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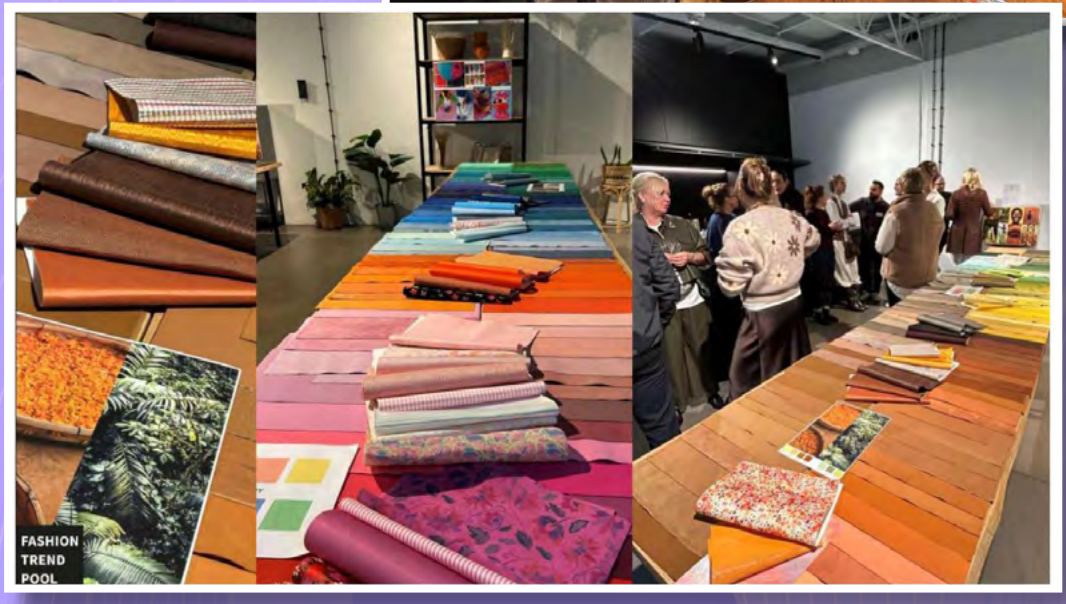
दि लेदर पोस्ट
The Leather Post

सीएसआईआर-केन्द्रीय चर्म अनुसंधान संस्थान
CSIR-Central Leather Research Institute



CSIR-CLRI at MODEUROP Colour Club Conference 2025

Director's Message

Greetings and Namaskar to the Stakeholders of the leather sector

Dr K J Sreeram
Director, CSIR-CLRI

लेदर पोस्ट के प्रिय पाठको,
हमें अतीत के उल्लेखनीय अग्रणीयों का, विशेष रूप से उनके जन्मदिन पर, समारोह मनाना बहुत पसंद है! इस वर्ष, हमने डॉ. सांतप्पा–डॉ. राघवन स्मृति व्याख्यान की मेजबानी की, जिसमें डॉ. आशीष लेले की अंतर्दृष्टि शामिल थी। हमारे अक्टूबर के द लेदर पोस्ट के अंक में कुछ रोमांचक सफलता की कहानियां दिखाई गई हैं, जिनमें मॉडयूरोप और कानपुर के अत्यधिक प्रदूषणकारी उद्योगों का निरीक्षण करने के हमारे समय पर किए गए प्रयासों के साथ–साथ हमारे आकर्षक स्वच्छता अभियान शामिल हैं।

सीएसआईआर–सीएलआरआई चर्म की अपहोल्सटरी के लिए विशिष्ट रसायनों में आत्मनिर्भर भविष्य के लिए आवश्यक महत्वपूर्ण प्रौद्योगिकीय सहायता प्रदान करने की दिशा में है।
पढ़ने का आनंद लें। सीएसआईआर–सीएलआरआई से बहुत कुछ आ रहा है!

We love celebrating the remarkable leaders of the past, especially on their birthdays! This year, we hosted the Dr. Santappa-Dr. Raghavan Memorial lecture, featuring insights from Dr. Ashish Lele.
Our October issue of The Leather Post showcases some exciting success stories, including ModEurop and our timely efforts to inspect Kanpur's grossly polluting industries, along with our engaging Swachhata campaigns. CSIR-CLRI is towards providing the vital technological support needed for a self-reliant future in specialty chemicals for leather upholstery.
Enjoy reading. There is much that is coming out of CSIR-CLRI!

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Chitosan Hydrogel Beads: A Recyclable Bio-adsorbent for Removal of Heavy Metals.

Heavy metals released into the environment become toxic when they exceed permissible limits. The quality of potable water has been deteriorating due to contamination of Heavy metals including Cupric salts [Cu(II)], bearing wastewater released by different industries. Though Cupric salts act as micronutrients and potent antimicrobial agents, excess copper ions can damage blooming, germination, fruit quality, and soil fertility. Copper ions enter the human body through contaminated water and cause hepatitis, mental deterioration, and tremors.

