



Newsleather

Stay curious, informed and connected

Edition 11, 2025

Welcome

This is the eleventh edition of our scientific newsletter, dedicated to providing the latest updates on research, regulatory developments, technology, and standard methods in the leather industry.

NOTE: This newsletter is in English, Spanish and Portuguese. One version after the other.

In this issue, we feature an interview with Dr. Kalarical J. Sreeram, a scientist, Director of the Central Leather Research Institute (CLRI), a constituent of the Council of Scientific and Industrial Research (CSIR) in Chennai, India.

IULTCS values its collaboration with Dr. Sreeram, an active member, academic, and Director of CLRI. He leads the institute's efforts in advancing leather science and technology, emphasizing sustainability, innovation, and industry partnerships.

We appreciate Dr. Sreeram's collaboration with IULTCS' Newsletter.

Please share your comments and suggestions to secretary@iultcs.org

Kind regards,

Dr. Luis A. Zugno, editor



IULTCS INTERVIEW

Lifeline: Dr. Kalarical J. Sreeram

Director of CSIR-CLRI in Chennai, India

Dr. Sreeram holds a doctorate in leather technology and is focused on environmental sustainability in the leather industry. Since joining CSIR-CLRI in 2002, he has advanced to Chief Scientist and then Director, developing formaldehyde-free fillers and chromium (VI) solutions. Under his leadership, CSIR-CLRI established India's footwear sizing standard and created specialized extreme cold leather gloves. He has over 120 publications, an h-index of 28, and 20 patents, receiving numerous awards such as the CSIR Young Scientist Award and IUR Research Project Plan Certificate of Approval of IULTCS in 2013. Currently, he is the Mission Director for the Waste to Wealth Mission of CSIR and heads the Department of Leather Technology at Anna University.



The CLRI is a constituent laboratory of CSIR. It was established in 1948 and is in Adyar, Chennai. The main area of work is Leather science and technology. Conducts R&D in leather processing, tanning, footwear design, and environmental sustainability. Also offers academic programs in collaboration with Anna University (B.Tech, M.Tech, Ph.D., etc.). <https://www.clri.res.in/>

IULTCS Question 1: Dr. Sreeram, could you briefly outline CLRI's history and explain why it was established in Chennai?

The Central Leather Research Institute was established in 1948, shortly after India's independence, with the vision that industrial research in leather could serve as a catalyst for social empowerment. This initiative likely drew inspiration from Mahatma Gandhi's 1934 statement highlighting the economic drains associated with the export of raw hides and the need for local expertise in leather processing.

In a 1945 lecture, Prof. BM Das (Superintendent, Bengal Tanning Institute), emphasized the importance of the leather industry and the urgent need for research to enhance its efficiency. His insights, along with a proposal by Dr. Sir A. Lakshmanaswami Mudaliar, the Vice Chancellor of the University of Madras, led to the establishment of the Leather Research Institute. The Government of Madras recognized the significance of these proposals and transferred land to the Ministry of Industry to support the institute's creation at the National level.

Entrusted to the Council for Scientific & Industrial Research, with Prof. BM Das as the first Director, the institute was strategically located to connect academia with a thriving industry. This collaboration has proven successful, transforming the Indian leather sector from mere trading into a robust manufacturing hub for quality leather and leather products. Today, the institute stands as a model of innovation and development within the industry.



Figure 1: Overview of the CLRI building with the India's flag colors effect

IULTCS Question 2: CLRI has a strong team of Analytical Chemistry. Please give us an overview of the analytical capabilities applied to leather.

From its inception, our institute has recognized that leather processing is inherently multidisciplinary. We have brought together experts from various fields, including biologists, chemists, engineers, and technologists, to foster a comprehensive approach. Our analytical chemists have played a crucial role in supporting the industry by developing innovative analytical tools aimed at estimating restricted substances and creating newer methods for the determination and regulation of harmful substances.

Additionally, our work on FT-IR based identification of leather materials versus synthetics is paving the way towards the implementation of an India Leather Mark, enhancing quality assurance in the industry. Today, we take pride in our testing wing, the Centre for Analysis, Testing, Evaluation and Reporting Services (CATERS), which is accredited under ISO 17025:2017 by National Accreditation Board for Testing and Calibration Laboratories (NABL), India. Our scope includes over 150 methods related to the testing of Restricted Substances List (RSLs), ensuring our commitment to quality and safety in leather processing continues to be robust and forward-thinking.



IULTCS Question 3: Please give us an update on the work being developed by the Analytical team on method development for regulatory compliance, with examples.

