1

# Synopsis of Objectives

- An Association with over 550 members from India and abroad working since last 72 years for the growth and development of Leather and its allied industries.

- Organize seminars, symposiums, workshops in order to share information, knowledge & latest development and interactions for the benefit of all concerned.

- Organize Human Resource Development programmes on regular basis.

- Publish for over 72 years, a technical monthly journal namely "Journal of Indian Leather Technologists' Association" (JILTA), widely circulated through out the World.

- Publish books for the benefit of the students at various levels of study, for the Research Scholar and the Industry.

- Work as interface between Industry and the Government.

- Assist Planning Commission, various Government Institutions, Ministry and autonomous bodies to formulate appropriate policies for the growth of the Industry.

- Assist small and tiny leather goods manufacturers in marketing their products by organizing LEXPOs in Kolkata and different parts of India.

## Indian Leather Technologists' Association
[A Member Society of International Union of Leather Technologists' and Chemists Societies]

'Sanjoy Bhavan', 3rdFloor, 44, Shanti Pally, Kolkata- 700 107, WB, India
Phone : 91-33-2441-3429 / 3459 ✺ WhatsApp +91 94325 53949
E-mail : admin@iltaonleather.org; mailtoilta@rediffmail.com
Website : www.iltaonleather.org

ILTA
Since 1950

## JOURNAL OF INDIAN LEATHER TECHNOLOGISTS' ASSOCIATION (JILTA)

## Contents

**Opinions expressed by the authors of contributions published in the Journal are not necessarily those of the Association**

# JOURNAL OF INDIAN LEATHER TECHNOLOGISTS' ASSOCIATION (JILTA)

Indian Leather Technologists' Association is a premier organisation of its kind in India was established in 1950 by Late Prof. B.M.Das. It is a Member Society of International Union of Leather Technologists & Chemists Societies (IULTCS).

The Journal of Indian Leather Technologists' Association (JILTA) is a monthly publication which encapsulates latest state of the art in processing technology of leather and its products, commerce and economics, research & development, news & views of the industry etc. It reaches to the Leather / Footwear Technologists and the decision makers all over the country and overseas.

## Advertisement Tariff

### Full Page / per month

| | |
|---|---|
| Black & White | Rs.    5,000.00/- |
| Colour (full page) | Rs.  10,000.00/- |
| Colour Insert (One side) | Rs.    5,000.00/- |
| (Provided by the Advertisers) | |

### Full Page / per anum

| | |
|---|---|
| Front inside (2nd Cover) | Rs.      96,000/- |
| 3rd Cover | Rs.      84,000/- |
| Back Cover | Rs.  1,20,000/- |

## Mechanical Specification

| | | |
|---|---|---|
| Overall size | : | 27 cm X 21 cm |
| Print area | : | 25 cm X17 cm |

Payment should be made by A/c. Payee Cheque to be  drawn  in favour of :

**Indian Leather Technologists' Association**
and Payable at **Kolkata**

*Send your enquiries to* :

**Indian Leather Technologists' Association**
'SANJOY BHAVAN'
3rd floor, 44, Shanti Pally, Kasba, Kolkata – 700 107
Phone : 91-33-24413429  /  91-33-24413459
E-mail : admin@iltaonleather.org / mailtoilta@rediffmail.com / iltaonleather1950@gmail.com
Website : www.iltaonleather.org

# INDIAN LEATHER TECHNOLOGISTS' ASSOCIATION (ILTA)
### (Member Society of International Union of Leather Technologists and Chemists Societies)

## Executive Committee (2022-24)

### Central Committee

President : Mr. Arnab Jha

Vice-Presidents : Mr. Asit Baran Kanungo
Mr. Pulok Majumdar
Dr. S. Rajamani

General Secretary : Mr. Susanta Mallick

Joint Secretaries : Mr. Bibhas Chandra Jana
Mr. Pradipta Konar

Treasurer : Mr. Kaushik Bhuiyan

Committee Members:

1. Mr. Alokesh Roy
2. Mr. Abhijit Das
3. Mr. Mihir Prasad Das
4. Mr. Udayaditya Pal
5. Mr. Jiban Dasgupta
6. Mr. Amit Kumar Mondal
7. Mr. Aniruddha De
8. Mr. Sudagar Lal
(Secretary North/West Region)
9. Dr. R. Mohan
(Secretary South Region)
10. Dr. K. J. Sreeram
11. Mr. Arijit Chakraborty

Ex-Officio Member : Dr. Goutam Mukherjee

### Regional Committees

**Southern Region :**

President : Mr. N. R. Jagannathan

Vice-President : Dr. J. Raghava Rao

Secretary : Dr. R. Mohan

Treasurer : Dr. Swarna V Kanth

Committee Members :
Dr. N. Nishad Fathima
Dr. P. Thanikaivelan
Dr. Subhendu Chakrabarti
Dr. S. V. Srinivasan
Dr. J. Kanagaraj

**Northern / Western Region :**

President : Mr. Jai Prakash Saraswat

Vice-President : Mr. Rajeev Mehta

Secretary : Mr. Sudagar Lal

Treasurer : Mr. Jaswinder Singh Saini

Committee Members:
Mr. Kamal Sharma
Mr. Mohinder Lal
Mr. Rajveer Verma
Mr. Jagdish Gupta
Mr. Sakattar Lal

# JOURNAL OF INDIAN LEATHER TECHNOLOGISTS' ASSOCIATION (JILTA)
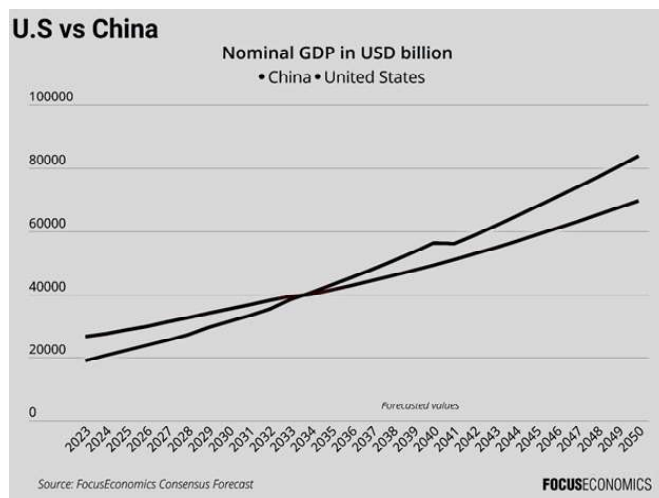
# A Look into Economic Corridors

In 2022, the U.S. economy was still 42% larger than China's in nominal GDP terms. Our panelists expect China is to gradually reduce that gap over the next decade, before surpassing the U.S. in 2034. By 2050, China's economy is forecast to be 20% larger than that of the U.S. But risks appear skewed to the downside for China. Economic reform momentum has waned in recent years, the population is declining and aging, the property sector is saddled with debt, and the West is imposing ever-tougher trade and technological restrictions. Worryingly, in recent months China's economy has consistently underperformed market expectations, seeing only a fleeting boost from the removal of Covid-19 restrictions.

India will surge to become the world's third-largest economy by 2050 according to our panelists, with nominal GDP of 38 billion— more than three times the size of Indonesia, the next biggest economy. India's key economic strengths will be favorable demographics, ongoing business-friendly reforms, and cordial relations with both the West and China. Yet the country's still faces obstacles to its economic development. The education system is deficient relative to other emerging Asian nations. Protectionism could harm trade; in recent years, the government has declined to participate in the newly formed CPTPP and RCEP trade agreements for instance and border disputes with Pakistan and China could intensify.

Consensus is for the nominal GDPs of Indonesia, the Philippines and Vietnam to be around 10 times larger in 2050 than they are currently, thanks to the region's relatively stable political panorama, proximity to China and India, and attractiveness as a base for global manufacturing investment. In contrast, major emerging economies in Africa, Latin America and Europe will see more modest progress. For instance, Argentina's economy is currently one and a half times the size of those of Vietnam and the Philippines; by 2050, the two East Asian nations will each boast economic output over twice that of Argentina.

On China's recent economic slowdown, **Nomura analysts** said: *"In view of the worsening downward spiral of major activity data and Beijing's tepid response to date, we lower our GDP growth and inflation forecasts. We expect Beijing to introduce a raft of supportive measures […] and believe it will increasingly play the role of borrower and spender of last resort. However, these measures may not turn things around, due to weak confidence, negative sentiment, the huge fiscal cliff due to the collapse of land sales, clogged transmission channels, a shrinking toolbox, slow decision-making on economic matters, and conflicts among multiple targets."*

On India, **EIU analysts** said : *"India's growth will be the fastest among major world economies in 2023-27. Although services will make up the bulk of GDP, the implementation of labour and logistics reforms will gradually improve manufacturing competitiveness."*

**U.S vs China**

Nominal GDP in USD billion
• China • United States



*Source: FocusEconomics Consensus Forecast*

FOCUSECONOMICS

**Briefings on Asia :**

- China's recovery from the pandemic is aiding regional GDP.

- The lifting of travel restrictions is boosting tourism; Asia was the region that kept travel restrictions in place

- for the longest, creating a favorable base of comparison for visitor arrivals this year. For instance, Thailand's visitor arrivals were 13 times higher in Q1 2023 compared to Q1 2022.

- As Asia is a large energy importer, cooling energy prices are supporting purchasing power and reducing currency pressures.

- The region retains key structural advantages relative to other emerging markets, such as competitive manufacturing sectors, high savings rates, a low age dependency ratio, relative political stability, and strong FDI inflows

- Less positively, many Asian countries have seen sharp falls in goods exports so far this year.

- This is partly due to the large weight of electronics in the export mix; global electronics demand is now cooling following the pandemic-induced boom.

- Moreover, Western consumers are spending more on services and less on goods, while China's economic recovery has yet to translate into higher goods demand from abroad, with Chinese imports contracting in January–April.

- GDP in Asia (ex-Japan) is forecast to grow by 5.0% in 2023 and 4.8% in 2024, outpacing growth in other world regions.

- Strong gains in consumption, investment, and services exports underpin these projections. In contrast, merchandise trade will be weak; our analysts see goods exports declining in 2023 on limp external demand.

- Bangladesh, India, and Cambodia are forecast to be the strongest performers this year. At the other end of the spectrum will be Pakistan, Sri Lanka, and the region's developed economies.

- Asia (ex-Japan) inflation will average 3.2% and 2.9% in 2023 and 2024, respectively. Improved supply chains and moderating commodity prices will dampen price pressures.

- China will record the lowest inflation, as the end of Covid-19 restrictions boosts supply and slack in the economy remains.

- In contrast, Laos, Pakistan, and Sri Lanka will see inflation well in the double digits due to past currency weakness.

- Regional interest rates should finish this year above their end-2022 level, and decline in 2024. However, monetary tightening in Asia (ex-Japan) will be comparatively mild—rates are seen rising less than 100 basis points on average from end-2021 to end-2023, compared to 430 basis points in Sub-Saharan Africa and 900 basis points in Latin America.

- The highest interest rates will be seen in Mongolia, Pakistan, and Sri Lanka. In contrast, Taiwan and Thailand will see the lowest policy rates

- On aggregate, regional currencies are forecast to gain strength against the U.S. dollar this year and next.

- Factors such as recovering tourist arrivals, falling energy prices, the region's attractiveness as an FDI destination, and broad-based USD weakness will all drive the appreciation.

- However, FX performance will vary wildly by country

- The U.S. and EU are accelerating efforts to boost domestic manufacturing capacity in critical industries

- 20% of freight from Asia could shift to markets closer to end-customers by 2025 according to a recent Deloitte survey, rising to 40% by 2030. This would spell bad news for Asian goods exporters.

- Further tit-for-tat trade and technology restrictions are likely as the U.S. continues its efforts to stem China's technological rise.

- Taiwan will be a particular flashpoint, given closer U.S.-Taiwan ties and China's insistence that the island fall under Beijing's remit.

- Companies will continue to move low-cost manufacturing from China to other Asian economies, with Vietnam and India likely to be key beneficiaries.