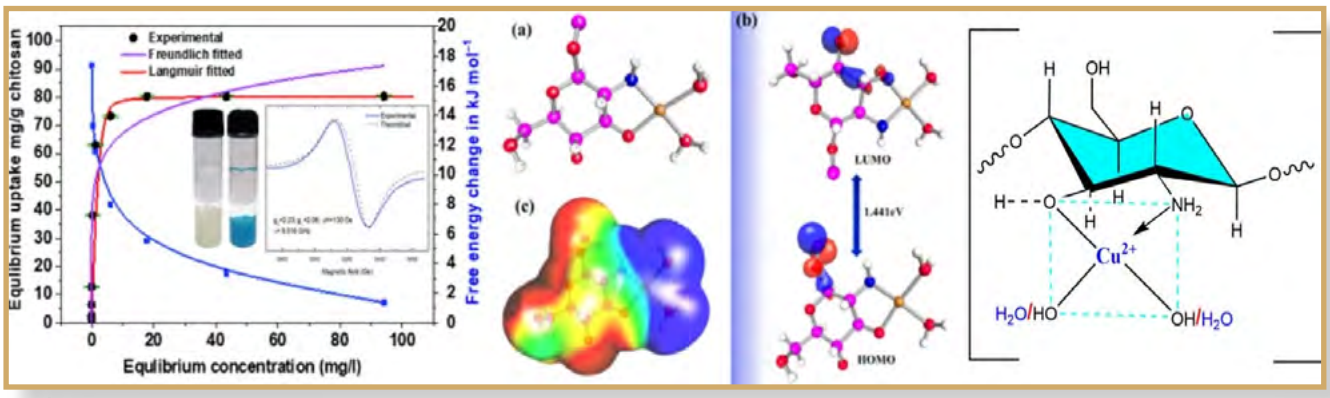
Various methods used to remove heavy metals, including chemical precipitation, electrochemical treatment, reverse osmosis, and solvent extraction. These processes are either expensive or ineffective when the metal ion concentration in water is very low. Adsorption has emerged as an efficient technique for removing heavy metals from diluted solutions using low-cost materials. One such low-cost material from biological origin is chitosan and its derivatives. Chitosan is mostly the deacetylated form of chitin, a straight-chain biopolymer of N-acetyl-D-glucosamine, which exists mainly in crustacean shells. It can also be isolated from fungi of the zygomycetes group. Its abundance, low cost, and superior adsorption capacity have made this non-toxic biopolymer a perfect adsorbent for removing toxic metals and dyes from wastewater. However, the removal efficiency depends on the source, degree of deacetylation, pH, and the physical form, such as flakes, powder, or beads. The application of swollen chitosan beads is advantageous over other forms due to their higher effective surface area.

Researchers at CSIR-CLRI have developed a chemically modified chitosan-based sustainable adsorption system for soluble metal pollutants. Here, the adsorbent is synthesized through sulphate-sulphuric acid modification of chitosan hydrogel bead, followed by optimization of physicochemical parameters. The chitosan hydrogel beads exhibited a high adsorption capacity for copper ions and greater reusability, owing to enhanced low-pH tolerance. Kinetic study further revealed that the completion of >98 % adsorption was within the first 120 min. The experimental data ascertained the multistep rate-controlling processes. Analytical techniques such as Fourier Transform Infrared Spectroscopy (FTIR), X-ray Photoelectron Spectroscopy (XPS), and Energy Dispersive X-ray Spectroscopy (EDAX) revealed the binding of copper ions with amine and hydroxyl groups at C-3 position of the glucosamine unit of chitosan. It is achieved by displacing the sulphate-containing moiety of SSmChHgBs. Copper desorption from the loaded beads was achieved by lowering the solution pH to 1.0. The SSmChHgBs can be reused more than 6 times for the removal of Cupric salts from water without significant loss of efficacy.

Sandipan Chatterjee, ArunKumar Guha , Bishnupada Chatterjee , Priyabrata Banerjee ,Nayan Ranjan Singha

Sulphate-modified chitosan hydrogel beads a recyclable bio-adsorbent for Cu(II): Experimental and theoretical studies toward nitrogen-/oxygen-donor selective binding and 1:1 complexation

International Journal of Biological Macromolecules
Volume 323, Part 1, September 2025, 146997https://
DOI: https://doi.org/10.1016/j.ijbiomac.2025.146997



Sulfonated Jatropha! Sustainability Green Alpha!! – A softening story

The name Jatropha derives from the Greek words 'jatros´ (doctor) and 'trophe´ (food), thus implying medicinal uses. Linnaeus (1753) named it the first. Jatropha is widely distributed in Central and South America, Africa, India, and South East Asia. It is a multipurpose species in its true sense- its wood and fruit can be used for numerous purposes including fuel; the seeds contain viscous oil that can be used for manufacture of candles and soap, in cosmetics industry, as a diesel/paraffin substitute or extender; it serves as a highly nutritious and economic protein supplement in animal feed; various parts of the plant are of medicinal value, its bark contains tannin, the flowers attract bees.