CSIR-CLRI also holds the Chairmanship of the Chemical Division 17 (CHD17) of Bureau of Indian Standards (BIS), which is responsible for bringing out national test methods and standards. The BIS is also the secretariat for ISO TC 120, which

brings out international test methods and standards in association with IULTCS. Either by adopting the ISO methods or where needed developing our own methods, the institute has contributed significantly to developing methods for regulatory compliance.

In the 1980s, we were pioneers in establishing protocols for the determination of pentachlorophenol, and in the 1990s, we focused our efforts on azo compounds, with our methods being validated against the German methods. One of our landmark contributions was the development of a new methodology for the unequivocal determination of chromium (VI) through chromatography. Most recently, we introduced a streamlined method for determining hydroxyproline content in leather, which simplifies earlier, more cumbersome procedures.



Figure 2: CLRI-Centre for Analysis, Testing, Evaluation and Reporting Services (CLRI-CATERS)

IULTCS Question 4: CLRI also develops new technologies. Please give us an update on the new developments in leather technology and science.

One of the significant contributions of CSIR-CLRI has been the IUE Guidelines for Best Practices in Sustainable Leather Manufacturing. At the beginning of this millennium, the institute aimed to initiate a paradigm shift from chemical processes to bioprocessing in leather production by introducing enzymes for fiber opening and unhairing. Our research on cyclic tetrameric species found in wastewater after chrome tanning led to the development of high-exhaust basic chromium sulfate.

Today, by utilizing the inherent water present in the leather, we have developed a waterless chrome tanning technology that has been adopted by approximately 180 tanneries in India and abroad (Patent EP3430174B1). Our focus on making the leather industry more environmentally friendly has resulted in simpler technologies that reduce emissions and add value to waste materials.

In terms of process technologies, one of our major contributions has been the effective use of goat skins and buffalo hides available in India for high-value leather applications. We have developed a method for creating leather for gloves that can withstand extremely cold climatic conditions.

IULTCS Question 5: What research and development areas are CLRI currently pursuing in biotechnology, environmental science, life cycle assessment (LCA), and sustainability?

The institute is actively working on a comprehensive examination of the carbon footprint associated with both conventional and innovative leather processing technologies. Our goal is to achieve a zero-carbon footprint from gate to gate of leather production by adopting two key concepts: cleaner processing and value addition to solid wastes.

One of our recent projects, which has garnered significant attention, involves the preparation of protein syntans as well as those combined with phenol, melamine, or acrylates from chrome shavings. This innovative approach not only contributes to waste reduction but also enhances the value of by-products in the leather manufacturing process.

On the circularity front, we have successfully implemented zero liquid discharge systems across Tamil Nadu, India. Collaborating with our sister laboratory, CSIR-

CSMCRI, we have transformed sodium chloride from the reverse osmosis rejects of our Common Effluent Treatment Plants into high-purity salt suitable for the chloralkaline industry. Additionally, we have repurposed black liquor from the paper and pulp industry, which contains degraded lignin, into retanning agents for leather production.

In the realm of biotechnology, our researchers are exploring the creation of collagen-like peptides with the potential for developing leather-like materials from these assembled peptide structures. This groundbreaking concept, reminiscent of producing skin in a laboratory setting, holds promise for applications beyond leather, particularly in biomedical fields. Furthermore, we are investigating the conversion of unused hides/skin components into collagen hydrolysates and gelatin, which could find uses in packaging, cosmetics, and potentially in the future, biomedical scaffolds. Through these diverse and innovative research endeavors, we aim to pave the way for a sustainable and eco-friendly leather industry while advancing scientific knowledge and applications across various sectors.

