

दि लेदर पोस्ट The Leather Post

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



CHINTAN SHIVIR VIKSIT BHARAT 2047

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,

अप्रैल 2025 का लेदर पोस्ट संस्थान द्वारा स्वयं के लिए बनाए जा रहे रोडमैप को सामने लाता है। ग्रामीण और हस्तशिल्प उत्पादों के लिए काम करने हेतु, संस्थान ने कई समझौता ज्ञापनों पर हस्ताक्षर किए हैं। यदि संस्थान को उद्योग और समाज के लिए कार्य करना है,

और प्रेरणा को पोषित करना होगा। राष्ट्रीय समुद्र प्रौद्योगिकी संस्थान, चेन्नई में विज्ञान और प्रौद्योगिकी मंत्रालय और पर्यावरण, वन और जलवायु परिवर्तन मंत्रालय द्वारा आयोजित चिंतन शिविर, कर्मचारियों के लिए सुविधाओं का सृजन, एक आँख खोलने वाला अनुभव रहा।

मुझे विश्वास है कि संस्थान ज्ञान, प्रतिभा और उच्च प्रदर्शन के साथ स्वयं को और उद्योग को पोषित करने के लिए निरंतर प्रयास करता रहेगा।

पढ़ने का आनंद लें!

The Leather Post of April 2025 brings out the roadmap that the institute is creating for itself. To work for the rural and artisanal products, the institute has entered into MoUs. If institute needs to perform for the industry and the society, then we need to nourish talent and motivation from inside. The *Chintan Shivir* organized by MoST and MoEF at NIOT Chennai was an eye opener, so has been the creation of facilities for the staff members.

I am sure that the institute would continue to take strides to nourish ourselves and the industry with knowledge, talent and high performance.

Happy Reading!



No.	Description	Pg.
	<i>Technologies</i>	
1	Research in Focus : Publications	4
2	Publications from CSIR-CLRI	8
	<i>Events</i>	
3	Inauguration of Departmental Record Room	8
4	MoU on Diabetic Foot Ulcer Risk Categorization	9
5	MoU for the development of the Kolhapur Footwear	9
6	Eco-friendly Technologies for Leather Industries	10
7	78th CSIR-CLRI Foundation Day Celebrations	11
8	CSIR-CLRI 78th Foundation Day Celebrations at Regional Centres	13
	<i>Institutional activities</i>	
9	Installation of Drinking Water Plant at CLRI Campus	14
10	Dr. B.R. Ambedkar's Birth Anniversary at CSIR-CLRI	15
11	Free Eye Camp at CSIR-CLRI	15
12	CSIR-CLRI SHOETECH 2025 "Indian Footwear Sizing System"	16
13	Participation	17
14	Chintan Shivir-Viksit Bharat 2047	18

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Chemo-Sensing Cr(VI) in Leathers: Ru-based Fluorescence Spectroscopy

Chromium (Cr), is the seventh most abundant heavy metal element on the Earth. Due to its extensive applications in both industrial and biological contexts, Cr is thus among the most strategic and critical transition metals. Cr is usually characterized by its Cr(III) and Cr(VI) states due to their stability. At the same time, the paradox of the Cr species is that they do have both beneficial and detrimental influence on human and animal health. Cr(III) is essential in maintaining lipid, insulin, glucose metabolism for mammals and nutritional supplement for humans and Cr(VI) is widely used in stainless steel production, electroplating, textile manufacturing, leather tanning, and wood preservation. However, global watchdogs for cancer and environment warn that Cr(VI) as a heavy metal contaminant may be one of the gravest environmental threats of this era. Recently, European legislation has lowered the limits for acceptable Cr(VI) concentrations in leather goods to only 1 mg kg⁻¹. The existing ISO's BS EN ISO 17075 – colorimetric & chromatographic versions are not any more reliable. Thus, a simple, time-efficient, highly selective, sensitive and cost-effective method is the need of the hour.