As for the leather sector, Jatropha oil, as a sustainable, non-edible vegetable source, is seen as a promising eco-friendly alternative to fish and fossil-fuel-based oils for both tanning and chemical softening. Whilst tanning is responsible for the conversion of low-value by-products (animal hide/skin) into value-added leathers, only the reintroduction of fatty matter restores flexibility to the leather, which was once soft and supple as a skin or hide. Conventionally, post-tanning waste stream, where petroleum-based fatliquors are major contributors, is poorly biodegradable, highly conductive, and salt-ridden. Post-tanning takes around 8.6 cubic meters of water and force-fed 360.2 kg of chemicals per ton of shaved leather. At this juncture, a team of researchers at CSIR-CLRI propose an (bio-fuelled) innovation through Sulfonated Jatropha Oil (SJO) prioritizing the fatliqouring part of the complex post tanning!

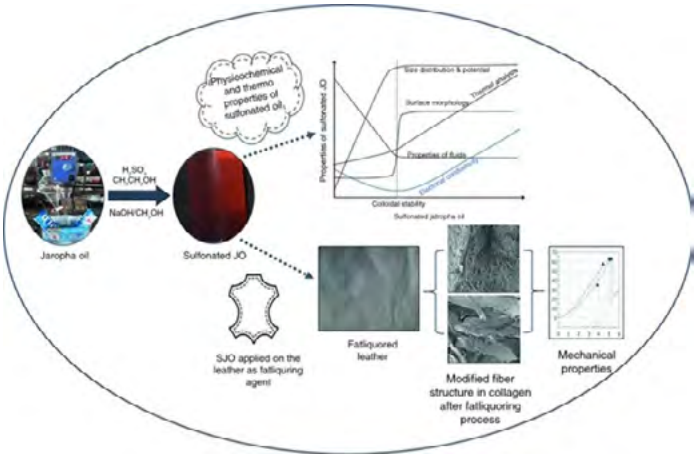
The watershed points in the fatliquoring process are: Designing an emulsion of specific particle size to enable the oil droplets to penetrate the leather, reaching up to the fibrils, thus promoting the sliding of fibrils and preventing adhesion. Retaining the desirable minimum moisture in leather is another underpinning paradox of fatliquoring! Keeping the above in view, the CSIR-CLRI team studied the sulfonation process and the physicochemical and thermal properties of sulfonated Jatropha oil (SJO) itself through a comprehensive analysis of the physicochemical properties, including electrical conductivity, viscosity, particle size, zeta potential, and surface morphology and thus confirmed the oil's enhanced functional characteristics in terms of stability, penetration, and performance thus establishing SJO as an effective and sustainable fatliquoring agent.

Choosing a waste land crop that is non-edible, more economical compared to marine oils, to be exploited in the leather sector is way clear of any conflict of interest and a brilliant step forward, promoting a circular bio-economy. In essence, this study highlights how plant-based alternatives can unfurl a greener path for leather manufacturers without compromising on quality or durability. Yes, Green Alpha can be the prized choice of Gen Alpha!

Aswini Annadurai, Mohammed Abu Javid, Md. Sayem Alam

Physicochemical and thermal properties studies of chemically modified Jatropha oil as a fatliquoring agent in leather processing

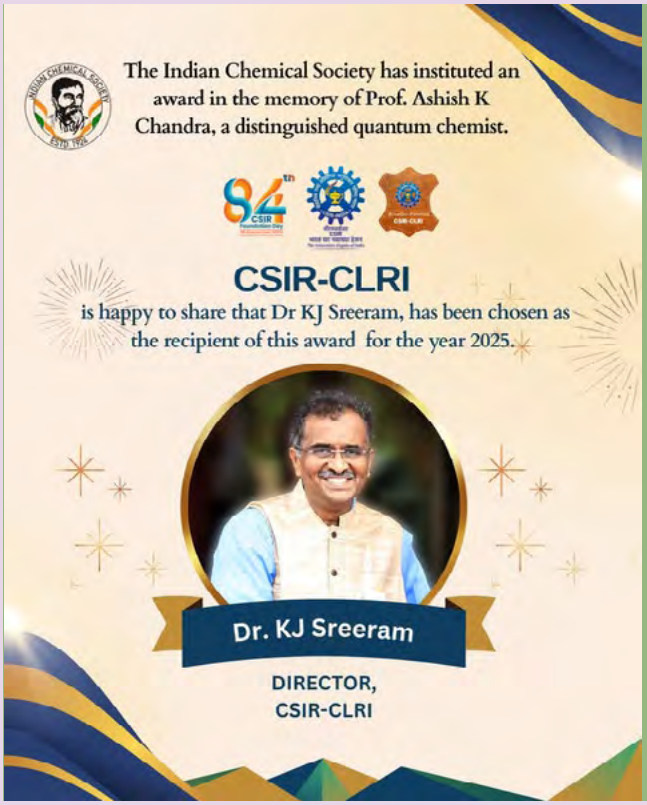
Journal of Thermal Analysis and Calorimetry (2025)
https://doi.org/10.1007/s10973-025-14899-x



