Meeting with the Chief Secretary, Govt. of West Bengal
It has been an important month in terms of the Institute–Industry connect. CSIR-CLRI had multiple level discussions towards the implementation of cleaner leather processing at CLC Kolkata. The discussions on sustainability in the leather industry have reached newer levels and the role of the institution is recognized at various forums including the COA meeting of CLE. The I-Connect initiative saw the institute showcasing technologies to the industry. The institute wholeheartedly thanks the IFLMEA for their support. We are poised for higher growth. The Institute-Industry connect would now go to the next level of partnering to attain the set export targets through technology-based initiatives.

Jai Hind

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**No** | Description |
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1 | i-connect initiative of CSIR |
2 | Successfully completed two years of tenure as Director CSIR-CLRI |
3 | Awards |
4 | LERIG Conclave: Stakeholders Meet |
5 | Skill up-gradation programme for rural leather artisans in Gujarat - RCED Ahmedabad |
6 | CSIR–CLRI Intervention in developing entrepreneurs in “Leather and Allied products” at Ladakh |
7 | Meeting with the Chief Secretary Govt. of West Bengal |
8 | CSIR-CLRI Internship Programme on Sophisticated Instruments |
9 | Visits |
10 | Samvidhan Diwas (Constitution Day) |
11 | Research in focus Publications |
12 | Report of XXXVI IULTCS Congress 2021 |
CSIR-CLRI and CSIR-Central Electronics Engineering Research Institute (CEERI) have jointly developed a Leather Grade system, a seamless method to grade leather based on the identified defects using state-of-art artificial intelligence and machine-vision technology. It is a customizable software that aids to gain maximum area yield. The multiple parameters of leather such as defects, colour, area, and grade of the leather can be found using the LEATHER GRADE system for enhanced productivity.

CSIR-CLRI has also focused on the development of leather products such as footwear, goods, and garments from goat skins as raw material varying the Colour, Material, and Finish (CMF) systems. Design inspirations of Spring Summer 2022 have been imbibed in the CMF system using low-quality raw material as input and high-tech finished article as the output through value addition for maximizing the profit.

CSIR-CLRI has organized the roadshow to the stakeholders as part of the i-Connect initiative of CSIR on 25 November 2021 at CSIR Madras Complex in collaboration with CSIR-CEERI. Technologies showcased were (a) Project Goat (Goat articles using sustainable technologies) (b) Leather Grade system (AI-based sorting and grading of finished leathers). Dr. KJ Sreeram, Director, CSIR-CLRI briefed about the program to the participants. Dr. Malathy Jawahar, Senior Principal Scientist, CSIR-CLRI highlighted the advantages of the Automated Leather Grading System. Dr. R Aravindhan, Principal Scientist, CSIR-CLRI explained the technology of making cleaner leather and leather products from goat skins, and Ms. Ambika Kumaresan, Scientist, CSIR-CLRI presented the design conceptualization activities.

It was followed by a live demonstration of an automated leather grading machine by Team CSIR-CEERI and CSIR-CLRI and the display of value-added leather products made out of goat leather by Team CSIR-CLRI.
On Saturday, 27 November, I completed two years of my tenure as Director CSIR-CLRI. I thought it would be a good idea to look back into the past and highlight where we should be in the future.

**Value Creation**

We are all aware that the fundamental objectives of the institute have been a) R&D to create value for hides and skins a by-product of the meat industry, b) value for leather and leather products, c) value for wastes from the leather industry, and d) create a future employment/entrepreneurship through leather and leather products.

At CSIR-CLRI, through the last 73 years, we have constantly been seeking to develop technologies that meet the customers’ needs, i.e., the stakeholders of the leather industry, and provide solutions for the environmental issues that have been bogging the sector. The success of CSIR-CLRI is rooted in our ability to continue improving on our existing technologies while constantly innovating to develop first-in-the-world solutions for the changing needs of the industry and society.

**Our Accomplishments and Motivation**

We have a long track record of developing proprietary technologies and cost-effective products and processes that have met the needs of the industry. Time and again, the innovations that have stemmed from small projects at the institute have been implemented nationwide through mission mode programs. We have been motivated by the mandate doing better today than yesterday forever.