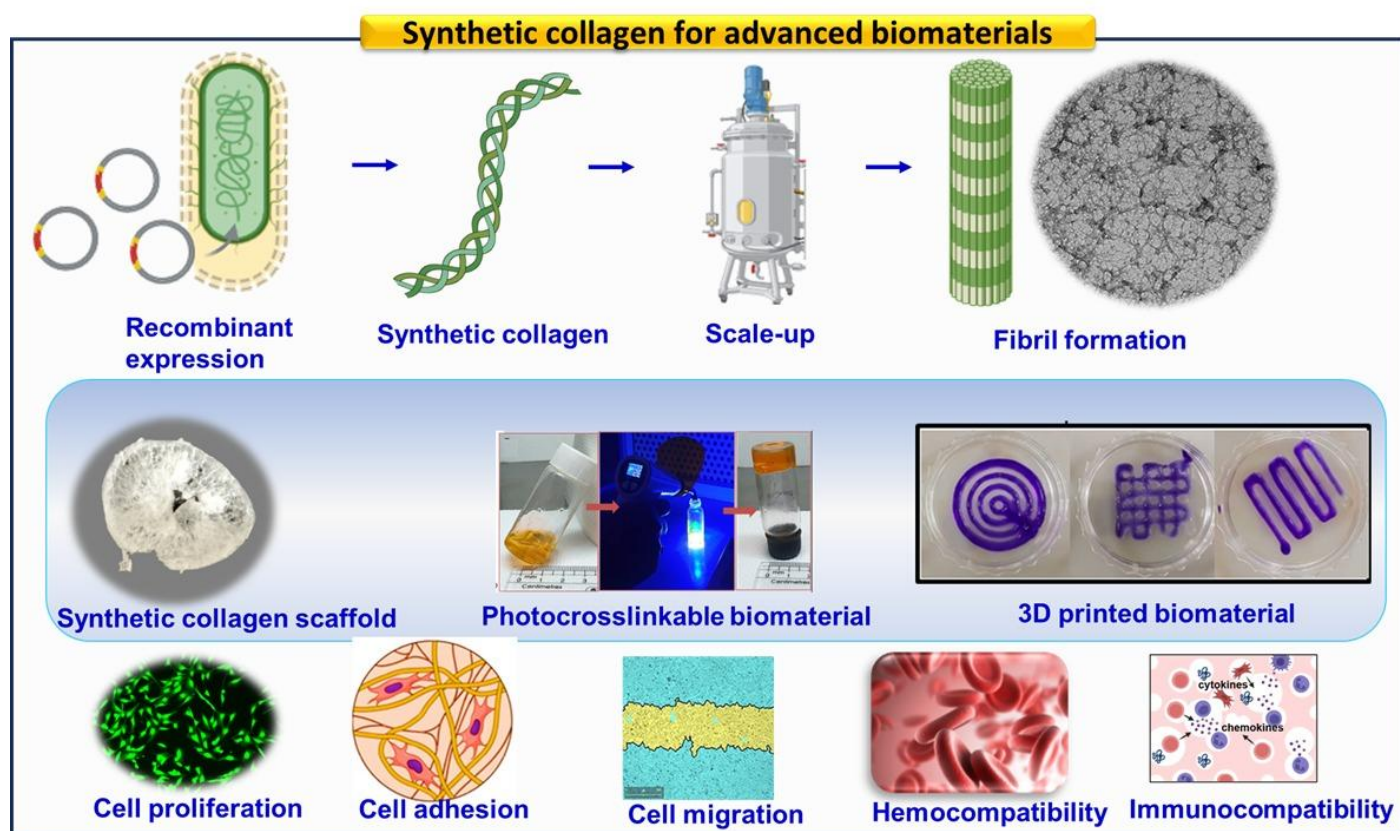


Figure 3: Developing synthetic collagen with multiple applications

IULTCS Question 6: CLRI also collaborates with Anna University and the University of Madras. Please give us an overview of the Bachelor, Master and PhD programs.

Our institute is dedicated to shaping the future of leather and footwear science, offering a robust educational framework for aspiring professionals in the industry. The leather education at Chennai dates back to 1945 and the presence of the university and the institute as adjoining campuses provides a strong academy – research collaboration.

Currently, we offer Bachelor of Technology (B.Tech), Master of Technology (M.Tech), and Ph.D. programs in leather and footwear science, with our esteemed scientists serving as honorary professors at Anna University. Admissions, along with foundational courses in chemistry, physics, biotechnology, and engineering, are managed by the university, while we specialize in leather-related subjects.

In a significant enhancement to our curriculum, B.Tech students can now tailor their educational journey by selecting from various specializations. Options include: a) Leather Science: Prepare for advanced studies with pathways to Master's and Doctorate degrees in leather science, b) Footwear Science: Equip yourself for careers in the footwear industry, c) International Affairs and Marketing: Gain insights into the global leather business landscape, and d) Environmental Management: Learn sustainable practices and waste management to promote circularity in the industry.

For our M.Tech (Leather & Footwear) Program, we welcome undergraduates with degrees in leather, chemistry, mechanical engineering, and production engineering, offering them a chance to deepen their expertise. We are proud to report an impressive 100% campus placement rate for our B.Tech graduates, along with various scholarship opportunities available.

Additionally, our institute is collaborating with the Government College of Engineering and Leather Technology in Kolkata and Harcourt Butler Technological University in Kanpur to provide guest lectures that enhance their curriculum. We have also fine-tuned educational programs for universities in Addis Ababa, demonstrating our commitment to global collaboration.

As we look to the future, our vision is clear: to establish our institute as the premier educational hub for leather science worldwide. We would be happy to

explore potential collaborations with the International Union of Leather Technologists and Chemists (IULTCS) and its member bodies to advance this goal.



