and identifying microorganisms from contaminated food, using phenotypic and molecular techniques for bacteria, fungi, and yeast. It covered topics like 16S/18S rRNA gene sequencing and Oxford Nanopore sequencing. Practical

training included the quantitative assessment of mycotoxins, antibiotics, pesticide contamination, by-product analysis, method validation, and statistical analysis to ensure food quality and safety.

Women's Day special batch for polymer characterization by GPC techniques (3rd -5th March)

This course covered an in-detail demonstration of the gel permeation chromatography technique for polymer characterization. Aspects like Introduction to GPC Technique, History, and development, Pump, Column, and detectors, Sample method development, sample run, Analysis and troubleshooting, etc were touched upon.

Women's Day special batch for HPLC and LC-MS (10th - 11th March)

Chromatography is a crucial technique extensively employed in industry and research that facilitates the separation, identification, and purification of components of mixture for both qualitative and quantitative analysis. This course offered a brief training on the HPLC & LC-MS techniques.



CSIR-NCL PARTICIPATES IN PLASTO 2025 EXHIBITION AND SEMINAR



PLASTO 2025, a premier exhibition and seminar dedicated to advancements in plastics and polymers, was held from January 8-11, 2025, at the Pune International Exhibition and Convention Centre, Pune. The event featured cutting-edge technologies, insightful presentations, and discussions led by industry leaders, researchers, and policymakers. The seminar, held on January 10, 2025, highlighted critical topics such as sustainable design, biodegradable plastics, and recycling, drawing a significant audience from academia and the industrial sector.

PLASTO 2025

The CSIR-National Chemical Laboratory (CSIR-NCL) showcased its crucial technologies during the exhibition and actively contributed to the seminar sessions. Dr. Paresh Dhepe, a senior scientist from CSIR-NCL, participated in a key panel discussion on “Biodegradable Plastics: Challenges and Opportunities,” sharing insights into innovative research and development in the domain.

The seminar, supported by the Indian Plastics Institute (IPI), featured various engaging sessions. The event began with an inauguration and welcome address by Dr. S. Radhakrishnan (Chairman, Seminar PLASTO 2025) and Mr. N. Sankararaman (Vice President, APP), setting the tone for engaging discussions on sustainability and innovation. Key presentations included topics such as sustainable design with polymers, applications of thermoplastic elastomers (TPE) in the automotive industry, and advancements in scientific injection molding. These sessions were delivered by industry experts like Dr. Sandeep Waykole, Mr. Haresh Babu, and Dr. Suhas Kulkarni.





The seminar also featured two prominent panel discussions. The first panel, moderated by Dr. Harshwardhan Pol, focused on “Biodegradable Plastics: Challenges and Opportunities.” This session explored the environmental hazards posed by non-degradable plastics and emphasized the development of cost-effective compostable plastics. Panelists included Dr. Pramod Kumbhar from Praj Industries, Dr. Sachin Jain from SKYI, Dr. Partha Kundu from CSIR-NIIST, Dr. Paresh Dhepe from CSIR-NCL, and Mr. Vimal Katiyar from IIT Guwahati. The second panel addressed “Plastic Recycling & Sustainability” and included discussions on recycling innovations and sustainability strategies. Panelists were Mr. Harshad Barde from SWACHH, Dr. Medha Tadpatrikar from Rudra, Mr. Swapan Ray from ICPE, Mr. Srinivas Adhe from Padcare, and Mr. KRS Narayanan from RIL.

The seminar emphasized the environmental threats posed by conventional plastics and the urgent need for sustainable alternatives. Experts highlighted the development of biodegradable plastics from agricultural and industrial waste, challenges in commercializing compostable plastics due to high production costs, and strategies to promote plastic recycling and reduce environmental impact.

CSIR-NCL's active involvement in PLASTO 2025 demonstrated its commitment to fostering sustainable development in the plastics sector. The exhibition and seminar provided a platform for sharing innovative research and encouraging collaborative efforts to address the pressing environmental challenges associated with plastic use.

STUDENTS AND TEACHERS

VISIT TO NCIM

On 17 January 2025, 67 meritorious students (grades VI–X) and 9 teachers from the Latur region visited the CSIR-NCL National Collection of Industrial Microorganisms (NCIM). The event, coordinated by Dr. Snehal More and Dr. Siddharth Bhosale, included a welcome by Dr. More and a tour led by Dr. Mahesh Dharme-Head of NCIM-who explained the importance of microorganisms in agriculture and climate change.

The students, organized into three groups, toured the NCIM lab where the project students demonstrated processes like microbial isolation, cultivation, genotypic/phenotypic identification, and preservation. They observed equipment and techniques including gram staining, PCR, centrifuges, lyophilization, sequencing (Sanger, VITEK), chromatography, and fermenter operation. Researchers also discussed improving crop yields, pest management, and biosynthetic pathways. The visit concluded with Marathi-language videos showcasing CSIR-Jigyasa outreach, eco-friendly Dimethyl Ether fuel, and PPE recycling-igniting enthusiasm for microbial science among participants.