We step into our 75th year in 2023; we need to be pushed by the Mission to Excel, where each program of ours is motivated to provide solutions today for tomorrow's problem. To have a clear thought of futuristic industrial needs, a clear understanding of the industry, the customers of the industry, and how the society is changing, so that we can anticipate how technology can meet the needs of our stakeholders is required. Each translational project of CSIR-CLRI must be governed by the mantra “do what others cannot,” leading to us being the sole solution provider. The industry is now looking towards the institute for meeting its quality assurance needs. Government agencies and industry groups in Kolkata and Kanpur have now come forward to providing infrastructure and instrumentation facilities for the institute to set up testing facilities in the region. The ISO 17025:2017 accredited testing facility of the institute -Centre for Analysis, Testing, Evaluation and Reporting Services (CATERS) has already started functioning at Kanpur. Union Territory of Ladakh has commenced working with CSIR-CLRI to create a decent living for the people of Ladakh through the leather. We have launched a leather product-based entrepreneurship drive targeted towards women and self-help groups. A similar effort is likely to commence in the UT of J&K as well.

**Newer Concerns**

Leather clusters in Kanpur and Kolkata are looking for technologies to reduce water consumption while meeting the total dissolved solids in wastewater norms. Customized solutions that meet the requirements of the specific clusters are needed. The LWG audit protocol 7.0 requires a minimum threshold of 25% to pass the water usage audit, calling for water reduction technologies from the industry.

Our society has changed at a pace never imagined before. Our Hon’ble Prime Minister has made five promises, viz., net-zero emissions by 2070, non-fossil energy capacity to 500 GW by 2030; reducing carbon intensity by 45% by 2030; fulfill 50% of energy requirements through renewable energy by 2030; reduce 1 billion tons of carbon emission from total projected emissions by 2030.
The carbon footprint of the leather industry is not very encouraging. Newer technologies are required to create a carbon-neutral leather sector, with commitments to reduce water and energy consumption. A circular economy linking leather and other manufacturing sectors may be necessary to reduce carbon emissions. These are areas where industrial R&D at CSIR-CLRI may have to be focused. Agencies connected with leather have published a leather manifesto seeking to recognize the positive contribution of natural fibres to reduce the climate impact of consumer products. They encourage the use of natural fibres, minimize reliance on fossil-fuel-based materials; support LCA methodologies to accurately account for the environmental impact of fossil-fuel-based materials, including end-of-life properties, and promote slow durable products that can be re-used and repaired for a longer lifespan. The compliance to the manifesto would require us to revisit several of the existing technologies, process methodologies, and product manufacturing techniques.

**Newer Plans**

Alternatives to leathers as a solution to environmental issues arising out of leather processing is a global thought. Leather being a natural fibre, such concerns have little impact on the international leather business. However, alternatives to leather to meet the worldwide footwear and product needs are worthy of consideration due to the limited supply of animal fibres. There is a clear transition from fossil-fuel-based alternatives to vegan materials. However, the present vegan leather-like materials are a combination of plant fibres coupled with synthetic polymers. A project on Much of Muchness is exploring the utility of non-animal-based natural fibres for potential leather-like materials.

We are in the process of developing a roadmap for R&D in footwear to make available technologies that would meet the emerging needs of the footwear sector, including those that can support the industrial needs of sustainability of their operations - environmentally and economically. Comfort footwear and footcare solutions have been our forte of research. The institute spearheaded the first of its kind Indian footwear sizing system to ensure comfortable footwear for the Indian population.

The strategic sector has raised a call for gloves, apparel, and footwear to withstand extreme cold climatic conditions. A research project is currently in progress in developing gloves that can withstand -40°C, with potential applications in high altitude defense locations.

The industry is looking forward to technologies that can turn their leather and non-leather wastes into value-added products. Technologies applicable on a large scale and at a low cost are of immediate need. Targeted research in this area, including the possibility of converting the wastes into filaments for 3D printing, would have to be put in place.

An analysis of the publication profile of the institute in Collagen Biomaterial indicates our strength in this area of research. Integration of research strengths would provide translatable technologies and contribute to collagen disease biology.