At this juncture, researchers at CSIR-CLRI propose Ruthenium-based novel fluorescence detector suitable for the sensitive and selective quantification of Cr(VI) ions. This innovation makes very many costly analytical methods although with high sensitivity & specificity redundant with its remarkable distinguishability between Cr(III) and Cr(VI), even in low-level concentrations and complex matrices. Contrary to the abundance of Cr,

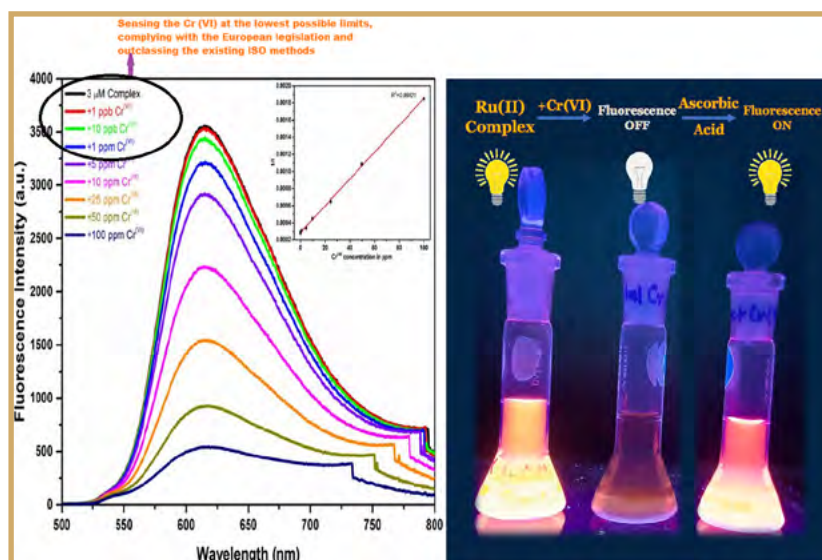
Ruthenium is incredibly scarce on the Earth's crust and remarkably resistant to corrosion and oxidation. The above team of researchers in CSIR-CLRI has intuitively designed and configured a Ru-based chemo sensor – a di-cationic ligand [Ru(bpy)₃]²⁺ along with PhDORi ligand (a modified phenanthroline derivative), enhancing the 'fluorophore' functionality and solubility. In aqueous solutions, the complex exhibits intense fluorescence at the MLCT (Metal-to-Ligand Charge Transfer) band at ~457 nm. The complex is so selective towards chromate/dichromate anions. Even in ppm to ppb concentrations, a linear response across a 105 fold concentration range was elicited. In real chromium-tanned leathers, accelerated aging preceded the Cr(VI) detection. However, to design, develop and characterize the Ru-based chemo sensor, it took laborious investigations: analytical, spectroscopic, cyclic voltammetry and cation-sensing. It is only appropriate to quote Steve Jobs here : "It takes a lot of hard work to make something simple!"

Pooja Rajagopalan · Sowmiya Saravanan · Mohan Ranganathan · Kalarical Janardhanan Sreeram · Sathyaraj Gopal

Fluorescence Enhanced Water-Soluble Ruthenium Complex: Advancing Precision in Cr(VI) Detection and Quantification

Journal of Fluorescence,

<https://doi.org/10.1007/s10895-025-04150-z>



Silica based Vulcanised Natural Rubber for Industrial Applications

Natural rubber (NR) is very well known to us through its daily usage as footwear, adhesives, gloves, doormat, tyres etc., NR can be converted to various products by chemical reactions. These new products are being utilised in manufacturing industries which need exceptional mechanical strength, durability, and abrasion resistance. NR is typically vulcanized (crosslinked) using appropriate agents. A study was carried out to synthesise natural rubber conjugates or composites, aiming to enhance reproducibility, reliability, and diversity in practical applications. Traditional methods often involve vulcanising of natural rubber, followed by the addition of nanomaterials through noncovalent interactions. In this new approach by the researcher at CSIR-CLRI, NR was vulcanized in the presence of functionalised/non-functionalised silica nanomaterials via covalent bond formation during the cross-linking process. Also, the preliminary studies indicated that these materials exhibit partial biodegradability.