Figure 4: Interaction with young administrators to appraise them of relevance of leather trade for employment and exports

IULTCS Question 7: A noted challenge for the leather industry globally is the shortage of professionals with formal education in leather technology. How many individuals graduated in leather-related fields in Chennai in 2024?

The global challenge of a shortage of professionals with formal education in leather technology is, in my opinion, a significant reason for the misinformation and negative publicity attributed to our sector. In response, our institute has been making efforts to develop the next generation of professionals who will advance the industry in a professional manner.

Through our B.Tech program in collaboration with Anna University, we have an intake of 60 students each year. This four-year program produces 60 graduates in leather technology annually. After accounting for about 20 students who choose other career paths, approximately 40 undergraduates are available to enter the leather industry. Additionally, there are usually 3 to 5 graduates at the

postgraduate level specializing in leather chemicals and the leather and footwear industries.

We also offer a Post Graduate Diploma in leather processing and lifestyle accessories through Academy of Scientific and Innovative Research (AcSIR), designed for individuals from various educational backgrounds who aspire to pursue a career in the leather industry. This course is particularly popular among industry leaders who want to prepare their next generation as professionals before they take over the reins of the business.

In addition to these programs, we conduct tailor-made certificate courses, executive training programs, and diplomas tailored to industry needs. One of our newer initiatives aims to enhance professionalism in the sector by offering customized upskilling programs for existing employees, which is gaining popularity within the industry.

IULTCS Question 8: Is CLRI currently working on projects to replace chrome tanning for compostable leather?

To some extent, we at the institute still believe that chromium is not a significant culprit if managed properly. This belief is based on fundamental studies we conducted about three decades ago regarding the oxidation states of chromium and its role in apoptosis and necrosis. However, the scarcity of chromite ores available for developing chromium-based tanning agents is one reason we are exploring alternatives beyond chromium.

We are looking forward to launching chromium-free silicate gels as a substitute for chromium tanning. Additionally, we are collaborating with industries such as tea, cashew nut, and areca nut to develop tannins that can be used for tanning while remaining outside the scope of the European Union Deforestation Regulation (EUDR).

IULTCS Question 9: What information or guidance would you like to share with young IULTCS members regarding leather education, leather science, and applied technology?

Many of us, including myself, entered this sector without a clear understanding of what leather science entails. However, as we delve deeper into the world of leather, the skin, and the remarkable protein collagen, we become increasingly passionate

about it. Leather offers opportunities for every branch of science to contribute meaningfully. What we need is a mindset that appreciates high-quality leather.

Every young professional in this sector can take pride in our efforts to ensure a sustainable future by transforming waste from the meat industry into a valuable product. We should ask ourselves: if leather production did not exist, what cleaner alternatives would we have for covering our feet?

It is essential for universities near tannery clusters to at least offer elective courses on leather making, as it serves as a tangible example of chemistry and biology in action. If we could redefine leather education from being process-oriented to focusing on achieving specific properties of end products, and understanding the chemistry involved in treating collagen fiber bundles, courses would become far more engaging and appealing.

To move forward, I believe we should establish a leather education hub led by the IULTCS, in collaboration with institutions like mine and the industry, to develop a global curriculum. Additionally, we might consider offering a course on how leather contributes to social upliftment and environmental protection for students of mass communication and journalism.

Though a little unconnected with the topic, CSIR-CLRI now organizes institutional visits for school and college students, programs such as one day as a scientist and open house for the public to understand and appreciate leather as a material for lifestyle commodities. Our effort to hold leather product sales by brands that have been created by our alumni in the institute premises have been well received by the local community. In essence, not only should we learn to appreciate leather, we need to educate others to do the same.



Figure 5: Empowering Women through Leather: Training Program for Rural Women

IULTCS Question 10: In your opinion how the leather education and leather production will evolve in India on the next 10 years?

Though a topic that could create a storm in many minds, I am strong believer that we only have that much raw material globally that we can cater to niche products. As per the statistics available to me, we do not have enough hides/skins to cover every foot in the world with a pair of shoes, which then opens up scope for non-leather materials to come into the footwear sector. The future leather industry needs to articulate the leather properties very well and occupy those niche segments that other fabrics may not be able to in the recent future, such as automotive leathers. Thus, moving of leather industry towards a niche lifestyle commodity manufacturer is inevitable, and we would have to take other fabrics along as partners in the journey, rather than as competitors.

The industrial segment in India would be prominently occupied by those who can make sufficient profits from their leather and product trade that they can not only make niche leather but also manage the environmental aspects of the trade.



***Disclaimer: ** The content presented in this interview is the responsibility of the author alone. Any copyrighted material included in the interview is used at the author's discretion, and IULTCS assumes no liability for any infringements that may occur. IULTCS disclaims all responsibility for the content and use of the information provided in this interview.*