Publications from CSIR-CLRI

October 2025

1	Maurya, A; Gupta, N; Singh, P; Bhutani, N; Anamika; Koner, RR; Dixit, M; Kuila, BK, Nitrogen- and Sulfur-Enriched Conjugated Polymer Network as an Electrocatalyst for the Oxygen Reduction Reaction and as a Cathode Material for Zinc-Air Batteries, ACS Applied Energy Materials, OCT 13, 2025, 8 (19), 14408-14416, 10.1021/acsaem.5c02067
2	Alva, V; Jain, P; Khan, K; Zameer, F; Kumar, PP; Prashanth, KVH; Gopal, S; Niranjan, V; Sahu, B; Ravish, H; Raghu, A; Raghavendra, HL; Apturkar, KD, Helicobacter pylori associated MicroRNA and transcriptional networks in gastric pathogenesis: Exploring the epigenetic dialogue landscape, Microbial Pathogenesis, OCT, 2025, 207, 10.1016/j.micpath.2025.107864
3	Chelliah, PAS; Palaniyandi, S; Kataki, S; Kumarasamy, L, Optimization of Substrate to Seed Inoculum Ratio for Enhanced Biogas Production from Vegetable Market Complex Waste, Journal of Environmental Engineering, OCT 1, 2025, 151 (10), 10.1061/JOEEDU.EEENG-7945
4	Sasikala, H; Meganathan, MK; Ramalingam, S, Self-healing aroma-Schiff base functionalized polyurethane for scratch resistant flexible fabrics, Progress in Organic Coatings, OCT, 2025, 207, 10.1016/j.porgcoat.2025.109431



Dr K J Sreeram has been chosen as the recipient of the Indian Chemical Society Award 2025, instituted in the memory of Prof. Asis K Chandra, a distinguished quantum chemist.

Santappa Raghavan Memorial Lecture 2025

Dr Ashish Lele, Director CSIR- National Chemical Laboratory, delivered the prestigious Santappa - Raghavan Memorial Lecture 2025 on 17 October 2025. Dr Lele spoke on the topic "*Molecular Topology to Industrial Processing of Entangled Polymers*." The memorial lecture series has been instituted to honour the exemplary contributions of Prof. M. Santappa and Dr. K. V. Raghavan. Over the years, several eminent researchers, including Prof. M. S. Ananth, Former Director, IIT Madras, Prof. S. Ramakrishnan, Professor, IISc, Bangalore, Dr. S Chandrasekhar, Former Secretary, Department of Science & Technology, Govt. of India, delivered the lecture. During the visit to CSIR-CLRI, Dr. Ashish Lele interacted with the young scientists at CSIR-CLRI and visited various R&D facilities at the Institute.

Prof. M. Santappa (02.10.1923– 26.02.2017) was a polymer chemist with double PhDs from the University of London and Manchester University in the UK. Prof. Santappa became the Director of CLRI on 1 August 1973 and continued until 1981. He was intimately connected with the programs, planning, and organization of the chemical and allied industries and was actively involved in the research and development activities of the Institute. He served as the Vice Chancellor of Sri Venkateswara University and the University of Madras. He was an elected Fellow of the Indian Academy of Sciences, the National Academy of Sciences, India, the Royal Institute of Chemistry, and the New York Academy of Sciences, and a founder fellow of the Academy of Sciences, Chennai. He received the Shanti Swarup Bhatnagar Prize, in 1967, for his contributions to chemical sciences. He was also the recipient of a degree of Doctor of Science (honoris causa) from Andhra University, Madras University, Sri Krishna Devaraya University, and Madurai Kamaraj University. The Society for Polymer Science, India, has instituted an annual award, the "Professor M. Santappa Award," in his honor, recognizing excellence in research in polymer chemistry.

Dr. K. V. Raghavan (01.10.1943 – 12.10.2017) was a Chemical Engineer with a Ph.D. from IIT, Madras. After working in IICT, Hyderabad (then RRL) and RRL Jorhat, Dr. Raghavan joined CLRI in 1986 as Scientist

'F' and then became Director, CLRI in February 1994. He has initiated and developed two important R & D divisions Viz. Chemical Engineering and Cell for Industrial Safety and Risk Analysis. During his tenure as Director, he made significant contributions for the growth of the Institute in terms of external cash flow and strengthening Institutes base as Technology Reservoir. He took over the Directorship of the Indian Institute of Chemical Technology (IICT), Hyderabad in 1996. On successful completion of this tenure, he was appointed as the Chairman of the Recruitment and Assessment Centre of DRDO, Ministry of Defense, Government of India, in May 2004. Dr. Raghavan was also an INAE Distinguished Professor since 2008 at IICT, Hyderabad. He also served on many prestigious committees. He was a recipient of several awards and recognitions, including the NRDC Invention Promotion Award, Nayudamma Gold Medal of AP Akademi of Sciences, Fellow of the National Academy of Engineering, Indian Institute of Chemical Engineers (IIChE), and A.P. Akademi of Sciences.