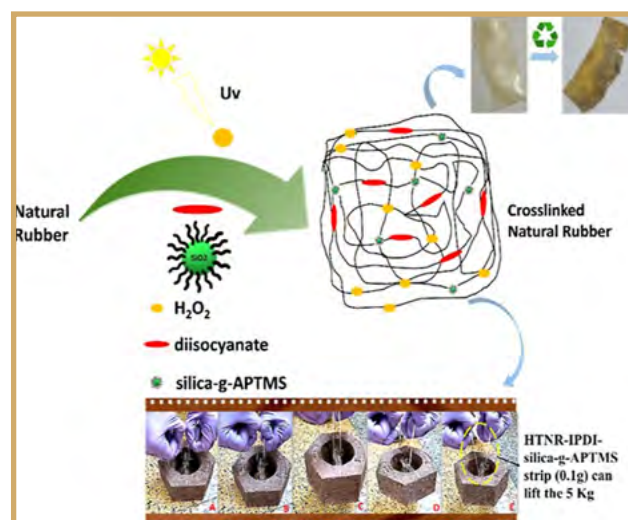
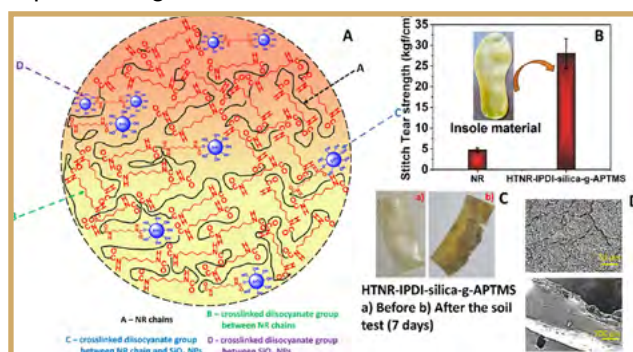
NR was successfully reacted simultaneously with diisocyanates and functionalized or nonfunctionalized silica nanoparticles to form a variety of NR conjugates through cross-linking. The reactions were effective with diisocyanates such as HDI and isophorone diisocyanate, as well as with both nonfunctionalized and amine-functionalized silica nanoparticles. The products were confirmed by various spectroscopic and microscopic analyses. These NR conjugates showed 10-fold improvement in tensile strength, Young's modulus, and related properties when isophorone diisocyanate was used in conjunction with amine-functionalized silica nanoparticles. This substantial improvement in properties, combined with the partial biodegradability, inspired the researchers to fabricate a footwear sole from this material. The fabricated sole meets most of

the critical performance criteria for footwear, including several-fold increases in stitch tear strength and high-water desorption capacity. These findings are very significant in highlighting the potential of developing sustainable materials from natural sources for use in the tyre and footwear industries.

Koilraj Stephen, Silambarasan Ravi, and Debasis Samanta*

Urethane Bond-Mediated Cross-Linking of Natural Rubber with Functionalized Silica Nanoparticles: Achieving Multifold Enhancement of Material Properties.

Ind. Eng. Chem. Res. 2025, 64, 4882–4893
<https://doi.org/10.1021/acs.iecr.4c04050>



Nano-Engineered Hybridised Polymeric Framework for Chronic Wound

By the turn of the year 2030, the global diabetic population is projected to reach 537 million. Diabetic wounds, particularly Diabetic Foot Ulcers (DFUs), pose a major healthcare challenge due to their non-healing nature, besides being chronic. Research initiatives focus on fabricating novel hybrid scaffolds with active pharmaceutical ingredients to effect a fundamental change in diabetic wound care. These novel scaffolds support tissue regeneration and enhance healing as they mimic the extracellular matrix. Designed in layers, they help in controlled release of drug, moisture management, and barrier protection against infections. Researchers at CSIR-CLRI have designed and fabricated a nano-engineered hybridised polymeric scaffold for chronic wound management. They used Polyvinylidene fluoride (PVDF) nanofibrous mat, a Collagen/Polyvinyl Alcohol (PVA) composite loaded with metformin hydrochloride, and polyhydroxybutyrate (PHB) embedded with aceclofenac for the purpose. Extensive physico-chemical and biochemical