- The trend will be supported by China-U.S. trade tensions, Beijing's focus on higher value production, rising Chinese wages, and falling labor supply in the Asian powerhouse.

- Pro-market reforms are unlikely under the current president, who has looked to boost the Party's control over activity.

- Beijing could renew crackdowns on economic sectors not aligned with the government's long-term goals.
- Ensuing regulatory uncertainty will likely hold back private investment.

- Chinese real estate indicators were weak in April, which puts in some doubt the incipient property market recovery observed earlier in the year.

- A prolonged housing malaise in China poses a risk to the overall economy and wider region, given that the property sector accounts for around a quarter of Chinese GDP.

- Sri Lanka defaulted on its debt last year and is currently seeking debt relief, while Pakistan is at risk of default this year or next.

- IMF support to both countries will be crucial to keep their economies afloat.

- Pakistan and Sri Lanka are at risk of renewed sociopolitical instability if economic conditions do not improve.

- By 14 October 2023: Pakistan will hold elections which could see an opposition victory given the current dire state of the economy. Military interference to attempt to keep the current government in power is also a possibility.

- January 2024: General elections in Taiwan could have a key bearing on relations with China. Victory for the current ruling party would likely spell further tensions and attempts to cozy up to the U.S., while an opposition win could improve China-Taiwan ties.

- February 2024: The incumbent party is likely to emerge victorious in general elections in Indonesia, although the current president Joko Widodo will not be running due to a term limit.

- April-May 2024: Regional behemoth India will hold elections, which will likely result in the incumbent strong federal (globally popular/powerful) Government retaining leadership of the country.

- ASEAN has proven resilient amidst such recessionary risks, with growth holding up relatively well while inflation fared much better compared to other Emerging Markets. The fiscal positions are also comparatively more prudent." UOB analysts

- Asia's export downturn is now over a year old. By product type, exports of semiconductors & electronics, chemicals, and electrical machinery have slumped. Exports to China have weakened the most, followed by the US and EU, while exports to ASEAN and the rest of the world have held up. Our view has for some time been that Q2 would mark the trough of Asia's exports down cycle." Nomura analysts

- "Tariffs [by the U.S. on China] are now noncontroversial, and removing them would likely entail greater political risk than maintaining them." Goldman Sachs analysts

- "A direct conflict between China and Taiwan is unlikely in 2023-24, in large part given our view that an attack would solicit US intervention. Nonetheless, tensions are high, increasing the risk of a miscalculation that could spiral into a wider conflict. We expect deepening US-Taiwan ties to continue to fuel Chinese hostilities towards Taiwan in 2023-24, particularly ahead of Taiwan's 2024 elections." EIU analysts

**Asian Outlook (Country wise) :**

ILTA
Since 1950

## China :

- The Chinese economy accelerated in Q1 on the disappearing impact of the pandemic.

- Activity lost steam at the outset of Q2: In April, retail sales, credit, and industrial production data undershot market expectations.

- The Consensus is for GDP growth to accelerate this year from last—partly on a favorable base effect—before dipping back below 5% in 2024.

- Inflation is forecast to remain low at around 2%, while the yuan should strengthen through end-2024.

## India :

- GDP growth is projected to have remained roughly stable in Q1 2023. Compared to Q4, industrial output rose at a faster rate, and the services PMI averaged at a higher level. Turning to Q2, the composite PMI rose to an almost 13-year high in April.

- India should be one of Asia's star performers this year and next, buoyed by strong investment and private consumption.

- Both inflation and interest rates will dip, although rates will remain above their pre-pandemic level.

## South Korea :

- GDP rebounded sequentially in Q1 as private spending and exports bounced back. Heading into Q2, GDP growth should be picking up marginally in sequential terms.

- Japan and Korea held a formal summit in Seoul for the first time in 12 years in early May. The rapprochement may boost investment and trade relations ahead.

- Growth will slow sharply this year on a downturn in the electronics sector, before picking up next year. Inflation and interest rates have likely peaked.

## Indonesia :

- Year-on-year GDP growth was stable in the first quarter. Resilient household and public spending were behind the reading.

- GDP growth will likely decelerate in Q2 on a tougher base effect. Available data for the quarter is broadly positive: In April, consumer confidence and the manufacturing PMI rose, and inflation continued its downward trend. However, exports fell by double digits year on year.

- GDP growth will be above the regional average this year and next, and no more rate hikes are expected by the Central Bank.

## Vietnam :

- After losing speed in Q1, growth is projected to pick up in Q2 but remain muted by historical standards. A downturn in global electronics demand is hitting industrial production, offsetting the boost from recovering tourist arrivals and lower interest rates.

- GDP growth will be historically weak this year but still above the regional average. In 2024, Vietnam should be Asia's joint-fastest growing economy as external demand picks up.

- Further monetary easing is likely later this year to support demand.

Therefore, India is going to surge and govern the global issues in the coming days. Let us pledge as Indians to hold hands together for a brighter India / global leader India with justified pragmatism.

*Goutam Mukherjee*

***Dr. Goutam Mukherjee***
Hony. Editor, JILTA

**Tell me and I forget, teach me and I may remember, involve me and I learn**

Stahl Campus(ft)



As an active proponent of responsible chemistry, Stahl has established the Stahl Campus® training institute in its Center of Excellence for sustainable leather technologies in Kanpur. With our Stahl Campus® Leather Modules, we can offer training and information, such as responsible chemistry and sustainability in leather production. We believe that in this way, we facilitate transparency that inevitably will lead to a better supply chain with responsible chemistry.

Our approach is modular, making it easy to tailor learning programs to specific needs. Stahl Campus® has at its core the drive to unlock human potential and make that new competitive advantage. By providing the possibility of sharing knowledge, we embrace our role in the dynamic leather and chemical industry. Stahl Campus® is a great opportunity to strengthen skills and capabilities in order to make working methods more efficient by sharing experiences and studying products and procedures.

If you're interested to receive more information on Stahl Campus®, please contact Prasanna Maduri (Prasanna.maduri@stahl.com).

If it can be imagined, it can be created.

ILTA
Since 1950

# We imagine sustainable pickle-free leather tanning

If it can be imagined, it can be created

Tanners benefit from higher process efficiency, reduced water, chemical and salt consumption, and a reduced environmental impact. This makes it possible for tanners to have an efficient process that is also sustainable and yields eco-friendly premium leathers.

High-quality leather no longer forces a choice between responsible processes and efficiency. The main benefits of a pickle-free system that avoids salt addition during pickling are:

- Reduction of water consumption by up to 40%
- Shorter process time on cow, sheep and goat
- Cleaner effluent, TDS reduction by up to 40%

Stahl

# STAHL SECURES ISCC PLUS RE-CERTIFICATION FOR FACILITIES IN GERMANY AND THE NETHERLANDS

Stahl, a leading provider of coating technologies, announces the successful re-certification of two manufacturing sites, in Germany and the Netherlands, according to the ISCC PLUS standard. The re-certification of the sites by certifying body TÜV NORD means Stahl can continue to scale up its use of renewable feedstocks across its polyurethane portfolio and beyond. This will enable the company to offer customers more products containing attributed renewable raw materials. The development marks a key step forward in Stahl's supply chain transparency ambitions, targeting greenhouse gas (GHG) emission reductions across the value chain.

The ISCC PLUS-certified products manufactured at Stahl's Waalwijk and Leinfelden locations include selected polyurethane coatings for flexible materials such as textiles, film and paper. The polyurethanes are made with between 20% and 70% renewable attributed biomass and recycled content. These products have the same performance as traditional fossil-based alternatives.

Renewable content is measured and verified using the mass balance methodology. This is a calculation-based approach that tracks the flow of materials through complex supply chains. Mass balance-certified products, such as those adhering to the ISCC PLUS standard, typically contain a mix of renewable- and non-renewable-derived feedstocks. The mass balance principle ensures that the percentage of renewable feedstocks always remains consistent, from sourcing to finished product.

Michael Costello, Group Director of ESG at Stahl:fl *"Mass-balance certification verifies that Stahl's manufacturing sites adhere to the highest standards of traceability, which is required to produce high-performing products containing both fossil- and renewable-derived feedstocks. Certification also requires a transparent chain of custody for the renewable raw materials used by the reporting company. This is essential to mitigate potential upstream supply chain risks, making ISCC PLUS certification a key tool for promoting greater supply chain transparency across the industry."fl*

Lidia Martínez, ESG Supply Chain Transparency Manager at Stahl:fl *"We are pleased to offer customers more mass balance-certified products made with ISCC PLUS-certified raw materials. Thanks to our re-certification, we can keep expanding our range of mass balance-certified polyurethanes made with bio-based, bio-circular and circular raw materials. ISCC PLUS re-certifications are an assurance of the quality and transparency of Stahl's mass balance bookkeeping. Alignment with ISCC PLUS is one of the ways we support the responsible sourcing of renewable feedstocks by providing proof of traceability."*

**About ISCC PLUS**

ISCC – International Sustainability and Carbon Certification – is a certification system that offers solutions for the implementation and certification of sustainable, deforestation-free and traceable supply chains for a wide range of bio-

based and circular materials. These include biomass waste and residues, non-biological renewables and recycled carbon materials. Independent third-party certification ensures compliance with high standards of ecological and social sustainability, as well as traceability, throughout the supply chain. All ISCC PLUS certificates are publicly available via the ISCC PLUS portal.

**About TÜV NORD**

A leading certifying body with more than 1,200 expert auditors all over the world, TÜV NORD provides professional audit and certification services across a range of industries, from aerospace to food service. TÜV NORD has been Stahl's certification partner since 2022 when it certified compliance with the ISCC PLUS standard at Stahl's Waalwijk and Leinfelden sites.

*(Stahl News – 18/07/2023)*

## STAHL'S EMISSIONS REDUCTION TARGETS APPROVED BY THE SCIENCE BASED TARGETS INITIATIVE

Stahl, a leading provider of coating technologies, announces that its near-term greenhouse gas (GHG) emissions reduction targets have been validated by the Science Based Targets initiative (SBTi). Stahl is one of the few coatings companies to receive this validation. To date, 145 companies in the chemicals sector have submitted an emissions reduction target to the SBTi, of which 61 have had their targets validated.

Stahl's science-based targets, which reflect the company's commitment to the 2015 Paris Agreement goals, are:



> ➤ Stahl Holdings B.V. commits to reduce absolute scope 1 & 2 GHG emissions 42.0% by CY2030 from a CY2021 base year.
> ➤ Stahl Holdings B.V. commits to reduce absolute scope 3 GHG emissions 25.0% by CY2030 from a CY2021 base year.

The SBTi classifies emissions reduction targets according to two potential temperature pathways: 1) limiting global temperature rises to 1.5°C above pre-industrial levels, and 2) limiting temperature rises to well below 2°C. The SBTi has determined that Stahl's Scope 1 and 2 target is in line with a 1.5°C trajectory, while Stahl's Scope 3 target has been validated in line with the well-below 2°C pathway.

**Maarten Heijbroek, CEO of Stahl:** *"The validation of our Scope 1, 2, and 3 emissions reduction targets by the SBTi is an important milestone on our ESG journey as we strive to limit our contribution to global warming, in line with the Paris Agreement. Our targets are ambitious, and rightly so. Realizing our goal to help create a more responsible coatings value chain starts with being accountable for our own environmental impact, and taking concrete steps to reduce our emissions wherever possible."*

**A clear strategy to reduce GHG emissions**

Stahl's approach to realizing its near-term emissions reduction targets is outlined in the company'sflEnvironmental, Social, and Governance (ESG) Roadmap to 2030. This strategy defines the specific metrics against which progress on the company's ESG commitments will be measured.

Stahl's Scope 1 and 2 GHG emissions reduction targets, as submitted to the SBTi, cover emissions from all manufacturing sites where Stahl products are produced, as well as the company's largest non-manufacturing locations. Stahl aims to lower these emissions by reducing its overall energy consumption and increasing the use of renewable energy at its sites. To achieve this, the company plans to increase its self-generated electricity capacity (using solar power, for example) and continue investing in more energy-efficient equipment.