CSIR-CLRI at MODEUROP

Colour Club Conference 2025

The ModEurop Colour Club Conference, part of the ModEurop Trend Fashion Platform, which offers color trends and materials for the shoe and accessory industries, was held during 14-15 October 2025. During the event, 9 out of 27 colors selected were from India for Spring Summer 7. The event also had a detailed presentation by the CSIR-CLRI team.

The ModEurop Colour Club Conference is a significant event in the fashion industry, offering insights into color trends and design inspiration. The conference selects colors for the upcoming seasons and provides a platform for designers to showcase their work. It is a key event for the Indian Leather Industry, showcasing leather and color proposals developed by various tanneries. The conference also highlights the luxury of longevity and the richness of nature in all its facets.

Fashion Trend Pool Colour Circle

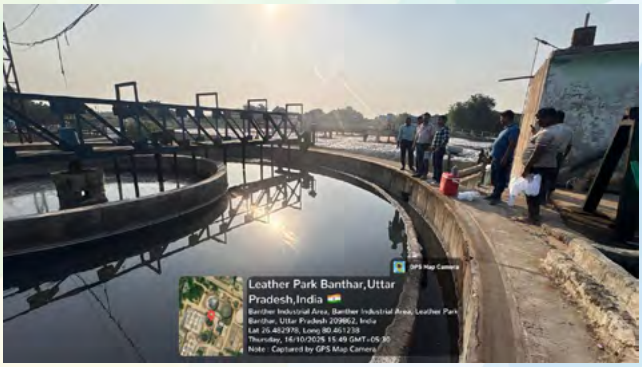
CSIR-CLRI contributes to the Indian Leather Sector's global leadership. It is indeed a remarkable achievement that 22 out of 24 colours selected by the Fashion Trend Pool Colour Circle for Spring-Summer '27 are from India, showcasing the country's influence in the fashion industry. This selection reflects the vibrant and diverse palette that will shape the upcoming season, emphasizing the importance of Indian contributions to global fashion trends.

Fashion Trend Pool is a network of footwear and fashion experts with a shared vision to inspire with the trends of the day. Fashion Trend Pool observes the global market, the catwalks and the retail trade, and senses the sprit about art, culture and architecture. In the international fashion capitals, they inform of the latest and important fashion, shoe, and material fairs.

CSIR-CLRI Inspects Grossly Polluting Industries (GPIs)

Team CSIR-CLRI has successfully concluded the Central Pollution Control Board (CPCB)-funded annual inspection of Grossly Polluting Industries (GPIs) in Kanpur. Scientists and technical staff from the CLRI Regional Centre Kanpur, CLRI Regional Centre - Jalandhar, the Environmental Engineering Division, and CLRI-CATERS collaborated seamlessly to accomplish this critical task within the stipulated timeframe.

Their collective efforts reflect CSIR-CLRI's dedication to environmental stewardship and its proactive role in monitoring and improving industrial compliance. This milestone reinforces the institute's leadership in driving sustainable practices across the leather and allied sectors.



Diploma Programme in Leather Processing: **A CSIR Skill Initiative**

CSIR-CLRI is effectively implementing CSIR Integrated Skill Initiative, launched as part of the Government of India's *Skill India* mission. Under this initiative, individuals are trained in various skill areas to meet industry requirements and promote employment generation, including small..scale entrepreneurship. The program encompasses a wide range of training programs across different domains, targeting various groups from school dropouts to graduates.

CSIR-CLRI has conducted a one-year Diploma Program in Leather Processing under the CSIR Skill Initiative, from September 2024 to September 2025—the Program aimed to equip participants with comprehensive technical knowledge and hands-on expertise in modern leather processing technologies.

The curriculum encompassed key subjects such as skin and hide structure, raw material selection, tanning technologies (chrome, vegetable, and aldehyde), post-tanning operations, dyeing, finishing, and mechanical processing. Special emphasis was placed on sustainability, with a focus on chrome management, eco-friendly alternatives, wastewater treatment, and solid waste management. Participants also received extensive hands-on training in leather testing, quality assurance, and the classification of leathers according to HSN codes.