**Meeting the HR Needs of the Sector**

The institute would focus on high and customized skill development alongside professional courses and diploma programs through a concerted effort and partnership. Skilling in areas beyond leather, such as handling and maintaining sophisticated instruments, is in the offing.

**Hub of Policy Development**

The institute continues to participate in policy development and implementation of government schemes for the leather sector. A centre for policy development for leather and allied sectors would be set up to enable the development of appropriate policies for the industry. To bring the research, industry, and government on the same platform, the Leather Research Industry Get-together has transited to the Leather Research Industry Government conclave. Suggested by the stakeholders to ensure their full participation in the conclave, the LERIG would now be held in March every year.

**Team Strength**

I earnestly request all the staff members to develop a culture of “CLRI First”. The restructuring and reorientation of the workforce to meet the emerging needs of the institute is nearly complete. The CSIR overarching committee recommendation for implementing a Laboratory Strategic Group (LSG) as a single-window facilitator for ease of working and doing business with CSIR is in place in the institute in the form of Laboratory Specific Strategic Group.
(LSSG). This group would facilitate research and translation of research.

An attitude of partnership for meeting the objectives of the organization is essential. Every single member of the organization needs to get together, team up and contribute. We need to deliver technological solutions speedily. Team CLRI is very young, with an average age below 47. The minor differences that exist within the organization need to be resolved through dialogue such that we put CLRI FIRST and the Needs of the Industry and Nation our PRIORITY.

Dr K J Sreeram
Director, CSIR-CLRI

Awards

International Union of Leather Technologists and Chemists Societies (IULTCS) 2021 Merit Award for Excellence in the Leather Industry was presented to Dr Thirumalachari Ramasami, Former Director, CSIR-CLRI who is known for his significant contributions to the chemistry of chromium as a scientist and leadership to the Indian leather sector as a technologist and to science as a civil servant. Dr. T. Ramasami, received the IULTCS Merit Award during the inauguration of IULTCS 2021 in Ethiopia.
A virtual meeting with stakeholders to discuss LERIG 2022 was held on 8th November 2021. Dr. K J Sreeram, Director, CSIR-CLRI brought out the transformative journey of the LERIG event over the years and presented the vision for LERIG 2022. The first Tanners Get-together (TGT) was held just prior to the leather fair in 1965. At the 26th meeting, TGT transformed into Leather Research Industry Get-Together (LERIG) to emphasize the partnership of research and industry in the development of the leather sector. Indian leather sector is ideally poised for converting the LERIG platform of “getting together” into a “Leather Research, Industry, Government” (LERIG) Conclave starting from the year 2022. He highlighted that “G” in LERIG will now stand for Government, where it is intended that government representatives will be part of panel discussions and other sessions to showcase the leather sector. He pointed out that henceforth LERIG will be known as Leather Research Industry Government (LERIG) Conclave.

Director sought the opinion of stakeholders on the possible dates for holding the LERIG conclave. He also opined that the LERIG conclave will be held in different cities in addition to Chennai. He also mentioned the upcoming Roadshow by CSIR-CLRI on Project Goat and Leather grading system in November 2021.

Mr. Selvam IAS, Executive Director, Council for Leather Exports (CLE) suggested that the LERIG conclave should focus on having sessions on sustainability and Industry 4.0. Mr. R K Jalan, Vice Chairman, CLE appreciated the change of “G” from Get-together to Government as participation of Government will be beneficial to the leather sector. He also emphasized the need for sessions on sustainability and Industry 4.0 in LERIG.

LERIG Conclave 2022 is proposed to be held during the week of March 2022 as it is convenient for all stakeholders. It was also decided to explore the possibility of organizing an inaugural event of LERIG Conclave 2022 at Kanpur.
CSIR-CLRI in collaboration with Gujarat Rural Industries Marketing Corporation Ltd. (GRIMCO) conducted a skill up-gradation programme at the following places of Gujarat for the upliftment of rural artisans from Scheduled Caste community. The training programme at Sarvarkundla, Amreli District was conducted from 2nd September to 30th November 2021 and 17 artisans from rural area learned about product making using leather/rexine materials starting from pattern making up to product finishing.

The training programme at Dwarka in Devbhumi Dwarka District was conducted from 4th September to 2nd December 2021 and 21 rural artisans benefited from this programme.