Stahl plans to reduce its Scope 3 upstream emissions primarily by replacing fossil-based raw materials in its products with renewable alternatives, such as bio-based and recycled-based feedstocks. In addition, the company plans to introduce more low-impact raw materials into its product design.

**About the Science Based Targets initiative**

The Science Based Targets initiative is a global body with the goal of enabling businesses to set ambitious emissions reduction targets in line with the latest climate science. It is focused on accelerating the efforts of companies worldwide to halve emissions before 2030 and achieve net-zero emissions before 2050. The initiative is a collaboration between the CDP, the United Nations Global Compact, World Resources Institute (WRI), and the World-Wide Fund for Nature (WWF).

More information about the steps Stahl is taking to realize its climate ambitions and broader ESG strategy can be found in the company's 2022 ESG Report, available online : ***https://esg2022.stahl.com/esg-report-2022/start***.

*(Stahl News – 04/05/2023)*

## STAHL OUTLINES PROGRESS ON ENVIRONMENTAL, SOCIAL, GOVERNANCE AMBITIONS IN 2022 ESG REPORT

Stahl, a leading provider of coating technologies, has published its 2022 Environmental, Social, and Governance (ESG) Report. The report, which shares its title with Stahl's new purpose –Touching lives, for a better worldfl– details the company's recent progress against its mid-term ESG 2030 targets and broader ESG ambitions. The report is available to view as a/ fully digital version.

Stahl's 2022 ESG Report is the 10th edition of the publication, which aims to provide stake-holders with a clear understanding of the company's ESG strategy,goals and activities.
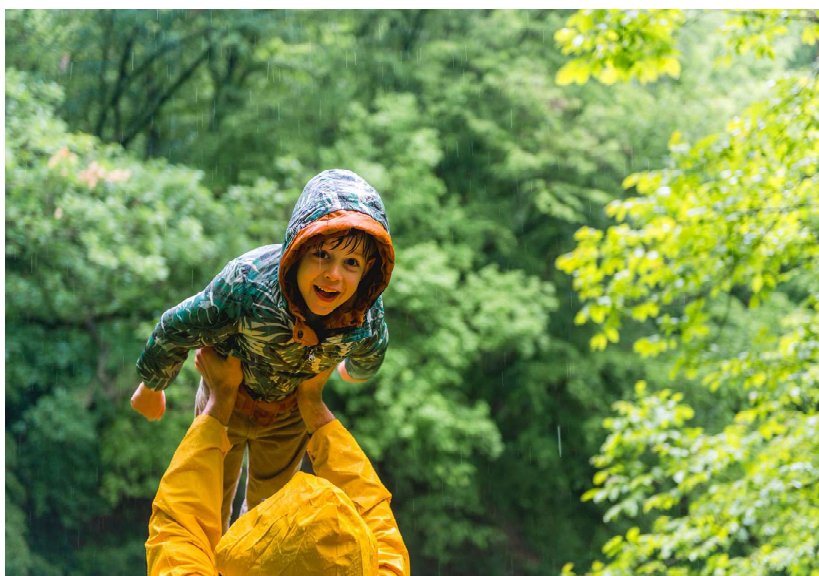
In 2022, Stahl took steps to strengthen its non-financial reporting, including preliminary efforts to address the requirements of/the/Corporate Sustainability Reporting Directive (CSRD), a forthcoming EU regulation. Stahl has established a project team to gain a better understanding of double materiality, governance elements, and other ESG disclosures related to the CSRD.

**Demonstrable progress against Stahl's ESG targets**

A key focus of the report is Stahl's ESG Roadmap to 2030,a list of ESG-related commitments and targets aligned with the UN Sustainable Development Goals (SDGs). % The roadmap uses metrics to track Stahl's progress against its targets, which are based on a set of clearly defined environmental,social, and governance topics.

These targets include reducing greenhouse gas (GHG) emissions. In 2022, the $CO_2e$ intensity of Stahl's Scope 1 and Scope 2 GHG emissions fell by 3%. This followed a decrease of more than 30% in the company's Scope 1 and 2 emissions in absolute terms between 2015 and 2020. During the year, Stahl also submitted a new Scope 3 target to the Science Based Targets initiative (SBTi), with the aim of reducing its upstream emissions by at least 25% by 2030 (2021 baseline). Scope 3 GHG emissions cover all the additional indirect emissions that may occur in the value chain, including those associated with purchased raw materials, packaging, business travel, logistics and transportation, and dealing with end-of-life products. Stahl's Scope 3 emissions currently represent over 90% of its carbon footprint.

**EcoVadis Platinum rating**

In 2022, Stahl received an EcoVadis Platinum rating, placing it in the top 1% of companies assessed by the globally renowned EcoVadis sustainability rating platform. By achieving the highest possible rating, Stahl has surpassed its ESG Roadmap goal of achieving a Gold rating by 2023. Stahl's commitment to the EcoVadis process also extends to its supply chain. 83% of the company's raw material spend came from EcoVadis-rated suppliers, and Stahl aims to ensure that all EcoVadis-rated suppliers in its network achieve a minimum rating of 47/100 by 2030.

**Safe and supportive work environment**

Stahl's 2022 ESG report also details the company's efforts to support the physical and mental well-being of its employees, forming a core pillar of its ESG approach. For instance, Stahl's Roadmap to 2030 includes a target to have all Stahl manufacturing sites ISO 45001-certified1 by 2030 (59% of Stahl's products were produced at ISO 45001-certified sitesin 2022).

In addition, Stahl has taken steps to increase employee engagement and strengthen its diversity, equity, and inclusion (DEI) culture and vision. This has included defining and implementing local DEI plans in each of Stahl's legal entities worldwide and appointing local DEI committees for eachflentity. As part of this effort, Stahl is committed to improving gender equality and the representation of women throughout the organization. To this end, it has set a target to achieve 30-60% female representation across the company's Leadership Team, Extended Leadership Team, and heads of function.

Maarten Heijbroek, CEO of Stahl: "2022 was my first full year as CEO, and I am proud to say that it was a year of progress, as we continued to build momentum toward the goals set out in our ESG Roadmap to 2030. It was a year of significant milestones, including the announcement of our new Scope 3 greenhouse gas emissions target and our EcoVadis Platinum rating, to name a few. While we still have a long way to go to become the responsible organization we aspire to be, each year we touch more lives, as we work with our partners toflcreate a better world."

*(Stahl News – 22/03/2023)*

# *From the desk of* General Secretary

## 73RD FOUNDATION DAY CELEBRATION OF ILTA & PROF. B. M. DAS MEMORIAL LECTURE

This would be organized by our association on Monday the 14th August' 2023 at 02.30 pm (Registration form 02.00 pm) at Science City Seminar Hall – 18 (A & B) followed by a Cultural Program and Ceremonial Dinner.

**Prof. Subhamoy Maitra**, Professor at Applied Statics Unit, Indian Statistical Institute, Kolkata, has kindly consented to deliver the prestigious 'Prof. B. M. Das Memorial Lecture' titled "*Application of Computational Methods in the MSME Sectors related to Leather Industry*".

Another lecture titled "*Entrepreneurship and how Digital can help in Labour Productivity*" will be delivered by Mr. Supriyo Sinha, Executive Director, Peerless Group, Kolkata.

Few Senior Life Members of our association are proposed to be felicitated on this occasion for their lifetime achievements in the field of Science and Technology & immense contribution to our association, respectively.

Toppers in B. Tech & M. Tech Leather Technology Examination from Moulana Abul Kalam Azad University of Technology, Kolkata and Anna University, Chennai would be felicitated with Prof. B. M. Das Memorial award & Prof. J. M. Dey Memorial award on this occasion.

Author of the Article published in JILTA during calendar year 2022 adjudged as the **Best Article** in the said year would also be felicitated with J. Sinha Roy Memorial Award in the occasion. A colorful cultural rendition would be presented on this occasion followed by a ceremonial dinner.

Formal Invitation for joining in the event along with e-Invitation Card has already been sent to all the members, associations, organizations, institutions and industry through email on 18/07/2023 & through post on 21/07/2023 respectively.

## 65th ANNUAL GENERAL MEETING

The 65th Annual General Meeting is likely to be held at any time of September' 2023. Audit of the Accounts for the F.Y. 2022 – 23 has been completed & Finalization of Annual Report is under process.

Details of the event will be intimated in due course.

## 14th ASIA INTERNATIONAL CONFERENCE ON LEATHER SCIENCE & TECHNOLOGY (AICLST)

ILTA is on the way to organize the 14th Asia International Conference on Leather Science & Technology (AICLST) in the year 2026 at Kolkata, India as endorsed by the IULTCS Secretariat.

It is proposed that this would be organized during the Platinum Jubilee Celebration year of ILTA from August, 2025 to July, 2026, preferably nearer the time of Chennai Trade Fair in Feb' 2026.

Planning & Details of the program would be shared in due course.

*(Susanta Mallick)*
General Secretary

---

## BEREAVEMENT

With profound grief and a heavy heart, we announce the sad demise of Mr. Ranendra Kumar Mukherjee on 1st August'2023. He was a senior and dedicated Life Member of ILTA.

May his soul rest in peace and May God give strength to the Members of the bereaved family to bear the irreparable loss.

## RECEIVING PRINTED COPY OF JILTA EVERY MONTH

We have started to post Printed copy of JILTA from April' 2022 to members and all concerned as it was before Covid period. Simultaneously we have been sending the e-copy of JILTA through email also to all the concerned receivers.

If you are not receiving JILTA by Post or through email, may please verify your Postal Address and/or Email Id with our office at the earliest.

## PUBLISH YOUR TECHNICAL ARTICLE

Faculties, Research Scholars and students of various Leather Institutes may wish to publish their Research / Project papers in an Article form in this monthly technical journal, JILTA.

Interested author may sent their paper (in MS Word format) along with a PP Photograph and Contact details like Email, Mobile etc. to our email IDs : admin@iltaonleather.org / jiltaeditor@gmail.com

## Members are requested to :-

a) Kindly inform us your 'E-Mail ID', 'Mobile No', 'Land Line No', through E-Mail ID: admin@iltaonleather.org or over Telephone Nos. : 24413429 / 3459. This will help us to communicate you directly without help of any outsiders like Postal Department / Courier etc. .

b) Kindly mention your Membership No. (If any) against your each and every communication, so that we can locate you easily in our record.

## YOUTUBE CHANNEL & FACEBOOK PAGE OF ILTA

An official YouTube Channel namely ILTA Online and a Face Book Page namely Indian Leather Technologists' Association has been launched for sharing the activities of our Association since November' 2020 and July' 2021 respectively.

You may find all the Lives / Video recordings of different Seminar, Symposiums & Webinars on both of these social medias along with our website www.iltaonleather.org time to time.

You are requested to kindly do Like & Subscribe the YouTube Channel and ''Follow' the FaceBook Page to get regular updates on the activities of our Association.

General Secretary and the Members of the Executive Committee are available to interact with members at 18.30 hrs, at our Registered Office on every Thursday

# Solidaridad

With over 50 years of experience in developing sustainable solutions to make communities more resilient, Solidaridad has been working on many different issues, from supporting marginalized communities to fostering a more sustainable supply chain.