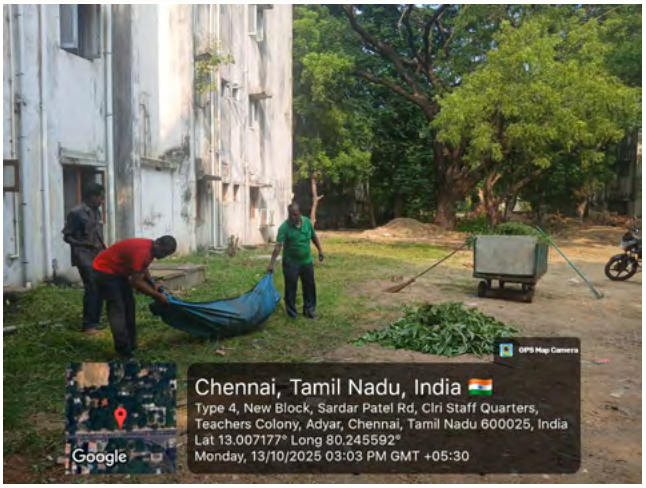
During the concluding feedback session, participants rated the program as excellent, acknowledging its significant contribution to their technical competence and professional development. They noted that the knowledge and skills gained through the program would play a vital role in enhancing the productivity, growth, and modernisation of their family-run leather enterprises.

SWACHHATA SPECIAL CAMPAIGN 5.0 AT CSIR-CLRI

The Government of India has launched a Special Campaign 5.0 from 2 October 2025 to 31 October 2025 for institutionalization. During this period, the Government had organised Special Campaign 5.0 to improve Swachhata and dispose of pending matters on the lines of the Special Campaigns held every year since 2021.

The success of Special Campaigns over the years has resulted in the institutionalisation of the campaign, and the Special Campaign covered all Offices of the Ministries / Departments of the Government of India, their attached / subordinate offices / PSUs / autonomous organizations.

CSIR-CLRI has taken up the Swachhata Special Campaign 5.0, both at the institute and in the residential areas on the campus. As part of the campaign, best practices such as the introduction of colour-coded



dustbins were implemented at the Institute's staff quarters and at CLRI Kendriya Vidyalaya School campus to facilitate the segregation of biodegradable and non-biodegradable waste.

SWACHHATA HI SEVA (SHS) CAMPAIGN 2025 AT CSIR-CLRI

The 9th edition of Swachhata Hi Seva (SHS) 2025 began on 17 September 2025 and culminated on 2 October on Gandhi Jayanti. During the 15-day campaign, millions across the nation were mobilized for high-impact swachhata drives. Launched jointly by the Ministry of Housing and Urban Affairs and the Department of Drinking Water and Sanitation, SHS 2025 brought together citizens, communities, and institutions to drive visible cleanliness on the ground.

The campaign also focused on Cleanliness Target Units-dark, dirty, and neglected spots.

As part of the Swachhata Hi Seva (SHS) Campaign 2025, CSIR-CLRI removed long-standing waste items, including plastic and wooden waste (second and final lot), accumulated in the Guesthouse and sent it to the Stores Section for safe disposal and recycling.

Cleanliness drives were carried out at three places: CSIR-CLRI Campus, Kendriya Vidyalaya CLRI Campus, and CLRI Staff Quarters on 15 October 2025.

OBSERVANCE OF VIGILANCE AWARENESS WEEK (VAW) AT CSIR-CLRI

CSIR-CLRI observed Vigilance Awareness Week (VAW) from 27 October to 2 November 2025 with the theme "*Vigilance: Our Shared Responsibility*." The observance of Vigilance Awareness Week serves as a reminder of the collective responsibility to promote honesty, fairness, and accountability, reinforcing the Institute's commitment to build a corruption-free and ethical work environment.

As part of the observance, the Integrity Pledge was administered by the Director, CSIR-CLRI, on 28 October 2025 at the Reception Hall, Main Building of the Institute. Staff members, research scholars, and students actively participated in the event and took the pledge to uphold integrity and transparency in all spheres of their professional and personal conduct.

Monitoring Committee Meeting on Specialty Chemicals

The 3rd Monitoring Committee Meeting of projects under '*Specialty Chemicals'* of "*Chemicals (including Leather) and Petrochemicals (CLP)*" Theme of CSIR was held on 15 October 2025 at CSIR-CECRI, Karaikudi, Tamil Nadu The "*Chemicals (including Leather) and Petrochemicals (CLP)*" theme is a significant initiative by the CSIR, focusing on the development and promotion of specialty chemicals. CSIR Vision 2030 for the CLP theme is to provide globally benchmarked, sustainable processes for chemicals, leading to reduced trade deficits.

Visit of Anusandhan National Research Foundation (ANRF), CEO to CSIR-CLRI

Dr. Shivkumar Kalyanaraman, CEO of Anusandhan National Research Foundation (ANRF), visited CSIR-CLRI on 8 October 2025. He visited the GAIT Facility in the Footwear Bio-Mechanics Unit and the Instrumentation Facility at Centre for analysis, testing, evaluation, and reporting services (CATERS), and interacted with the Scientists. Gait analysis is useful for people with lower limb/ foot problems and people with ailments like diabetes mellitus that affect the foot. Gait analysis reports biomechanics of the foot and determines weight bearing ability of the foot. It also shows the muscle activity. GAIT analysis is used to design customized footwear and to treat the disability by improving walking. Physicians/ Diabetologists/ Podiatrists/ Orthopedicians are encouraged to send their patients to CLRI – Gait Lab for analysis.