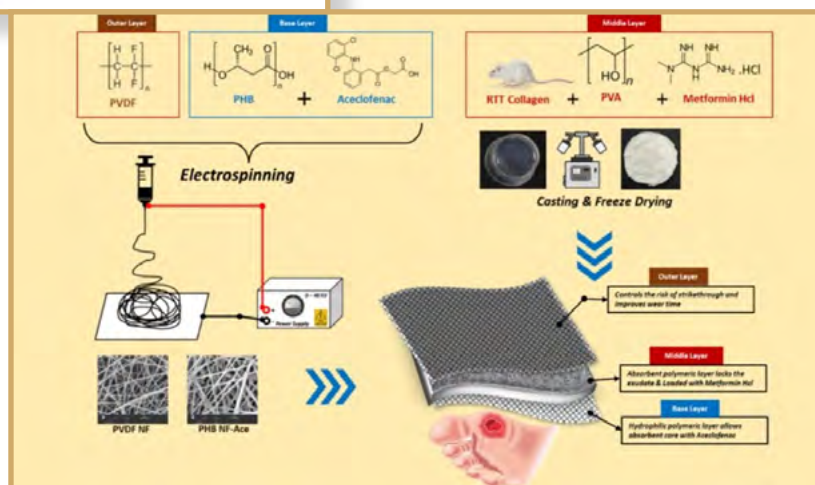
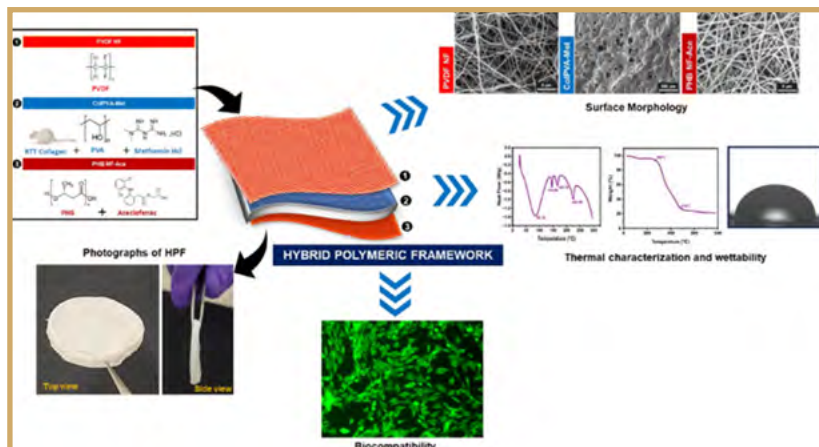
indicated the porous structure of the hybrid polymeric framework (HPF) scaffold. This unique structure aids in the significant release of drugs, metformin and aceclofenac. Further, the hybrid polymeric framework showed swelling of 150–200% to enable drug release along with the efficient exudate absorption that forms the prerequisite for chronic wounds. The HPF scaffold had a very high cell viability and hemocompatibility, in-vitro wound contraction and an improved anti-oxidant activity, which accelerates the tissue repair in chronic wounds. This nano-engineered hybrid scaffold has enormous potential to offer advanced holistic solution for chronic wound management.

Solaimuthu, A., Murali, P., Vijayan, A.N. et al.

Nano-Engineered Hybridized Polymeric Framework for Chronic Wound Management.

AAPS PharmSciTech 26, 134 (2025).

DOI: <https://doi.org/10.1208/s12249-025-03124-5>



Post-Tanning with Neem Oil Seed Based Antifungal Fatliquor

Fatliquoring, a post-tanning process imparts desirable physical properties to leather, like tensile strength, extensibility, wetting properties, waterproofness, and permeability to water vapour and air. Occasionally more than one type of fatliquors are mixed and applied to attain these vital properties. Fungal attack makes the leather stiffer reducing its durability, and also form colored spots rendering it unfit for use. These fungi primarily thrive on the fatliquors and other materials incorporated during the leather processing. Further, is the non-incorporated fatliquors are eventually discharged as waste and are not amenable to biological treatment. Fatliquors derived from fish and vegetable oils provide superior softness to leather due to their long, unsaturated carbon chains. But the rising cost of edible oils makes their use increasingly impractical. and non-edible oils can be an alternative raw materials source for fatliquor production.