Castor   Tea   Sugarcane   Leather   Textile   Palm Oil   Aquaculture   Dairy

Fruits & Vegetables   Gold   Soy   Cocoa   Coffee   Livestock   Medicinal Plant

**Solidaridad**

switchasia
GRANTS PROGRAMME

## EFFECTIVE WASTE MANAGEMENT AND SUSTAINABLE DEVELOPMENT OF MSME TANNING COMPANIES IN KOLKATA LEATHER CLUSTER (BANTALA)
## 2022-2023



**Circular Economy**

**Effective solid waste management**

**Robust public – private partnership**

**Capacity building Programme**

**Efficient water consumption practices**

**Training on Occupational Health and Safety**

### PROJECT PARTNERS IN ASIA



Pradipta Konar, Programme Manager-Leather(Kolkata): pradipta.konar@solidaridadnetwork.org

**Solidaridad Regional Expertise Centre**

158/5, Prince Anwar Shah Road, Kolkata-700045    |    Contact: 033-40602211, +91-9830279866

**Solidaridad**

switchasia
GRANTS PROGRAMME

**INTERNATIONAL UNION OF LEATHER TECHNOLOGISTS AND CHEMISTS SOCIETIES**

## PROFESSOR JIANZHONG MA ANNOUNCED AS RECIPIENT OF THE IULTCS MERIT AWARD 2023

It is with great pleasure that IULTCS announces Prof Jianzhong Ma has been chosen as the winner of the prestigious IULTCS Merit Award for Excellence in the Leather Industry. The IULTCS was founded for the purpose of encouraging the technology, chemistry and science of leather on a worldwide basis. It is therefore appropriate that we recognise the achievements of those of stature in our industry who have contributed significantly to our global understanding of the leather industry and its by-products. The IULTCS Merit Award is given biennially by the IULTCS Executive to an individual, whose past or current endeavours have had an extraordinary impact on our industry and provide an example for others to follow. Prof Jianzhong Ma fits this profile perfectly.

Prof Jianzhong Ma has published more than 240 academic articles on prestigious international peer-reviewed journals, such as Advanced Functional Materials, Angewandte Chemie International Edition, Green Chemistry, Carbohydrate Polymers, etc. Seven of them were selected by ESI high citation papers. More than 100 National Invention patents and 7 international invention patents have been authorized. He has published 9 books including 2 monographs, among which "Chemistry of Leather Finishing Materials" has been rated as one of the national top-quality courses. To formulate and revise 7 National and Industrial Standards. Currently, Prof. Jianzhong Ma's H-index (Reported by Web of Science) is 39 and total citation is more than 7056 times.

His extensive list of Practical Achievements is long and varied, with much of his time dedicated to the leather industry, helping to maintain sensible adjustments to testing methods as well as working on new technology for a better future for the leather industry worldwide. He is project leader of 973 pre-research Project of China, 863 Project of China, Key Project of the National Natural Science Foundation of China, General Project of the National Natural Science Foundation of China, National Key Research and Development Plan Project, and over 60 items of University-Enterprise Cooperation Research Projects.

Prof Jianzhong Ma has been actively involved with the development and industrialization of new leather tanning agents, retanning agents, finishing agents, fattening agents, and other chemicals, transferred to more than 40 enterprises at home and abroad. functional finishing agents such as cold resistant, hydrophobic and antifouling chemicals have been developed and put into practice. The achievement won the 2nd prize of national technological invention, as well as 2 types of 1st prize of provincial and ministerial technical invention.He has presided over the national teaching team, national quality courses, national planning textbooks and national experimental teaching demonstration centre

etc. He has cultivated more than 100 graduate students, including entrepreneurial talent of the national "Thousand Talents Plan", young top-notch scholar of the "Ten Thousand Talents Plan", and young scholar of Yangtze River Scholars. A large number of outstanding engineering talents have been delivered to the industry. He won the 2nd prize of national teaching achievement.

Notable Conference and workshop presentations from Prof Jianzhong Ma for the leather industry have been:

1. Speaker of 14th National Leather Science and Technology Conference, Plenary presentation, China, 2022
2. Executive Chairman of the Organizing Committee of 11th Asia International Conference of Leather Science and Technology (AICLST), China, 2018
3. Speaker of XXXII Congress of the International Union of Leather Technologists and Chemists Societies (IULTCS), Oral presentation, Turkey, 2013
4. Speaker of XXXI Congress of the International Union of Leather Technologists and Chemists Societies (IULTCS), Oral presentation, Spain, 2011
5. Speaker of 5th Asian International Conference of Leather Science and Technology (AICLST), Oral presentation, Korea, 2002

The award ceremony will be made during the XXXVII IULTCS Congress in Chengdu, China. Please join us to congratulate Prof Ma for the IULTCS Merit Award.

*(IULTCS Website)*

## IULTCS CONGRESS: DEADLINE EXTENSION FOR ABSTRACT SUBMISSIONS AND ACCEPTANCE NOTIFICATION

In response to the overwhelming interest and active engagement of participants, the International Union of Leather Technologists and Chemists Societies (IULTCS) has collaborated with the China Leather Industrial Association (CLIA) to facilitate an improved experience for all participants. As a result, the deadline for abstract submissions and acceptance notification has been extended tofl**July 15 and July 31**, respectively. It will grant prospective presenters additional time to refine their submissions and contribute to the exceptional scientific program.



The IULTCS Congress stands as a premier platform for researchers, academics, industry experts, and professionals to engage in fruitful discussions, explore innovative technologies, and foster collaborations that drive progress in the field of leather technology and chemistry. By extending these vital deadlines, IULTCS aims to promote an inclusive and dynamic environment, encouraging the submission of exceptional research work that showcases the forefront of leather-related advancements.

For further details, including submission guidelines and conference updates, please visit the official 2023 XXXVII IULTCS Congress website (www.iultcs2023.org). Stay tuned for more exciting announcements and prepare to be a part of this transformative event.

*(Source : https://www.iultcs2023.org)*

# Photochromic Polyure - thane Footwear

*(Concluding Part)*

**Dibyendu Bikash Datta[1]   Raksha Kothari[2]**

[1] Associater Professor, Dept. of Fashion Management Studies

[2] Graduate Scholar, Dept. of Leather Design

National Institute of Fashion Technology, Kolkata

## 2.3. Application methods

Besides different printing and coating techniques, some other methods of application of photochromic microencapsulated compounds, such as spraying, impregnation (Kamata, 1995) and dyeing, can be used. Photochromic colourants can also be applied as a pigment. To use photochromic colourants as a pigment, it is dissolved in acetone and the solution is added dropwise into a binder and thickener formulation. This formulation is referred to as a printing paste of 0.05% wD w, representing the concentration of the colourant in the print paste. Then using a plain mesh print screen, printing is carried out, the printed sample is dried and cured at 140°C for 5 min in a hot air oven. For printing photochromic dyes on leather materials, the influence of the substrate on the visual effect of photochromic dyes should be taken into account. Light-coloured substrates are more adequate for photochromic dyes.

Surface coating with photochromic colourants is also possible. The leather substrate can be coated with different coating systems like PU, polyacrylate and a Sol-Gel system. As photochromic colourants are not soluble in water, they must be solved in the first step in small amounts of a solvent like acetone or methyl alcohol. The solved colourant is then mixed in the coating system and the coating formulation is applied to the leather. The colour effects depend on the leather, the coating material and the amount of the photochromic colourant. Good colour effects can be obtained by a small amount of photochromic colourant (<1%). The minimal amount depends on the dyestuff (Classen and Beringer, 2010).

**Microcapsules fixed with polymer binders**

Photochromic dyes are usually available as microcapsules in pulverized form. The shell of microcapsules acts as protection and improves the stability of dyes in particular, and extends their lifetime. Microencapsulation is the process by which an active substance, which represents the core of a microcapsule, is protected with a special wrapper or shell. Microcapsule is a tiny particle with a size of 1 to 1000 μm, which has a core composed of a photochromic system and a shell made of polymer material. Conventional microencapsulation processes can be mechanical (spray drying, centrifugation, co-extrusion etc.) or chemical (coacervation or interfacial polymerization). The chemical process is more suitable for photochromic dyes. To obtain satisfactory shelf-life and durability on leather interfacial polymerisation is nearly always used (Rijavec and Braèko, 2007).

Many different substances can be incorporated into microcapsules by using chemical processes. However, certain basic requirements must be fulfilled like the active substance should not be soluble in the carrying medium and should not react with the shell or exert some other influence on it, the active substance should be properly dispersed in the carrying medium and should be resistant to the changes of pH, temperature or other conditions required by the microencapsulation process.

Microcapsules can be used as conventional pigments and are applied on leather substrates by using polymer binders. The choice of binder is highly important for the quality and stability of dyes at use, particularly at washing. Mostly used are water-soluble polymer binders, (starch, modified starch, carboxymethyl-cellulose, polyvinyl alcohol, xanthates), synthetic latexes (such as styrene-butadiene copolymer, poly(vinyl acetate), polyacrylates with anionic or nonionic emulsifiers) and amino aldehyde resins (such as urea- and melamine-formaldehyde resins, dimethylolethylene-urea,

*Corresponding author E-mail : dbdatta@gmail.com*

dimethylolpropylene-urea and silicones) (Boh, 2003). For the application of microcapsules, a suspension, which, besides microcapsules and binder, contains also antifoaming and viscosity-controlling agents is prepared. The addition of PU latex improves the softness of the fabric handle, whereas the addition of melamine/formaldehyde resins produces a stiffer handle (Rijavec and Braèko, 2007).

**Water-soluble photochromic dyes**

The development of new water-soluble photochromic dyes represents an important move forward in the development of less expensive photochromic dyes for leather and textile materials. We speak about a series of spirooxazine-based photochromic dyes containing a sulphonate group, which imparts water solubility to dyes. These dyes are designed for dyeing protein substrates, such as fashionable leather shoes and accessories, silk apparel and furnishings. Under the influence of UV irradiation (maximum wavelength 370 nm), a dyed silk substrate (at the dye concentration of two per cent on the weight of fabric) exhibited a change in colour from its original natural pale yellowish to green. The colour changes are much more distinct immediately after dyeing when the fabric is still wet than after drying. The wash fastness and photostability of dyed silk fabrics are moderate (Shah et al., 2005).

### 2.4 Application areas for photochromic colourants

Photochromic colourants have a wide range of potential application areas for use in textiles and non-textile applications that change colour in response to light. Here are some examples:

*Eyewear* : Photochromic colourants are commonly used in eyeglass lenses, allowing them to darken in bright sunlight and lighten indoors or in low light conditions. This adaptive feature provides users with convenient and comfortable vision without the need for separate sunglasses.

*Automotive*: Photochromic colourants can be incorporated into automotive glass, such as windshields or sunroofs, to automatically adjust the tint level based on light intensity. This helps to reduce glare and improve driving visibility.

*Architectural and smart windows* : Photochromic colourants can be applied to windows and glass facades in buildings. By responding to sunlight, they can control the amount of light and heat entering the interior, contributing to energy efficiency and occupant comfort. Additionally, smart

windows with photochromic properties can eliminate the need for blinds or curtains.

*Textiles and apparel* : Photochromic colourants can be used in textiles and fabrics to create interactive and dynamic designs. For example, they can be applied to clothing, accessories, or home textiles to create colour-changing effects in response to UV light exposure. UV-light sensitive curtain has been developed by the Swedish Interactive Institute using photochromic colourants sensitive to UV radiation. Various parts of the curtain are dynamically illuminated by a computer-controlled UV lamp, creating a dynamic textile pattern which is driven by a computer-controlled digitized pattern (Hallnäs et al., 2002). Photochromic colourants are now used in the development of camouflage patterns for military protective clothing. This pattern can change from one colour to another upon absorption of sunlight to mimic the surrounding environment (Chowdhury et al., 2014). Photochromic PU-coated textile products can be found in various forms, including bags, wallets, belts, shoes, and even furniture upholstery. When these items are exposed to sunlight or other UV sources, a transition from a lighter or neutral colour to a darker or more vibrant shade occurs.

*Packaging and security* : A photochromic colourant can be used in packaging materials, labels, or security features. These labels can provide an added layer of security by changing colour when exposed to specific light conditions.

*Art and design* : Photochromic colourants offer artists and designers unique opportunities for creating interactive and engaging artworks. By incorporating these materials into paintings, sculptures, or installations, artists can introduce dynamic and changing colour effects based on lighting conditions.

*Educational tools and toys* : Photochromic colourants can be used in educational tools, such as books or learning aids, to illustrate light-related concepts. They can also be integrated into toys or novelty items to provide unique visual or sensory experiences for children and adults.