During the visit, Dr. Kalyanaram saw the following equipment/facilities at the GAIT Lab:

- 3-D Gait and Posture Analysis
- Plantar Pressure and Force Analysis
- In-Shoe Plantar Pressure Test
- Electromyography (EMG)
- Instrumented Treadmill Analysis
- Body Composition Analysis (BCA)
- 3-D Foot Scan.

Visit of NIFT Raebareli to CLRI KLC Complex, Unnao (U.P.)

A group of 30 students from the Leather Design Department of the National Institute of Fashion Technology (NIFT), Raebareli (U.P.), accompanied by their faculty members, visited the testing laboratory of CSIR-CLRI, located at the Kanpur Leather Complex (KLC), Unnao (U.P.), on 11 October 2025.

During the visit, the students were introduced to the intricacies of mechanical and chemical testing of leather and leather products. The laboratory team provided comprehensive demonstrations and explanations of various testing protocols, highlighting the importance of quality standards and compliance in the leather industry.

Visit of Students from Gulbarga University to CSIR-CLRI

About 16 pursuing Master of Library Science (MLISc) students and two faculty members from Gulbarga University, Karnataka, visited CSIR-CLRI. During the visit, the students explored the CSIR-CLRI library facilities, including the digital online library resources. They also observed various leather processing techniques and a range of finished leather products, gaining insights into the skills and training opportunities available at the institute.

Chairman of Andhra Pradesh MSME Visits CLRI KLC Complex, Unnao, (U.P)

Shri. Tammireddy Sivashankar Rao, the Hon'ble Chairman of Andhra Pradesh MSME Development Corporation, along with his team, undertook an Exposure Visit to the state of Uttar Pradesh to gain insights into the Government of Uttar Pradesh's successful MSME development initiatives.

The delegation visited the CSIR-CLRI testing laboratory on 16 October 2025, located at the KLC Complex, Banthar (Unnao). The team was warmly received by the Scientist-In-Charge of the CSIR-CLRI Regional Centre, Kanpur, who provided a comprehensive overview of the Centre's infrastructure, testing capabilities, and ongoing initiatives.

News Coverage of PG Students from Chandigarh visit to CLRI Regional Centre, Jalandhar

अजीत समाचार

पीजीजीसी-11 के छात्रों ने किया सीएसआईआर-सीएलआरआई का शैक्षणिक भ्रमण

पीजीजीसी-11 चंडीगढ़ के छात्र सीएसआईआर-सीएलआरआई के शैक्षणिक भ्रमण दौरान जानकारी लेते हुए।

चंडीगढ़, 5 अक्तूर (विशेष संवाददाता): पोस्ट ग्रेजुएट गवर्नमेंट कॉलेज, सेक्टर-11, चंडीगढ़ के 60 साइंस के स्टूडेंट्स ने 3 लेक्चरार के साथ सीएसआईआर-सीएलआरआई, जालंधर स्थित रीजनल सेंटर का शैक्षिक दौरा किया। इस दौरे के दौरान छात्रों ने केंद्र की आधुनिक प्रयोगशालाओं को देखा, जहाँ केमिकल, फिजिक्स और पर्यावरण से जुड़ी जांच की जाती है। यहां एक छोटा टैनरी प्लांट भी है, जो उद्योगों को तकनीकी सेवाएं देता है। छात्रों ने डॉ. अभिनंदन कुमार, जो कि सीनियर प्रिंसिपल साइंटिस्ट हैं, से मुलाकात की। उन्होंने छात्रों के सवालों के जवाब दिए और वहां होने वाले कामों की जानकारी दी। इसके अलावा, छात्रों को संस्थान में साल भर चलने वाली इंटर्नशिप योजनाओं के बारे में भी बताया गया, जिससे उन्हें आगे पढ़ाई और करियर में मदद मिल सकती है। यह दौरा विज्ञान और प्रौद्योगिकी विभाग, चंडीगढ़ प्रशासन द्वारा प्रायोजित किया गया था। इसका उद्देश्य छात्रों को वैज्ञानिक संस्थानों से परिचित कराना और उनमें अनुसंधान के प्रति रुचि बढ़ाना था।

PGGC-11, Chandigarh students visit CSIR-CLRI for educational tour

PUNJAB EXPRESS BUREAU
Chandigarh, October 5

Sixty science students from Post Graduate Government College, Sector-11, Chandigarh, along with three staff members, undertook an educational tour of the CSIR–Central Leather Research Institute (CLRI), Regional Center located in Jalandhar.

During the visit, the students explored the center's modern laboratories, where testing related to chemicals, physics, and the environment is conducted. The center also houses a small tannery plant that provides technical services to industries. The students met Dr. Abhinandan Kumar, a Senior Principal Scientist, who answered their questions and shared insights about the ongoing work at the institute.

Additionally, the students were informed about the year-round internship programs offered by the institute, which could support their further studies and career development.