The trainees acquired the skills of leather/rexine goods making and were able to provide quality finish to the products with an aesthetic appeal.
CSIR-CLRI with the support of Industry and commerce Ladakh, A Training program on Skill development on “Opportunities in Leather and Allied product” was organized at the two districts of Ladakh namely Leh and Kargil from 24 July 2021 to 23 August 2021.

A total of Fifty women candidates were trained in both districts. The training was given in the following operations as Basic Sketching, Basic Cutting, Basic Stitching, Pattern development, and products fabrication. During the training program, trainees have fabricated the following articles such as Pencil Pouch, Sling Bag, Tote Bag, and Ladies Backpack. These products were made using local Ethnic fabric material namely “Namboo”.

Trainees of Chuchot, Leh has formed a Self Help Group and are producing various products by using locally available ethnic fabric.

Department of Industry and Commerce (DIC) has provided an industrial sewing machine to this group for a period of four months without any charges. The following articles are being fabricated by the SHG using locally available materials pencil pouch, Toiletry Kit Pouch, Cosmetic Kit Pouch, ladies Waist Bags, Luggage Bag.

To encourage the SHG, the Department of Industry & Commerce sponsored them to participate and exhibit their products in India International Trade Fair 2021, one of the largest integrated trade fair in the South Asian region being held in Pragati Maidan, Delhi from 14.11.2021 to 27.11.2021. All the fabricated products were displayed at the trade fair and 40 percent of the products were sold out in the first week itself.
Dr K J Sreeram, Director, CSIR-CLRI, Dr K Sri Bala Kameswari, Senior Principal Scientist & Scientist-in-Charge, Regional Centre, Kolkata, and Dr P Thanikaivelan, Senior Principal Scientist, CSIR-CLRI, Chennai participated in a meeting chaired by Dr. Hari Krishna Dwivedi, Chief Secretary, Govt. of West Bengal on 20 November 2021 at Calcutta Leather Complex (CLC). The Principal Secretary, Micro, Small and Medium Enterprises and Textiles (MSME&T) and the members, Member Secretary, West Bengal Pollution Control Board, Secretary, Land & Land Reforms and Refuge Relief & Rehabilitation (L&LR and RR&R) Department, members from Kolkata Metropolitan Development Authority (KMDA) and members from Calcutta Tanners Association also participated in the meeting. The Chief Secretary, Govt. of West Bengal reviewed the status of various infrastructural developments in the leather complex and the implementation of cleaner technologies to reduce the TDS in wastewater. Dr K J Sreeram, Director, CSIR-CLRI briefed the various technological options and the efforts taken by CSIR-CLRI for reducing TDS in wastewater. Further, he explained about the pilot-scale biogas plant installed in CLC and the proposed full-scale biogas generation plant at CLC. It was decided in the meeting that the tanneries have to gradually adopt the Cleaner Technologies viz., mechanical desalting, enzyme-based tanning process, and waterless chrome tanning process, etc., as suggested by the CSIR-CLRI scientists to bring down the TDS in the tannery effluent. As the pilot-scale Biogas plant has been successfully running in CLC, it was also recommended that the state government may consider setting up a large-scale Biogas project in CLC.
CLRI-CATERS (Centre for Analysis, Testing, Evaluation, and Reporting Services), an ISO 17025:2017 accredited laboratory, provides state-of-art testing facilities for the leather, footwear, and allied industries. The Centre for Academic & Research Excellence (CARE) at CSIR-CLRI houses host of sophisticated instruments that are of primary requirement in the development of analytical protocols for any industry. With precision and reproducibility dependent on the skills of the analyst to a large extent, there is a strong need to develop talents to operate and maintain these sophisticated instruments.