*Cosmetics and nail polishes* : Photochromic colourants can be integrated into cosmetic products, including nail polishes and lipsticks. These materials can create colour-changing effects in response to light or temperature, offering unique and eye-catching aesthetics.

It is important to note that the application areas for photochromic colourants are not limited to the examples

provided above. As the field of materials science progresses, new and innovative uses for photochromic colourants may continue to emerge, expanding their potential across various industries and creative domains.

## 3.0 The making of a footwear

Photochromic PU leather (~0.6 mm in thickness) was chosen as the material for making the footwear. The process followed for making the footwear is given below.



(a) Before exposure to sunlight

(b) After exposure to sunlight

Figure 3: Digital design of the colour-changing shoe

(i)   Designing: Designs of footwear are selected according to the client/ brand endorsing the product according to the authors' vision after trend study and forecasting.

(ii)  Pattern making: Patterns for the Upper, Sole, and Insole are made according to the selected designs. They are either made by masking directly upon the last or they are made using a mean form of a particular size derived from the last.

(iii) Pattern cutting: Net patterns and Working patterns are cut out on pattern-making sheets for further work.

(iv)  Digitization: The Standard pattern is digitized; working patterns are made from the digital standard pattern and then printed using the 3D printer.

(v)   Cutting: The patterns from the 3D printers are then used to cut the PU leather required for the sampling of the footwear.

(vi)  Pasting: The cut PU leather components required for pasting are then pasted using neoprene.

(vii) Stitching: After pasting, stitching of the upper and the lining is done and then sent for further processing.

(viii) Lasting: After the shoe upper is made, it goes for lasting. The first insole is attached to the last using nails then the adhesive is applied to the insole and the footwear upper.

After semi-drying the adhesive, the upper is attached to the insole and heat is provided through the help of a blower for it to stay durable.

(ix)  Sole attachment: The lasted upper is attached to the sole. Heat is provided to the shoe and the sole. The attached footwear is put into a heat and pressure machine for it to attach properly.

(x)   Finishing: After the soles are attached, wax/polish/paints are applied to the shoes according to the finish required. The shoes are then buffed in the finishing machine.

(xi)  De-lasting: The shoes are then removed from the last after finishing. If it is an open-category footwear, lasts are removed before the finishing process.

(xii) Insock making: After the upper of the shoe is made, the insock of the footwear is made.

(xiii) Tattooing/Embossing: The insock of the footwear is tattooed; branded and then sent for its placement in the footwear. The insock of open footwear is done before the lasting process and attached to it during the lasting process itself.

(xiv) Lacing: After finishing and de-lasting, laces are added to closed footwear if needed.

(xv)  Final finishing: After lacing the footwear, they go for a final finish. Any extra thread or dirt is removed.

(a)Before exposure to sunlight  (b) After exposure to sunlight

Figure 4: The footwear developed with photochromic PU leather

In this context, smart PU leather may be suitable for some of the above-stated application areas, however, more distinctive and precise applications may include the following areas (a) expressive footwear and exotic functional leather-based products, (b) textile–leather composites for specific applications in automobiles, upholstery and furniture leather, (c) bag leather, (d) fancy book binding leather, (e) special type of designed leather, (f) laminated plastic leather composite surfaces for various applications (Billah et al., 2011).

## 4.0 Different measurements of photochromic material

### Colour measurement of photochromic material using a spectrophotometer

The dynamic colour-changing properties of photochromic colourants present significant challenges for the assessment using traditional colour measurement instrumentation. For the measurement of the colour yield of photochromic materials, it is necessary to carefully control several experimental factors, including temperature (because of its effect on the thermal reversion of the photochromic reaction) and the time interval between UV irradiation of the sample and measurement. Little and Christie, (2010) developed methodologies to assess photochromic samples using independent UV irradiation in combination with a traditional colour measurement system. They used a traditional spectrophotometer along with a UV source with an emission maximum of 365 nm for sample irradiation. Samples were mounted at a distance of 4.5 cm below the horizontal UV source, which was contained in a cabinet and the controlled temperature in the laboratory was maintained by a localized air heating system. They optimized the colour measurement method, using the small aperture, specular included and UV excluded a sample temperature of 24⁰C and a time of 3s between irradiation and measurement (Chowdhury et al., 2014).

### Intensity measurement

The intensity of the light emitted from a fabric coated with photochromic colourants can be measured by Illuminometer (expressed as 'lux'). Illuminometer contains a photon detector which is connected to a selenium chip. The specimen is kept on a photon detector, which absorbs the photon emitted by the specimen. A current starts flowing due to the absorption of photons since selenium is a semiconductor. The instrument is calibrated in such a way that this current value is converted to a 'lux' value, which is shown on the electric display (Majumdar et al., (2019).

### Wash fastness test of photochromic colourants

Wash fastness tests can be carried out according to any standard mild laundering method (BS1006:1990 CO6) (Ferguson and Taylor, 1980) using a wash wheel. Due to the dynamic colour change properties of photochromic colourants, traditional assessment methods using grey-scale standards are not appropriate for the determination of wash fastness ratings. Hence, the wash fastness behaviour of a test sample is measured by a comparative study of the photochromic colour build-up before and after the wash fastness tests. This can be expressed as the colour difference (ÄE) between the background (before UV irradiation) and developed colours after 1 min exposure to UV irradiation (Little and Christie, 2011).

The level of photo colouration developed by UV irradiation varies with colourant classes. It was found that, in the case of the selected spirooxazine colourants, the degree of photo colouration increased with initial washing and then decreased with subsequent washings. It was proposed that the polymeric binder matrix loosens around the colourant molecules with initial washing. The wash fastness properties of the photochromic prints are associated with the binder rather than the colourants. This appears to be reasonable for applications that do not require frequent aggressive washing.

### Photostability of photochromic colourants

The photostability of colourants in an application, usually referred to as light fastness in the case of traditional dyes, is generally assessed by exposing the sample to an accelerated fading instrument, such as the Xenotest fadometer. In the case of normal dyes, there is a well-known standard procedure for the measurement of light fastness and the degree of fading is generally assessed against the Blue Wool standards. This

procedure is inappropriate for photochromic samples due to their dynamic colour change properties. That's why the degree of photo colouration is expressed as the colour difference (ÄE) between the background (before UV irradiation) and developed colours after 1 min exposure to UVA irradiation. But to provide a meaningful comparison of different photochromic colourants, normalized values need to be calculated. This normalization process involves converting the degree of photo colouration after a particular time of exposure on the Xenotest instrument to a fraction of the initial degree of photo colouration, i.e. ÄE/ÄE$_o$ where ÄE$_o$ is the original colour difference between the background and developed colour for a particular colourant before exposure on the Xenotest (Little and Christie, 2011).

The photochromic colourants, when applied alone to the substrate show limited photostability and in some cases, the incorporation of UV absorbers improves the photostability of the colourants. But the effect is specific to particular UV absorberD colourant combinations. Because of competition for the UV light between the colourant and the UV absorber, their use leads to a consistent reduction in the degree of photo colouration of the colourant. However, the incorporation of hindered amine light stabilizers (HALS), which are free radical scavengers, consistently and significantly enhanced the photostability of the colourants (Little and Christie, 2011).

### The half-life of photochromic colourants

Response time to fading of photochromic colourants is usually determined by using half-life (T$_{1/2}$). Half-life time is the time in which the colour effect is halved. The rate at which Photochromic colourants fade back to their original state is determined by their half-life (T$_{1/2}$). The half-life time is often short (<90 seconds). So to measure the half-life the colour measurement is repeated after 10-second intervals or the minimum time required for repeat measurement (Classen and Beringer, 2010).

### The effect of temperature on photochromism

Temperature plays a role depending upon the type of reversibility (T or P systems) of photochromic colourants. Ortica (2012) reviewed a series of thermo-reversible photochromic molecules belonging to the classes of spirooxazine, arylethene and chromenes and found that the rate of the thermal bleaching reaction increases with the increase in temperature, thus decreasing light-stimulated colouration. For some nitro-substituted chromenes, it was observed that temperature

variations influenced the colourability by substituting the molecular structure. Temperature also significantly influences the quantum yields of photobleaching. Generally, the quantum yield for discolouration decreases with decreasing temperature, due to a barrier (of the order of a few kJ/mol) to the ring-opening reaction.

### Problems associated with photochromic colourants application

Though photochromatic colourants have opened a whole new world of opportunities for producing novel effects, they have not achieved commercial success. The major technical reasons for this state of affairs are the difficulties encountered when applying industrial photochromic colourants by traditional colouration techniques. Often, such colourants are supplied as a slurry of microencapsulated pigments in a liquid which is difficult to dilute with water or even common organic solvents (Chowdhury et al., 2014). This makes their application difficult with conventional techniques. Also, they have poor performance in terms of wash and light fastness.

Due to the dynamic colour-changing properties of photochromatic colourants, their assessment using traditional colour measurement instrumentation is challenging. They require to be simultaneously irradiated with UV light during color measurement which requires specialized instrumentation.

Several other factors also affect the properties of photochromic colourants on PU and other hydrophobic polymers. Conventional T-type colourants pose problems in PU dyeing since the molecules do not respond well to dyeing conditions and do not diffuse into PU. The properties of PU are also affected by photochromic colourants. The degree of photochromism decreases with increasing temperatures due to the thermal reverse reaction. Aggressive washing may cause pigment particles to loosen. Their high cost is also a hindrance.

However, for wider application and commercial viability, it appears that the structure of the colourant molecules and/or colouration process design will be necessary to give cost-efficient, durable effects of acceptable intensities and kinetics with colouration by conventional dyeing techniques.

### 5.0 Future trends

The colour is highly important and is practically always the decisive factor for the customers' decision to buy. In the 1990s, photochromism was widely used particularly in fashionable

products. At present, ongoing research investigating the usage of chromism on leather and textiles to create functional passive smart materials, which can only sense environmental conditions and functional active smart materials, which can sense and react to environmental conditions by changing their colour.

Microcapsules and dyes inside them generally do not endure more than about twenty laundering cycles. High temperatures at tumble drying and ironing accelerate the deterioration of the properties of the microcapsules. For the wider application of photochromic and thermochromic dyes, it would be necessary to improve their light stability, their resistance to detergents, particularly oxidation ones, and their yield of colour (to achieve deeper hues). Besides this high price of smart dyes in comparison to conventional dyes due to microencapsulation and poor selection of appropriate binders for PU represent challenges for future research. There is potential for the development of new smart dyes, such as water-soluble photochromic dyes. The necessity for pressure-sensitive smart dyes (Kanakkanatt, 1996) for application on various substrates which reversibly change their colour under the influence of tensile or compressive stress, is growing.

## 6.0 Conclusion

Innovative photochromic colouration and functional finishes are opening up an exciting new era in leather materials. New possibilities and challenges open up for users. When applied to leather materials with photochromic properties present unique challenges, including intriguing properties and problems that have not yet been fully explored. Photochromic colourants occupy a niche position in the colouration industry. Photochromic leather is typically used in the fashion, leisure, and sportswear industries. The application spectrum of these colourants is growing, their properties like lightfastness, wash fastness, etc. are improving, and application procedures are simplified. While Japan and the USA have developed a wide range of photochromic materials, many are still in the early stages of commercialization. A significant amount of research must be conducted in a variety of applications before large-scale production is feasible. At present, only a few commercial organizations are developing improved compositions. The formulation, encapsulation, and application of photochromic colouration on leather require further research. The current process has many inherent problems that restrict its commercial use in leather applications. Furthermore, the price, availability, and photochromic colour effect must be improved to make it more attractive to the end user.

## References :

1. Bamfield, P. (2010). Chromic phenomena: technological applications of colour chemistry. Royal Society of Chemistry.

2. Bayer, O. (1947). Das di isocyanat polyadditionsverfahren (polyurethane). *Angewandte Chemie*, *59*(9), 257-272.

3. Behera, A. (2021). *Advanced Materials: An Introduction to Modern Materials Science*. Springer Nature.

4. Billah, S. M. R., Christie, R. M., Shamey, R., Morgan, K. M., & Alam, M. K. (2011). Photochromic Dyeing of Leather. *Leather International*, *213*(4806), 34-36.