To address these critical issues, researchers at CSIR-CLRI have developed an eco-friendly fatliquor from Neem seed oil. This plant-based fatliquor exhibited strong antifungal activity, particularly against pathogenic fungi: *Aspergillus niger*, *A. flavus*, and *Penicillium chrysogenum*. The presence of fatty acids

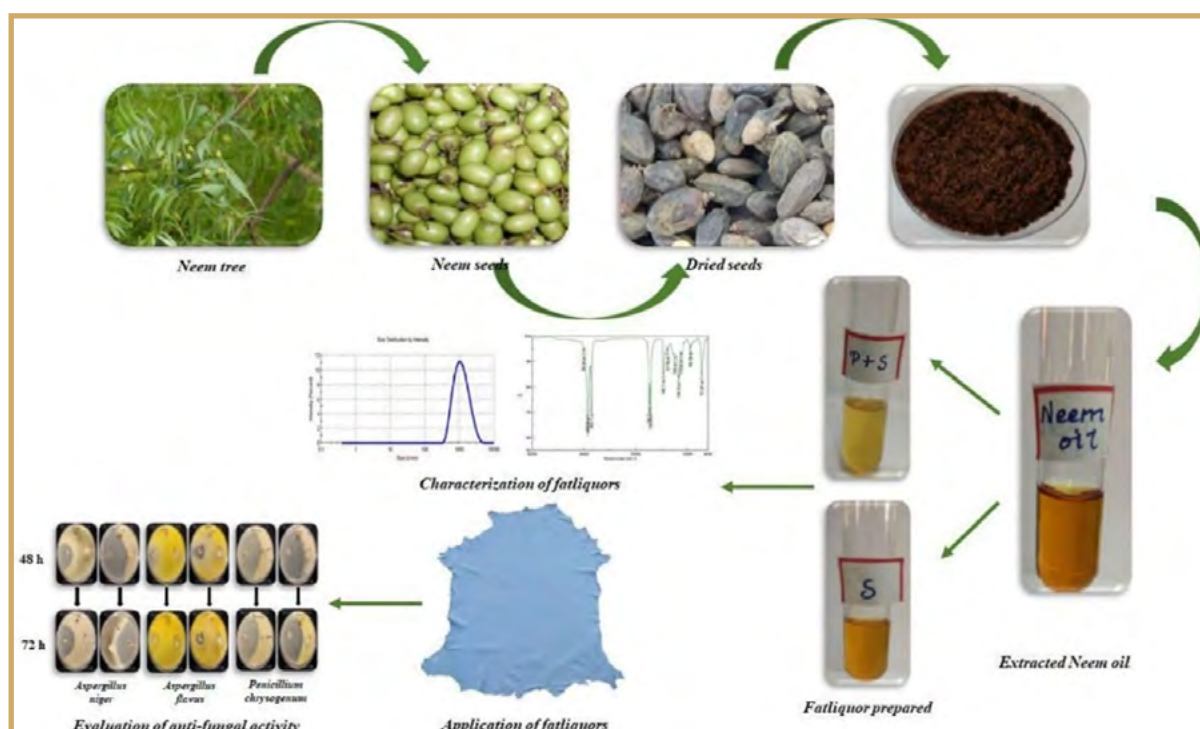
like oleic, palmitic, and stearic acids in the neem seed oil fatliquor was responsible for the antimicrobial properties. The fatliquor prepared by sulphation using only sulphuric acid showed superior antifungal effect. Evaluating the effect of this novel fatliquor on leather showed clear inhibition of the tested fungi. When compared to commercial fatliquor, the Neem-based fatliquor could achieve comparable or better tensile strength, elongation, and tear resistance. And also it showed improvements in softness, grain smoothness, and general appearance. Further, the product was free of rancid odour and was stable for use. It is of added significance that the new process uses non-edible oil, promotes sustainability and aims to reduce pollution load.

Sivaranjani Venugopal & Yasmin Khambhaty*,

Greener route towards preparation of plant-based antifungal fatliquor for eco-conscious application during leather making

Journal of Coatings Technology and Research, 2025, 22 (3) 1099–1112.