Keeping in view the need to develop skillsets for the operation and maintenance of sophisticated instruments the institute is calling for the first tranche of the internship. The program details are:

**Chromatography Pack**
- Provide to the trainee theoretical knowledge of different chromatographic techniques
- Impart training on procedures in handling chromatographic instruments such as GC, GC-MS, GC-MS-MS, HPLC etc.
- Training on data management and periodic checks
- Ethics in data collection and management

**Spectroscopy Pack**
- Provide to the trainee theoretical knowledge of different spectroscopic techniques
- Impart training on procedures in handling spectroscopic instruments such as UV-Vis, Fluorescence, AAS, ICP-OES, ICP MS etc.
- Training on data management and periodic checks
- Ethics in data collection and management

**Timelines**
- Opening of application for the internship – 19 November 2021
- Closing of application for the internship – 10 December 2021
- Publication of results – 24 December 2021
- Last date for payment of fees – 31 December 2021
- Course commencement – 3 January 2022

**Number of Seats**
- Only 5 in each pack

**Location of Internship**
- CSIR-CLRI, Chennai

**Duration**
- 3 months (December – February 2021)

**Internship Fees**
- Rs. 15,000/-

**Boarding and Lodging:**
- Candidates have to make their own arrangement

**Eligibility**
- First Class MSc in chemistry.

**Age Limit:**
- 27 years

**Selection**
- Selection would be based on the PG mark merit. If required a written/interview would be conducted for selection.

Interested students may fill the application form provided in the link below (or) forward their resume with a statement of purpose of undergoing the internship along with a scanned copy of the M.Sc. certificate electronically at clricare@clri.res.in Original of the M.Sc. certificate will have to be produced for verification at the time of admission, on selection

https://forms.gle/FfBT3kwCkMqfBBQZA
Shri Rajnish Kumar Jenaw, CMD of National Scheduled Castes Finance & Development Corporation (NSFDC) & Shri. Subhash Chand, AGM visited CSIR-CLRI on 20 November 2021. The dignitaries visited various departments of CSIR-CLRI and saw the facilities available at CATERS, GAIT, Fashion Studio, SPDC, and Leather Process Technology Dr (Smt) Swarna V Kanth, Sr. Principal Scientist presented the cluster development activities by CSIR-CLRI, and Dr. V Subramanian, Outstanding Scientist presented the facilities & business opportunities available at CSIR-CLRI. Dr. R. Aravindhan, Principal Scientist of the Leather Process Technology Department explained the facilities available at LPT (Tannery). Dr. K. Krishnaraj, Chief Scientist presented about Footwear and other Leather products.
Constitution Day also known as ‘Samvidhan Divas’, celebrated on 26th November every year to commemorate the adoption of the Constitution of India. During the Constitution Day celebrations at CSIR-CLRI the Director and Staff of CSIR-CLRI read the Preamble of Constitution of India.
Thermotropic liquid crystals are an important class of materials and show fascinating behavior when subjected to temperature change. There is a significant interest to understand their behavior in terms of molecular arrangement and dynamics due to their technological importance. Molecules in the liquid crystalline phase, known as mesophase, have characteristics of both highly ordered solid phases and disordered liquid phases. The long-range orientational order, a prime characteristic of a liquid crystal, determines the behavior of liquid crystals. It also shows the alignment of molecules around a common imaginary axis known as the director. Structurally rod-like thermotropic liquid crystals (mesogens) are made up of rod-like core (aromatic groups) and decorated with flexible aliphatic chains. The current trend of research mainly focuses on non-linear mesogens, i.e., molecular design deviates from the simple rod-like (linear) structure as it exhibits exciting properties. Research on rod-like mesogens is still continuing due to their structural simplicity and well-known structure-property relationship. Further, these mesogens serve as benchmark molecules for examining their mesophase features and important properties like orientational order. In this work, rod-like mesogens were designed with biphenyl and bithiophene units as a part of the core at the terminal position. The Solid-state $^{13}$C NMR technique was employed to find the mesophase properties and to estimate the orientational order parameter. In addition, hot-stage optical polarizing microscopy (HOPM) and differential scanning calorimetry (DSC) were also employed to confirm the mesophase properties of these molecules. The fundamental knowledge gained by the application of this methodology will lead to a broad understanding of these materials at the molecular level and help in the rational designing of a new generation of materials.