5. Chowdhury, M. A., Joshi, M., & Butola, B. S. (2014). Photochromic and thermochromic colorants in textile applications. Journal of Engineered Fibers and Fabrics, 9(1), 107-123.

6. Classen, E., & Beringer, J. (2010). Photochromic textiles by functional coatings. ICTN.

7. Colombier, I., Spagnoli, S., Corval, A., Baldeck, P. L., Giraud, M., Léaustic, A., & Yu, P. (2005). Strong photomechanical effects in photochromic organic microcrystals. Molecular Crystals and Liquid Crystals, 431(1), 495-499.

8. Crano, J. C., & Guglielmetti, R. J. (Eds.). (2002). Organic photochromic and thermochromic compounds;Vol 2: Physicochemical studies, biological applications, and thermo chromism. Boston, MA: Springer US.

9. Dawson, T. L. (2010). Changing colours: now you see them, now you don't. Coloration Technology, 126(4), 177-188.

10. Durr, H., & Bouas-Laurent, H. (Eds.). (2003). Photochromism: molecules and systems. Elsevier.

11. Esther, L., Piselli, A., Faucheu, J., Delafosse, D., & Del Curto, B. (2014, June). Smart materials: development of new sensory experiences through stimuli-responsive materials. In 5th STS Italia conference a matter of design: making society through science and technology (pp. 367-382). STS Italia.

12. Ferguson, A. D., & Taylor, T. P. (1980). Standard methods for the determination of colour fastness of textiles and leather. Journal of the Society of Dyers and Colourists, 96(1), 18.

13. Gust, D., Moore, T. A., & Moore, A. L. (2006). Molecular switches controlled by light. Chemical Communications, (11), 1169-1178.

14. Hallnäs, L., Melin, L., & Redström, J. (2002). A design

research program for textiles and computational technology. Nordic Textile Journal, 1(2), 56-63.

15. Hassabo, A. G., Zayed, M., Bakr, M., & Othman, H. A. (2022). Chromic Dyes for SMART Textile: A Review. Letters in Applied NanoBioScience, 12(4).

16. Jeong, J., Min, K. S., Kumar, R. S., Mergu, N., & Son, Y. A. (2019). Synthesis of novel betaine dyes for multi-chromic sensors. Journal of Molecular Structure, 1187, 151-163.

17. Jia, L., Zeng, S., Ding, H., Smith, A. T., LaChance, A. M., Farooqui, M. M., ... & Sun, L. (2021). Leather Based Multi Stimuli Responsive Chromisms. *Advanced Functional Materials*, *31*(35), 2104427.

18. Kamata, M., Suno, H., Maeda, T., & Hosikawa, R. (1995). U.S. Patent No. 5,431,697. Washington, DC: U.S. Patent and Trademark Office.

19. Kojio, K., Nozaki, S., Takahara, A., & Yamasaki, S. (2020). Influence of chemical structure of hard segments on physical properties of polyurethane elastomers: a review. *Journal of Polymer Research*, *27*, 1-13.

20. Kuehni, R. G. (2012). Colour: An introduction to practice and principles. John Wiley & Sons.

21. Little, A. F., & Christie, R. M. (2010). Textile applications of photochromic dyes. Part 1: establishment of a methodology for evaluation of photochromic textiles using traditional colour measurement instrumentation. *Coloration Technology*, 126(3), 157-163.

22. Little, A. F., & Christie, R. M. (2011). Textile applications of photochromic dyes. Part 3: Factors affecting the technical performance of textiles screen printed with commercial photochromic dyes. *Coloration Technology*, 127(5), 275-281.

23. Majumdar, A., Gupta, D., & Gupta, S. (Eds.). (2019). Functional textiles and clothing. Springer Singapore.

24. Matsuda, K., & Irie, M. (2006). Recent development of 6□-electrocyclic photochromic systems. *Chemistry letters*, 35(11), 1204-1209.

25. Mattila, H. (Ed.). (2006). Intelligent textiles and clothing. Woodhead Publishing.

26. Maxwell, C. A. (2007). Animal hide processing: impact on collagen structure. Cardiff University (United Kingdom).

27. McNaught, A. D. (1997). Compendium of chemical terminology (Vol. 1669). Oxford: Blackwell Science.

28. Nigel Corns, S., Partington, S. M., & Towns, A. D. (2009). Industrial organic photochromic dyes. *Coloration Technology*, 125(5), 249-261.

29. Ortica, F. (2012). The role of temperature in the photochromic behaviour. Dyes and Pigments, 92(2), 807-816.

30. Patai, S. (1975). Chemistry of the Hydrazo, Azo, and Azoxy groups. Wiley.

31. Research and Markets (2023) *Polyurethane Global Market Report 2023*, Available at: https://www.research-Zandmarkets.com/reports/polyurethane global market report#......... (Accessed: 13 June 2023).

32. Rijavec, T., & Braèko, S. (2007). Smart dyes for medical and other textiles. Smart textiles for medicine and healthcare: Materials, systems and applications. London: Woodhead Publishing, 123-149.

33. Shah, M. R. B., Christie, R. M., Morgan, K. M., & Shamey, R. (2005). Photochromic protein substrates. Molecular Crystals and Liquid Crystals, 431(1), 535-539.

34. Standaert, W. (2022). Product digitalization at Nike: The future is now. Journal of Information Technology Teaching Cases, 12(1), 28-34.

35. Sundar, S., Vijayalakshmi, N., Gupta, S., Rajaram, R., & Radhakrishnan, G. (2006). Aqueous dispersions of polyurethane–polyvinyl pyridine cationomers and their application as binder in base coat for leather finishing. Progress in Organic Coatings, 56(2-3), 178-184.

36. Tian, H., & Zhang, J. (Eds.). (2016). Photochromic materials: preparation, properties and applications. John Wiley & Sons.

37. Tian, S. (2020). Recent advances in functional polyurethane and its application in leather manufacture: A review. *Polymers*, *12*(9), 1996.

38. Towns, A. (2021). Photochromic dyes. Physical Sciences Reviews, 6(9), 477-511.

39. Trzebiatowska, P. J., Echart, A. S., Correas, T. C., Eceiza, A., & Datta, J. (2018). The changes of crosslink density of polyurethanes synthesised with using recycled component. Chemical structure and mechanical properties investigations.*Progress in Organic Coatings*, *115*, 41-48.

40. Yokoyama, Y. (2000). Fulgides for memories and switches. Chemical Reviews, 100(5), 1717-1740.

ILTA
Since 1950



## Ranendra Kumar Mukherjee

(27th December' 1937  -  1st August' 2023)

We mourn the loss of a man who devoted his entire life to loving, caring, and serving as many people as is possible in a lifetime. Mr. Ranendra Kumar Mukherjee was one of the Founding Members of Indian Leather Technologists' Association, a former President of the Rotary Club of East Calcutta, twice recipient of the Import Substitution Award from the Government of India. He was the glue that held our family together. He was a devoted son, a thoughtful father, a doting husband, an affectionate grandfather, a sincere colleague, and an ardent provider to the needs of the downtrodden. His mammoth personality cannot be contained in brevity. He was freed from our earthly shackles on the 1st of August, 2023 and went on to grace his presence in the afterlife.

The world might be run by evil, but the world runs because of the good. The world lost a lot of good with his passing; leaving us with a void that will be hi impossible to ever fill. Let us all pray and do some good, for he is watching over us, showering love, blessing us.

We pray to almighty to bestow enough courage to his family and near and dear ones to bear with this untimely bereavement and let his soul rest in peace.

— ❖ —

ILTA
Since 1950

# Leather from Invasive Species

(Part-7)

**Subrata Das,** M.Tech (Leather Technology)

Freelance Leather Technologist & Consultant, Chennai

## Argentinean Black & White Tegu Lizard




Florida's location and popularity as the Sunshine State makes it particularly vulnerable to invasive species. It has an annual influx of 120-130 million tourists, seeking to enjoy its salubrious tropical climate, myriad attractions, extended summers and mild winters (8-15 Degrees Celsius), through thirty-five designated ports of entry .The climate, terrain and geography of the region is very similar to that of tropical countries in Asia, Africa and South America from which some of the exotic species , imported for the pet trade originate (1)(2)

Initially invasive species such as the greenhouse frog, house mice, black- and brown rats travelled to Florida on cargo ships as stowaways, from far flung places in other continents. (3) (4)

Gradually Florida assumed the role of world leader in the trade of exotic pets. Innumerable creatures of various species, from the world over, were imported, taking full advantages of the loopholes, in the relatively unregulated trade in non-native species, in the 1980s.

The first decade of this century, experienced a spurt in demand for exotic pets, from all across the United States, approximately seventy-nine thousand tegus of all kinds — gold, black and

white, red, caiman lizards, Chacoan white headed tegus and their hybrids were sold and purchased by importers, dealers, enthusiastic pet owners, herpers and herpetoculturalists. That the species could be toilet trained to egest outdoors, made their maintenance convenient.

The scaled pets could be housed in both indoor enclosures and outdoor pens. This added to their value as pets. The intelligent tegus, which over time recognized their human handlers, exhibited a high degree of movement and activeness in summer and slipped into brumation (reptilian hibernation), when temperatures dropped. Being endowed with sharp teeth, arched claws and powerful jaws , capable of delivering 1,000 newtons of jaw compression, they were not the ideal pet material for beginners.(5)

After initial infatuation of impulsive purchases had worn off and boredom had set in, or pets, growing unexpectedly in appetite and dimension, became too cumbersome and expensive, both in terms of money and effort to look after, some pet owners, often less experienced or disinclined to a long-term commitment, are believed to have unburdened themselves by clandestinely discarding the fauna in the moist,

Corresponding author E-mail : katasraj@rediffmail.com

ILTA
Since 1950

expansive, verdant Everglades. On the other hand, some of these non-indigenous pets escaped captivity and went on to establish stable, breeding populations. While some entered into competition with native species for limited resources, others fed voraciously on them, disrupting local ecology. Once established, the odds of eradicating the introduced population of these exotic escapees, spread across a large area, became very low.(6).

Prior to 2000, almost all Argentinean black and white tegu lizards were captive bred in outdoor enclosures in Florida. The burrowing proclivity of the lizards is also thought to have been responsible for some accidental escapes into the wild. In 2004, three hurricanes, Charley, Frances and Jeanne severely affected Hillsborough and Polk counties , and are thought to have resulted in the escape of multiple tegus from breeders or dealers.

Also, in the last decade of the 20th century, very few live tegus were imported into the United States. A miniscule number of captive- bred specimens were annually available for sale. However, between 2000-02, Paraguayan authorities permitted the export of 1500–1750 live specimens, priced as little as $35 each, most of which entered the US through Floridian dealers.

Although it is illegal by law to release any non-indigenous species, anywhere in Florida, without governmental authorization, a transgressor can only be arraigned if witnessed by an officer with the Florida Fish and Wildlife Conservation Commission. Unsurprisingly, there has never been any conviction.(7)

The lone reptile species deemed to be partially endothermic, and one of the largest lizards in the Western Hemisphere, Argentina black and white tegu lizards, which grow to 5 feet in length and ten kilos in weight, are found in almost all countries of Central and South America, from Guatemala to Argentina. Their predominant concentrations are in the lowland evergreen equatorial rain forests of Brazil, Pantanal and Gran Chaco regions of Paraguay, Argentine Pampas and coastal and interior Uruguay (8).