<https://link.springer.com/article/10.1007/s11998-024-01036-w>



April 2025

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Inauguration of Departmental Record Room

Shri Mahendra Kumar Gupta, Joint Secretary (Administration) CSIR, India inaugurated a dedicated facility of the Departmental Record Room at CSIR-CLRI on 12/4/2025. This initiative is in alignment with The Public Records Act, 1993 enacted to regulate the management, administration, and preservation of public records of the Government and Autonomous

organisations. The establishment of this facility at CSIR-CLRI will ensure that public records are properly maintained and accessible for future reference. This facility is a significant milestone in CSIR-CLRI's efforts to modernise and streamline record-keeping processes.



MoU on Diabetic Foot Ulcer Risk Categorization

On 25 April 2025, CSIR-CLRI and Madras Medical College (MMC) exchanged a Memorandum of Understanding (MoU) on “Data Collection for Diabetic Foot Ulcer Risk Categorization”. In the project, gait data will be taken from individuals with diabetic foot complications to generate clinical insights on gait abnormalities and Diabetic Foot Ulcer (DFU) risk factors.



MoU for the development of the Kolhapur Footwear

During the CSIR-CLRI 78th Foundation Day Celebrations, an MoU was signed between CSIR-CLRI and Kalapuri Foundation for the development of the Kolhapur Footwear Cluster. Under this partnership, CSIR-CLRI will undertake a comprehensive diagnostic study to enhance sustainability, skill development, and infrastructure within the cluster while promoting traditional footwear at national and international platforms.



ECO-FRIENDLY TECHNOLOGIES FOR LEATHER INDUSTRIES

CSIR-CLRI had organised a stakeholders preparatory meeting on 8 April 2025 as a forerunner for collaborative workshops at Ambur, Ranipet and Vaniyambadi clusters for promoting the sustainable eco-friendly technologies. The meeting was represented by AISTHMA, CETPs, and tanners with ETPs in the Vellore tanning sector.



78 CSIR-CLRI FOUNDATION DAY CELEBRATIONS

The 78th Foundation Day of CSIR-CLRI was held on 24 April 2025 at the Triple Helix Auditorium. Shri R Selvam, IAS, Executive Director, Council for Leather Exports (CLE), graced the occasion as Chief Guest and delivered the Foundation Day Lecture.



Dr. K.J. Sreeram, Director, CSIR-CLRI, distributed the Awards / Appreciation Certificates to the Young Researcher. Certificates for Patent Filing / Copyright Filing were also issued to CSIR-CLRI staff members.





CSIR-CLRI 78th Foundation Day Celebrations at Regional Centres

CLRI Regional Centre-Jalandhar

The 78th CSIR-CLRI Foundation Day was celebrated on 24 April 2025 at the CLRI Regional Centre, Jalandhar. Students and faculty from the School of Eminence, Bhargo Camp, Jalandhar, and Tanners and

Technical staff from Industry have actively participated. The Chief Guest, Shri. Amandeep Singh Sandhu, President, Punjab Leather Federation (PLF), presided over the event and addressed the gathering.



CLRI Regional Centre-Kolkata

CLRI Regional Centre in Kolkata organised a one-day workshop at Brainware University, Kolkata on 23 April 2025 on the 78th CSIR-CLRI Foundation Day. Over 100 students participated in the workshop, which featured a poster competition under the theme “*Waste Utilization: Paving the Way to a Circular Economy*”. Dr. Malathy Jawahar, Senior Principal Scientist, provided an overview of various research activities at CSIR-

CLRI. Dr. M. Sathish, Senior Scientist, discussed the diverse opportunities available in the leather sector and shared insights into leather-making. Dr. Surabhi Deepali Muduli, DST-Women Scientist, delivered a lecture on the preparation of magnetic carbon from leather solid waste and its applications in leather and wastewater treatment.



Installation of Drinking Water Plant at CLRI Campus

The Director, CSIR-CLRI, on 24th April 2025, inaugurated the drinking water plant installed at the CLRI Campus.



Dr. B.R. Ambedkar's Birth Anniversary at CSIR-CLRI

On the occasion of Dr. B.R. Ambedkar's Birth Anniversary, Dr. K.J. Sreeram, Director, CSIR-CLRI, garlanded the portrait of Dr. B. R. Ambedkar at the foyer of CLRI Main Building. Floral tributes were offered to the portrait of Dr B.R. Ambedkar by CSIR-CLRI staff, remembering his contributions to society on 17 April 2025.