A. A. Boopathi, T. Bhavani, Nitin P. Lobo,* and T. Narasimhaswamy*

Liquid Crystals, 2021, 48(10), 1477-1491, DOI: 10.1080/02678292.2021.1883139
Polyurethanes (PU) are considered high-performance materials for versatile applications. Extensive research is required to fabricate flame-retardant PU polymers for improved oxidative and thermal stability. A flame-resistant material composed of phosphorus, nitrogen, and silicon atoms was designed. Triethanolamine-diethyl phosphate (P-OH) with flame retardant Phosphorous atom in the chemical structure was synthesized and construction of the polyurethane foam was achieved between P-OH and toluene diisocyanate with the inclusion of polyethylene glycol (PEG) and polydimethylsiloxane (PDMS). The PU foams were characterized for their thermal stability, thermal degradation kinetics, and morphology. The analyses indicated that the foams were amorphous and changes slightly the microphase separation. An increase in PDMS/PEG ratio in the polyurethane has increased glass transition temperature from 168.3°C to 177.3°C. The polyurethane systems were considered as being “slow-burning” with a level of UL-94 V-0, and their ignition delay time was estimated to have eight seconds. The materials possess good thermal stability and can be employed in conditions under 300°C. This type of PU nanocomposites considers as being ‘slow-burning’ can be used in the fields of energy-saving buildings and thermal energy storage.

Stanley Olivier Kanemoto, Siddan Gouthaman, Madhu Venkatesh, Arnaud Maxime Cheumani, Maurice Kor Ndikontar, Suguna Lakshmi Madurai

XXXVI Biennial Congress of the International Union of Leather Technologists and Chemists Societies (IULTCS) was hosted by Africa Leather and Leather Products Institute (ALLPI), Addis Ababa, Ethiopia in association with the Ministry of Industry, Govt. of Ethiopia during 3 - 5 November 2021 at the Skylight Hotel, Addis Ababa. The Congress was held in the hybrid mode (due to the COVID-19 pandemic limitations), with both face-to-face and online participants. The online system facilitated recordings of all presentations and discussions and will be available to registered participants during the next two months. Over 240 participants from many countries on all the continents attended the event. A total of 36 oral presentations in 9 Sessions and more than 70 poster presentations in 6 Virtual Poster & Exhibition Time Slots were made on leather and leather product technologies, leather science, and sustainability of leather etc. The Congress was steered by AALPI Expert team led by Prof. Mekonnen Hailemariam with 16 well-known scientists, researchers, and professionals in the leather sector from across the different continents as moderators. I had the privilege of moderating the 7th Session.

The official opening ceremony of the Congress was followed by the presentation of the IULTCS 2021 Merit Award for Excellence in Leather Industry to Dr. T. Ramasami, Former Director, CSIR-CLRI, and the Heidemann Lecture by Professor Anthony Covington.

Dr. S. Rajamani, Scientist ‘G’ (Retd), CSIR-CLRI made an online oral presentation on “Biological liquefaction and anaerobic digestion of waste fleshings integrated with sludge and bio-energy generation- a novel and sustainable development”.

The oral presentations generated a lot of discussions on the subject materials presented. Some of the topics discussed were: Metal-Organic Framework-Layered Double Hydroxide; improve the absorption of chemicals in wet leather processing; Study on Construction and Properties of Self-cleaning leather; Hydrocarbons release during the biodegradation of solid waste from tanneries for biogas production; Application of kinetic models in leather processing; Phenolic monomers in aromatic syntans and their influence on leather; Leather Product Design Canvas and Leather Design- Guidelines for Sustainable Development- The role of Design as a Driver for Sustainable Leathergoods in the 21st century; MOFs enabled polyacrylate based nanocomposite as flame retardant leather finishes; an investigation on the usability of 3D visualization and simulation programs in leather apparel.

Dr. N. Kamini, CSIR-CLRI made an online oral presentation on "Microbial degradation of animal hair and preparation of organic compost thereof "and Dr. Sanjeev Gupta, CSIR-CLRI along with his co-author Dr. Pon. Subbiah (Institute of Leather Technology, Chennai) made a presentation on "Preparation of Shoe Soling Material using Leather and Textile Waste".

There were many online poster presentations too from CSIR-CLRI. My poster presentation was on” Education for Sustainable Development of the leather industry- challenges and pedagogical models”.

Many scientific staff from CSIR-CLRI participated in the Congress Proceedings online. At the closing ceremony of the Congress, the IULTCS anthem was played and the Union’s flag was handed over to the host of the next Congress, the China Leather Industry Association.
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