The lacertilians, known as "lizagators" to European diaspora, which domiciled in Argentina, in the aftermath of WWII, have a presence in almost every country of mainland Americas, except Canada, although a breeder in Ontario Canada , was reported to be raising and trading in tegus. (9) These reptilian

predators have also been found in thickets and undergrowth, as well as in wet habitats such as flooded expanses of grass, interspersed with scattered shrubs and trees, waterways, pools, and rivulets. They are largely sweeping and non-selective of habitat type, as long as they have access to any kind of food, and terrain to burrow. These lizards are observed to do best in elevated grasslands and jungles, which receive copious seasonal rainfall. Finding the salubrious conditions, they are firmly entrenched in Florida's subtropical pine and hardwood zones (10)

The quadrupedal walk, run, climb and crawl by simultaneous movement of opposite feet – two diagonal limbs remain stationary on the ground, while the other two move forward. The body is arched and twisted sideways, as the limbs retract for forward motion, curving the abdomen into sinusoidal waves, visually resembling side-to-side movement. During bipedal locomotion, the Tegu's trunk is elevated as forelimbs are raised off the ground. Only the hind limbs power movement as the lizard runs for short distances to escape perceived threat or to challenge and wrestle for mating rights with competitors. In water, the adept swimmers use their tail and legs to propel themselves forward. They are tolerant of short-term submersion in water, by holding their breath and remaining below water surface for up to 22 minutes. While climbing trees ,to stalk and hunt arboreal prey, the squamate reptiles gain traction and anchorage on tree trunks with their sharp claws

Tegus are ectothermic , lacking specialized tissues to generate heat. They depend on sunshine and external heat sources for thermoregulation. However, a path breaking study in 2016, established that, they can appreciably augment and maintain their internal body temperature higher than that of the ambient temperature. Until then, only an exclusive group of larger lacertilians such as komodo dragons and some crocodiles and sea turtles were known to be able to raise their internal temperature under certain set of conditions.(11)

The Argentine black and white tegu possesses the ability of raising its own body temperature internally, during mating season and in winter, thereby exhibiting partial endothermy. The average internal temperature increases in monitored specimens was between 4 C and 5 C, with some lizards warmed as much as 10 C, during the course of the breeding season, running from September to November, each year, which is springtime in the southern latitudes.

In temperatures below eight to eleven degrees, the lizards descend into subterranean burrows to escape temporary cold shock. Once favourable conditions return, they awake, emerge and resume normal routine. It is this ability to regulate body temperature, which makes the non-native species supremely adaptable to seasonal and unseasonal chills, cold snaps and freezes in North America. Hibernating below the frost line, is vital for tegus to ride out punishing winters in newer homes, north of Florida. (12)(13)

In south Florida, the terrestrial lizards awaken and emerge from their subterranean shelters in February, each year, for the mating season, commencing early spring. The females attain reproductive maturity after their second year of brumation. Interestingly in mating season, small males are rejected by breeding females, and small females do not mate. Courtship and physical intimacy are only observed in larger of the species.

The female tegus, which can lay thirty to forty eggs every year, lives in the nesting burrows, lined with moist grass, twigs, leaves and sundry material from the surroundings, throughout the incubation period, to provide warmth and protection. They are aggressive towards intruders. Hatchlings remain for a few weeks in the nesting burrow with the mother. The fertility and ability of female tegu lizards to lay this many eggs and hibernate underground give them great advantages to surviving in Florida.

Tegu Lizards are endowed with supreme survival faculty. In the 1980s, some two million tegu skins were exported annually from Argentina to European tanneries. Yet the tenacious omnivores faced no threat of extirpation. With 3% of the world trade in exotic skins, being contributed by lizards, including that from Tegus, Argentina alone , maintains an annual quota of 100,000 , with half the volume being contributed by Paraguay. (14)

Tegu lizards have been commercially harvested for their skins in Argentina and Paraguay since the 1980s with one million and a half million or more skins, further inflated by 25%, with skins from Bolivia, crossing the border to enter the trade chain. These are exported to Hong Kong, Japan, Canada and the United States (to be used in the manufacture of cowboy boots). Tegu hunting is permitted by the Dirección de Fauna Silvestre de la Nación in collaboration with the Ministerio de Medio Ambiente of the Province of Santa Fe, under the "Tupinambis" hunting programme.(15)

In Argentina, upon slaughter, the scaled reptiles are flayed dorsally, allowing the ventral plates to remain inviolate. The skins are salted or air dried and supplied to local tanneries. The challenge in manufacturing lizard leather is, that their skin structure is less pliable and elastic and has a lower usable surface, compared with leather from livestock.

However, the three lizard species that are typically used for exotic leather The Java, Nile, and Tegu lizards all grow to yield anywhere between 2 and 4 square feet in size, making them suitable for cutting panels for making luxury items such as bags, watch straps, belts, boots, and wallets.

Lacertilian leather is considered at par with alligator and ostrich leather in luxuriance, textural optic, softness, durability, pliability and physical properties. The scales are exceptionally water-resistant and impart to the accessories made from the skins, significant resistance to light, heat and stain.

Designers incorporate lizard leather in clothing and accessories to impart qualities of exclusiveness, edginess and delicateness to their creations, primarily as contrast or accent to more durable bovine or lamb leather, although beautiful jackets made entirely of lizard leather have also been often showcased in a medley of colours.

The leathers are ideally suited for use in small patterns, such as for watch straps or wallets or shoes. Since they are very thin yet endowed with excellent scuff, tensile and puncture resistance, making them suitable for hand-stitching applications, handcrafted iPhone, iPad ,BlackBerry, and other "smart phone" cases are increasingly being seen in showrooms all over the world, due to Increased demand for personal luxury items, fuelled by a rising upper-middle class client base.(16)

Although the scaled omnivores are generalist feeders, they have a marked partiality towards eggs of other ground-nesting birds, such as the burrowing owl, reptiles such as gopher tortoises, Burmese pythons , the threatened eastern Indigo snake and even alligators, crocodiles and sea turtles. With their keen sense of smell and sharp claws, they are able to burrow and access the eggs of other species, from another direction, to feast on them. The voracious predators occasionally ambush small birds to devour. In addition, they consume wild berries and fruits growing in thickest and small shrub. The extraordinarily vagile species are known to walk 10-12 km a day, in search of food and new territory to colonise.

Other listed terrestrial or burrowing species adversely impacted in tegu invaded habitats are the Florida pine snake, short tailed snake, Florida gopher frog, Florida mouse. Affected and threatened avifauna includes Florida sandhill crane and Florida scrub- jay. In scrubland the pestiferous lizards pose grave danger to bluetail mole skinks and sand skinks and in riparian areas to diamondback terrapins and sea turtles.

The vulnerability of the gopher tortoise has alarmed scientists as this "keystone species" is nature's altruist, whose burrows provide protection and shelter to many other species.

In Venezuela, tegus, are infamous for stealthily accessing chicken coops to steal eggs. They are therefore called - el lobo pollero, "the chicken wolf."

There is irrefutable substantiation of tegus adversely impacting native species across Florida. Tegus are now the latest addition on the catalogue of invasive species. The sunshine state has poured approximately $1.3 million since 2016 to contain the threat. The egg predators have been reported in 35 Florida counties. They have also been sighted in Georgia, South Carolina, Alabama, Louisiana and Texas(17)

Of these states, Georgia alone appears to have put the challenge head on, in time. Scientists and tegu hunters have reported a decline in numbers and are finding fewer tegus now, than when the issue was first red flagged.

Unfortunately, this is not the case in Florida. Subsequent to the first adult tegus captured in Everglades National Park in 2017, their numbers in South Florida have spiralled.

From February to early July, 2022, BioCorps interns and park staff have captured 359 tegus — While the number of captures is striking, there's no way of knowing how many tegus go uncaught each year, as no accurate population estimates exists for tegus. Therefore, only the data of the total number of lizards caught is available – 961 in 2020 and 844 in 2021.

According to another study of USGS, the southeast section of the US is the high-risk zone. This area has a suitable climate for Argentine tegus. Although the study also confirmed that the exact number of tegus living in the US is unknown till now, over 12,000 tegus state wide have been removed from the wild to date.

Captive-bred populations are larger in size because of their "spoiled pet" (indulgent and sedentary) lifestyle and diet in captivity.(18)

It has been observed that wild-caught lacertilians have appreciably higher scale count, murkier dorsal colouring and longer noses than pets and companion tegus. USGS scientists believe, this is to meet the demand of feral existence requiring greater camouflage, thermoregulation and osmoregulation. (19)

Unfortunately, in Florida, the tegu has already established itself, and has wreaked havoc on the native birds and reptiles of the Sunshine State. As of now the focus is on their containment rather than eradication. Proactive action by the authorities, to achieve the objective, includes intensifying detection and removal of the lizards from occupied areas, thwarting expansion of their current range, measuring and analysing the impact of integrated outreach strengthening trapping activity and employing GPS, radio telemetry to register tegu movement and implementing results to intensify their removal(20) As on mid-2023, tegu lizards have been reported in significant numbers from Texas, Louisiana, Alabama, South Carolina, Georgia –a nd Florida – which has been uncharitably nicknamed – "The Ellis Island of Exotic Species" - Ellis Island being America's largest and most active immigration station, between 1892 -1924 , through which 12 million immigrants entered the USA.

Eradication is almost impossible once tegu numbers are well entrenched. Florida has three confirmed free ranging, actively breeding populations, as on date (panhandle, St. Petersburg and The Everglades National Park). There is also concern tegus cause bacterial contamination of crops and spread salmonella and internal parasite, by direct or indirect contact or excreta.

Alarmingly, trapping efforts for Argentine black and white tegus produced data for an established population of another South American invasive species in Florida — the gold tegu. Similar to Argentine black and white tegus, gold tegus are an imminent danger to nesting indigenous wildlife because their ovivorous diet .

As recently as in May 23, as further substantiation that the lizard interlopers were rampantly multiplying in the backwoods and now backyards of Florida, an Orlando resident , captured an adult tegu, which had consumed a couple of his pet red-

foot tortoises , from his property, using a cage and a can of cat food as bait. While another, a former employee of St. Lucie Nuclear Plant, has singlehandedly trapped 117 of the omnivores, from the environs of Fort Pierce, Florida, where he resides. As on end April 2022, more than 12,000 of the non-indigenous lacertilians have been removed from the Sunshine State, from the time, trapping officially commenced. The actual number running amok is assumed to be fifteen times higher.

Roje Exotics -American Leather, based in San Francisco (16) and PanAm Leathers headquartered in New York, specialize in a number of exotic species such as crocodile, elephant, eel, alligator, python, stingray, arapaima and many varieties of lizard, including Tegu leather skins and accessories. While Roje maintains a revolving stock of 10,000 skins of 40 various colours, prints, and metallic finishes at any time, Pan Am Leathers is a third-generation tannery with expertise in alligator skin, anaconda skin, various crocodile skin, lizard skin and python skin in their New York tannery and caiman skin at their Colombian tannery.(21)

With infrastructure and expertise in place for optimum exploitation of skins of the invasive tegus, the mantel is on the tegu hunters and the Florida wildlife authorities to ensure prompt collection of culls, their temporary preservation, flaying and forwarding to the tanners for processing, into leathers of beauty and quality, since an established market already exists for premium reptile leather in general and lizard leather in particular. The fat of the lizard has been used by Argentinean and Paraguayan peasants as a palliative for aches, pains and gout. This aspect could also be explored.