HANDS ON ROBOTICS

WORKSHOP

On 18 February 2025, as part of CSIR's Platinum Jubilee celebrations, the CSIR-National Chemical Laboratory hosted a hands-on Robotics Workshop under the CSIR-Jigyasa initiative, organized by the Science Outreach Resource Center. Two sessions were held: Batch I with 39 students and 5 teachers, and Batch II with 37 students and 4 teachers, representing 8 schools.

Dr. Wafia Masih, Senior Principal Scientist, welcomed participants with a video on Jigyasa and explained NCL's research outreach. The robotics sessions, led by Ms. Deepali Bhangale and Ms. Rashmi Sapdhare from Saras Robotics, introduced students to fundamental robotics concepts and guided them in assembling turtle robots.

During the hands-on session, students explored mechanical assembly, gear mechanisms, off-center motion, and animal-inspired structures. The team-based format sparked enthusiasm, creativity, and problem-solving skills, inspiring students to explore robotics within scientific and technological contexts.

STUDENTS AND TEACHERS PARTICIPATE IN NANO JATHA 2025

On 21 February 2025, 180 students and 11 teachers from five schools attended Nano Jatha 2025 at CSIR-NCL, Pune, celebrating CSIR's Platinum Jubilee under the Jigyasa initiative. The full-day program (9 am–5:30 pm) opened with a welcome from Dr. Wafia Masih, who highlighted CSIR's mission, Jigyasa's significance, and showcased the outreach website featuring event galleries and feedback.

The keynote, delivered by Dr. B. L. V. Prasad (Director, Centre for Nano and Soft Matter Sciences (CeNS), Bangalore & Chief Scientist at CSIR-NCL, Pune), focused on “Asking the First and Right Question” in

nanoscience, emphasizing curiosity-driven inquiry and career choices aligned with passion.

Seven hands-on nano-chemistry experiments were showcased by NCL scholars, covering gold nanoparticles, galvanic gilding, graphene circuits, fruit-juice electricity, sodium-ion batteries, piezoelectric pavements, and humidity sensors. Dr. Ashish Lele, Director of CSIR-NCL, reinforced the role of science in societal progress and encouraged student engagement. The day concluded with an interactive quiz, prize distribution, and reflective feedback, inspiring curiosity and fostering deeper scientific appreciation.

TEACHER MENTORING PROGRAMME

Science Outreach and Biochemical Sciences division at CSIR-NCL jointly, organized 'Teachers Mentoring Program' on 20th March, 2025, which was attended by 22 science teachers (grades I-VIII) from 11 Zilla Parishad schools across Maharashtra.

Dr. Ashok Giri showcased NCL's biochemical research, natural-product drug discovery, and plant–insect ecosystem dynamics, urging teachers to nurture curiosity as the foundation of scientific inquiry. Dr. Rakesh Joshi highlighted environmental challenges in agriculture, pesticide usage, and links between fertilizers and

long-term farmer health, while stressing the importance of student assessment. Dr. Shubhangi Umbarkar discussed clean fuels, green hydrogen, circular economy, DME plants, and NCL's COVID-era innovations-oxygen systems, PPE recycling, and oxygen enrichment units.

Dr. Wafia Masih concluded by presenting CSIR-Jigyasa outreach initiatives, sharing student feedback, and guiding teachers to online resources for further engagement. The program fostered impactful scientist-educator dialogue and empowered teachers to inspire STEM enthusiasm among young learners.

Novel Process for the Production of **IMEGLIMIN**

Process Highlights

- ✓ Reusable novel Heterogeneous Catalyst
- ✓ 100% Key Starting Material conversion
- ✓ Highly selective (97%) process
- ✓ High Racemic yields (up to 85%)
- ✓ Less effluent discharge
- ✓ Reduced reaction time
- ✓ Reusable solvent



IMEGLIMIN

Metformin Substitute:
Type-2 Diabetes
Treatment

Technology Available For Licensing/ Co-development

Background

- India's Type-2 diabetes cases may reach 134 million by 2045
- Prolonged use of Metformin can cause gastro intolerance & vit B-12 deficiency
- Imeglimin (TWYMEEG®), a novel & safer alternative, was launched in Japan.
- Our technology offering improves its synthesis & economics by addressing existing issues of solubility limitations, longer reaction time, more down-streaming steps & water footprints etc.

Value Proposition

- Inexpensive heterogeneous catalyst
- Scalable & Cost-effective Process
- Racemic Yield of up to 85%
- Significant reduction in wastewater Generation
- Improved solubility limitations
- Less Downstreaming steps

MARKET

- TWYMEEG® net sales in Japan has reached JPY 5 billion (USD 33 million) in 2024
- India has approved Imeglimin in January 2023

Technology Offering

Reusable Heterogeneous Catalyst

Batch Size: 10 kg

Reduced water footprint

Racemic Yield 85%

Efficient downstream protocol

Reusable Solvent

Application:
Treatment of Type-2 Diabetes

IP: IN202411037382



*Golden Shower Tree - Amaltas,
Cassia Fistula Plant*



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