This educational visit was sponsored by the Department of Science and Technology, Chandigarh Administration, with the objective of familiarizing students with scientific institutions and fostering interest in research.

How CLRI uses leather waste to produce hydrogen

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Chennai: City researchers have used leather waste, which often causes pollution during processing, to produce clean hydrogen fuel. A team at the CSIR-Central Leather Research Institute (CLRI) developed a method that converts semi-processed leather waste into nano-microreactors capable of generating hydrogen.

CLRI senior scientist Amit A Vernekar, who led the research team, said the process uses wet blue leather, which is used in leather processing and sourced from leather trimming waste. The collagen structure of this skin contains microscopic channels. The team turned these into nano-microreactors and coated them with palladium nanoclusters, a catalyst that helps release hydrogen gas. When ammonia borane, a hydrogen-rich compound, is added, the palladium triggers a reaction that produces hydrogen. The design of the channels allows the gas to escape, preventing buildup and keeping the reaction running smoothly.

"By repurposing stabilised skin waste into advanced catalytic systems, we not only solve fundamental challenges in hydrogen generation but also demonstrate an innovative pathway towards circular economy approaches in material science," said Rajani Kumar Borah, PhD student and first author of the study published in the journal Small, who worked along with Ansari Palliyarayil, a post-doctoral researcher. The researchers said the approach is a sustainable and scalable strategy for hydrogen production. It also helps in reducing leather waste.

Hydrogen is a clean fuel with numerous applications. It's used in fuel cells to power vehicles and provide electricity, in heating systems, to power rockets, and in the production of fertilisers.

Researchers said hydrogen generation faces issues such as catalyst deactivation and hydrogen bubble buildup, which reduce efficiency. The team's bioinspired design solves both problems; the collagen matrix prevents catalyst blockage, and the leather's surface helps bubbles detach quickly.

Vernekar said, "Currently, the research on ammonia borates is limited as it is challenging to convert the spent fuel borates back to ammonia borates. We are investigating the means by which the spent fuel can be efficiently converted to ammonia borates, as this is crucial for circular economy."

IN A NUTSHELL

- A semi-processed leather waste called wet blue leather is used as base material
- The skin's natural collagen structure, full of tiny channels, is used to create nano-microreactors that act like miniature reaction chambers
- Tiny palladium particles are attached to the skin's structure to act as a catalyst
- It is then immersed in ammonia borane solution, a chemical that stores hydrogen
- The skin's lysyl-rich (a form of amino acid lysine) collagen matrix absorbs and activates ammonia borane
- The palladium sites trigger a reaction that releases hydrogen gas from ammonia borane, while the skin's microchannels let the gas escape smoothly
- The skin design prevents byproducts from blocking the catalyst and stops hydrogen bubbles from sticking, keeping the system highly efficient for clean hydrogen generation

Scientists at CSIR-Central Leather Research Institute

CSIR-Central Leather Research Institute

(CSIR Integrated Skill Initiative Training Programme)

CSIR-CLRI announces the commencement of the following placement oriented courses

Leather Processing

- Post Graduate Diploma Programme in Leather Technology
- Diploma in Leather Processing
- Short Term Executive Skill Development Programme in Leather Processing
- Integrated Skill Development on Quality Control Methods in Leather Manufacture
- Computerized colour Matching for Leather manufacturing

Leather and Leather products

- Post Graduate Diploma Programme in Leather Products Technology
- Quality and Visual Inspection of Leather and Leather Products
- Skill Training Programme in Leather and Leather-like materials for Emerging Entrepreneurs
- Short Term Executive Skill Development Programme in Leather Upholstery Manufacture
- Course in Fashion Design and Development for Leather Lifestyle Products

Leather Goods and Garments

- Diploma in Leather Goods Manufacture
- Short Term Executive Skill Development Programme in Leather Goods Manufacture
- Training Programme in Leather Goods Design (Manual and CAD)
- Diploma in Leather Garment Manufacture
- Short Term Executive Skill Development Programme in Leather Garments manufacture
- CAD for Garments

Allied Science courses

- Bioinformatics Associate/ Analyst
- Quality Control Chemist – Microbiology
- QA Chemist Equipment Validation - Life Sciences
- Nuclear Magnetic Resonance (NMR) Spectroscopy Analyst
- Quality Assurance Chemist
- Leather Biotechnologist
- Enzyme Technologist
- Structural Analytical Technologist
- rDNA Technologist

Leather Allied Sectors

- Short Term Executive Training Programme on Occupational Health and Safety for Leather and Allied (Product) Industries
- Short Term Executive Training Programme on Testing and Calibration for Leather Sector
- Repair, restore and maintenance of leather products
- Short Term Executive Training Programme on Waste Management for

Footwear

- Diploma in Footwear Manufacture
- Short Term Executive Skill Development Programme in Footwear manufacture
- Training programme in GAIT Analysis
- CAD for Footwear

Please visit https://clri.org/training.aspx for online / offline submission of duly filled in application

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For more info:

Website : https://clri.org/training.aspx

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