Free Eye Camp at CSIR-CLRI

A Free Eye Camp was organised on 22 April 2025 at the CLRI Campus to benefit the employees, pensioners, and their dependent family members. The camp was organised by the Institute in association with M/s Vasan Eye Care, which provides world-class treatment, specializing in LASIK, cataract surgery, retina care, and more.



CSIR-CLRI SHOETECH 2025 “Indian Footwear Sizing System”

CSIR-CLRI conducted “Indian Footwear Sizing System - Awareness and Clarification session”, on 2 April 2025, at the 9th edition of SHOETECH 2025 event, Agra, India

Shri Sanjay Gupta, President, Indian Footwear Components Manufacturers Association (IFCOMA), introduced the theme and invited the CSIR-CLRI team to present “Indian Foot Sizing System”. Dr S Mathivanan, Senior Principal Scientist, CSIR-CLRI, presented an overview of the project and emphasized the importance of foot sizing for our country and to promote the pride of “Bha sizing” on a global platform. Dr D Suresh Kumar, Senior Scientist, CSIR-CLRI, presented the technical details and spoke on the nuances of the Indian Footwear Sizing.

CSIR-CLRI requested the industry to adopt shoe

lasts developed by CSIR-CLRI and to make prototype sample of footwear using the digitized anthropometric database. The Indian footwear industry must leverage the database for improved product development aligned with Indian foot morphology. The objective is primarily to cater for the Indian customers across the country. It was informed that CSIR-CLRI is dedicated to disseminating the India Footwear Sizing system.

Participating in the event, Dr R Mohan, Chief Scientist, stressed that the essence of manufacturing products is to adapt to the standards and specifications to design and develop footwear exclusively for the Indian feet and customers.

The industry members greatly appreciated and lauded the concerted efforts and hard work done by CSIR-CLRI for the Indian footwear industry and our country at large.



Leadership Development Workshop for Women Scientists Working in Space and Allied Sciences (WiSLP) Program

Dr. Yasmin Khambhaty, Principal Scientist, CSIR-CLRI, was nominated for the Leadership Development Workshop for Women Scientists Working in Space and Allied Sciences (WiSLP) Program organised by the Department of Science and Technology. This programme was held in collaboration with the British Council under the UK-India Education and Research

Initiative (UKIERI) at JNCASR, Bengaluru. Dr. Yasmin Khambhaty was also selected for Phase 2 of WiSLP, which included advanced training at Coventry University, United Kingdom, from 19 - 27 March 2025. The program covered themes such as sustainable leadership, leadership in space, and allied sciences.



CSIR-CLRI @ ICWEES 2025 Conference, NIT, Karaikal, Puducherry

Scientists from CSIR-CLRI participated in the International Conference on Water, Environment, Energy and Society, organized jointly by the National Institute of Technology Puducherry and the International Association for Water, Environment, Energy and Society, in association with Rabindranath Tagore University (RNTU), Texas A&M University, USA, and IHE Delft Institute for Water Education, Netherlands. The event was held in Karaikal (Puducherry) from 23 to 26 April 2025.

Dr. S. Swarnalatha, Principal Scientist, delivered a keynote lecture on “Valorisation of Industrial Solid Waste - A Sustainable Approach”

Dr. S V Srinivasan, Senior Principal Scientist, presented research findings on “Pyrolysis of Bulk Organic Fractions of Municipal Solid Waste Generated from Cities” and was awarded Best Paper at the conference.



Dr. K. J. Sreeram, Director, CSIR-CLRI, participated in the Opening session of Chintan Shivir-Viksit Bharat 2047 held on 12 April 2025 at the National Institute of Ocean Technology (NIOT), Chennai. Dr. Jitendra Singh, Honourable Minister, S&T, addressed the gathering. During the occasion, Dr N Kalaiselvi, DG CSIR, spoke on Viksit Bharat 2047.

CHINTAN SHIVIR

VIKSIT BHARAT 2047



**HAPPY
RETIREMENT**



Shri. K Gnana prabhu
Senior Technician (3)
SPDDC

The Director and Staff wish him a happy and healthy retired life

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
- ◆ NuclearMagneticResonance (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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