Tegu flesh has been consumed in the Southern cone of Argentina and in the "Corazon de las Americas" – Paraguay since time immemorial. The back, the tail and the legs of the lizard constitute the edible parts due to their more considerable volume.  Therefore, with further research, flesh of the invasive tegu could be on its way to providing meat that is economically priced, low in cholesterol and balanced in fatty acids , not only for human consumption, but also as a pet protein.(22)
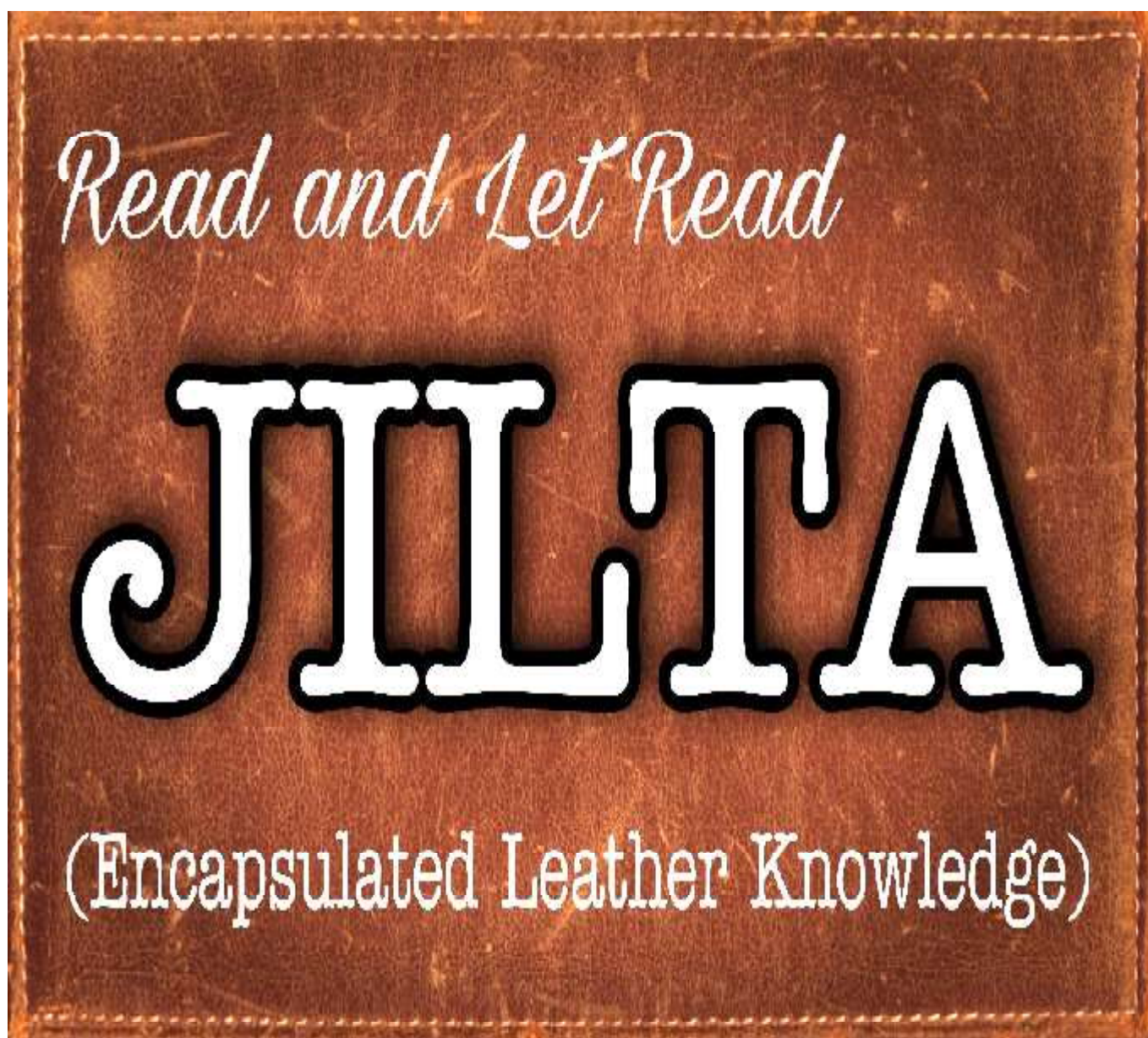
**Reference :**

1. https://www.usnews.com/news/best-states/florida/articles/2022-02-15/florida-latest-tourist-numbers-higher-than-before-pandemic#:~:text=Preliminary%20estimates%20show%20that%20122.4,All%20rights%20reserved.

2. https://www.floridamuseum.ufl.edu/science/what-are-floridas-invaders/#:~:text=Florida's%20warm%2C%20wet%20climate,a%20new%20sub%2Dtropical%20lifestyle.

3. https://myfwc.com/wildlifehabitats/nonnatives/amphibians/frogs-and-toads/greenhouse-frog/

4. https://www.kindersafepestsolutions.com/blog/types-of-rodents-in-florida#:~:text=They%20are%20the%20most%20common,6.5'%20and%208%E2%80%9D%20long.

5. https://en.wikipedia.org/wiki/Salvator_(lizard)

6. https://en.wikipedia.org/wiki/Geography_of_Uruguay

7. http://tegutopia.ca/

8. https://www.nationalgeographic.com/animals/article/tegu-lizards-invasive-spreading-southeast-united-states

9. https://www.worldatlas.com/articles/killing-of-reptiles-for-their-skin-which-reptiles-are-most-affected.html

10. file:///C:/Users/SS%20Leather/Downloads/alves-rrn,+EBC2022-11-06-601-Published-01.pdf

11. https://www.researchgate.net/publication/271443588_Tupinambis_Lizards_in_Argentina_Implementing_Management_of_a_a_additionally_Exploited_Resource

12. https://www.usgs.gov/news/state-news-release/new-research-verifies-invasive-tegu-lizards-adaptable-various-climates

13. https://crocdoc.ifas.ufl.edu/projects/Argentinablackandwhitetegus/

14. https://www.usnews.com/news/best-states/florida/articles/2022-04-23/wildlife-officials-need-help-catching-invasive-tegu-lizards

15. https://www.wunc.org/2022-07-28/these-giant-lizards-have-a-reptile-superpower-that-may-help-them-thrive-from-florida-to-north-carolina

16. http://www.rojeleather.com/species-and-leathers/lizard-leather/

17. https://slugabug.com/2020/06/15/prehistoric-looking-tegu-on-the-march-in-florida-georgia/

18. https://www.dailymail.co.uk/news/article-2568820/Large-South-American-lizard-sharp-teeth-powerful-jaws-latest-invasive-species-invade-Florida.html

19. https://news.gcu.edu/gcu-news/gcu-team-scales-extensive-tegu-lizard-study/

20. https://myfwc.com/wildlifehabitats/profiles/reptiles/argentina-black-and-white-tegu/#:~:text=Potential%20impacts%20of%20tegus%20include, American%20crocodile%20nests%20in%20Florida.

21. About Pan Am Leathers | The World's Largest Exotic Skin Tannery

22. https://www.sciencedirect.com/science/article/abs/pii/S0889157505001109

Read and Let Read

JILTA

(Encapsulated Leather Knowledge)

## VIETNAM TRADE DELEGATION VISITS INDIA



The India Department for Promotion of Industry and Internal Trade (DPIIT), Ministry of Commerce and Industry is hosting a delegation from Vietnam to promote bilateral cooperation between India and Vietnam in the infrastructure and logistics sectors. The five-day visit of the delegation between July 31-August 4, is a follow-up to an Indian delegation's visit, headed by Special Secretary, DPIIT, Smt Sumita Dawra to Vietnam between March 29-31, 2023.

Union Minister of State for Commerce and Industry, Sh. Som Parkash stated that these bilateral meetings will foster collaboration and foreign investments in the logistics sector in both countries and promote further investments.

First two days of the programme included Government to Business (G2B) and Business to Business (B2B) meetings with stakeholders from both private and public sectors from both countries. During the discussions, the India Council for Leather Exports showcased the potential for setting-up production units in mega leather, footwear and accessories clusters located throughout the country for attracting foreign investment.

*(ILM – 03/08/2023)*

## LEATHER GOODS MARKET REPORT 2023-2028, INDUSTRY SIZE, SHARE, TRENDS AND FORECAST

IMARC Group, a leading market research company, has recently releases report titled "**Leather Goods Market: Global Industry Trends, Share, Size, Growth, Opportunity and Forecast 2023-2028.**" The study provides a detailed analysis of the industry, including the global leather goods market share, size, trends, and growth forecasts. The report also includes competitor and regional analysis and highlights the latest advancements in the market.



**How big is the leather goods market?**

The global leather goods market size reached US$ 370.5 Billion in 2022. Looking forward, IMARC Group expects the market to reach US$ 505.1 Billion by 2028, exhibiting a growth rate (CAGR) of 4.7% during 2023-2028.

**What is leather goods?**

Leather represents a stretchable and durable material made by treating hides and skins of numerous animals, such as buffaloes, sheep, cattle, goats, hogs, horses, and camels. It is used to manufacture gloves, bags, clothes, watches, footwear, saddles, harnesses, and furniture, owing to its enhanced strength, durability, and flexibility. In addition, leather is long-lasting, repairable, comfortable, and resistant to dust, fire, scratch, and water. As a result, it is extensively utilized in the manufacturing of products, including automotive upholstery, sports equipment and apparel.

**What are the growth prospects and trends in the leather goods industry?**

The escalating demand for premium and branded products, on account of the growing urbanization and income levels and the rising living standards of consumers, is among the key factors stimulating the leather goods market. Moreover, the expanding travel and tourism sector and the emerging trend of travel vlogging are increasing the sales of customized suitcases, trolley bags, and backpacks made from durable and stretchable

material, which is acting as another significant growth-inducing factor. Besides this, the growing popularity of fashion shows that promote leather products, such as handbags, jackets, pants, and shoes, is positively influencing the global market. Furthermore, the inflating focus of leading market players to create brand awareness among the masses through several promotional activities on social media platforms and celebrity endorsements is also propelling the market growth.

Apart from this, the widespread adoption of advanced technologies in leather production, including the automated cutting process, to provide varieties and customization options is further fueling the global market. Additionally, the elevating need for passenger and commercial vehicles with enhanced and customized automotive upholstery, owing to the growing global population, is anticipated to fuel the leather goods market over the forecasted period.

**What is included in market segmentation?**

The report has segmented the market into the following categories:

**Breakup by Product:**

**Footwear**

- ❖ Military Shoes
- ❖ Casual Shoes
- ❖ Formal Shoes
- ❖ Sports Shoes
- ❖ Others

**Other Leather Products**

- ❖ Upholstery
- ❖ Luggage
- ❖ Accessories
- ❖ Clothing & Apparel
- ❖ Bags, Wallets and Purses
- ❖ Others

**Breakup by Material Type:**

**Genuine Leather**

- ❖ Top-grain Leather
- ❖ Split-grain Leather

**Synthetic Leather**

- ❖ PU-Based Leather
- ❖ PVC-Based Leather
- ❖ Bio-Based Leather

**Breakup by Price:**

- ❖ Premium Products
- ❖ Mass Products

**Breakup by Distribution Channel:**

- ❖ Clothing and Sportswear Retailers
- ❖ Departmental Stores
- ❖ Supermarkets and Hypermarkets
- ❖ Online Stores
- ❖ Others

**Breakup by Region:**

- ❖ North America (U.S. & Canada)
- ❖ Europe (Germany, United Kingdom, France, Italy, Spain, Russia, and Others)
- ❖ Asia Pacific (China, India, Japan, South Korea, Indonesia, Australia, and Others)
- ❖ Latin America (Brazil, Mexico)
- ❖ Middle East & Africa

**Who are the key players operating in the industry?**

The report covers the major market players including:

- ❖ Adidas AG
- ❖ American Leather Holdings LLC
- ❖ Capri Holdings Limited
- ❖ Hermès International S.A.
- ❖ Kering S.A.
- ❖ LVMH
- ❖ Prada S.p.A
- ❖ Puma SE
- ❖ Tapestry Inc.
- ❖ VIP Industries (Piramal Group)
- ❖ Woodland (Aero Group).

*(digitaljournal.com – 02/08/2023)*

## TRAINING ON LEATHER PRODUCTS UNDER-WAY IN LONGLENG. NAGALAND



A comprehensive training for Self-Help Groups (SHGs), entrepreneurs, and graduates, aiming to enhance their skills and knowledge in leather products got underway on August 2 at Phom Baptist Christian Association (PBCA) Executive Hall, Longleng. According to a DIPR report, the four-day training was being organised by Central Leather Research Institute (CLRI) Adyar Chennai in partnership with Yingli College Longleng and PBCA, Longleng. During the training, participants would engage in hands-on sessions covering various aspects of leather crafting, including wallet making, ladies' sling bag creation, pen pouch crafting, and leather bag manufacturing.

The training sessions are being conducted by experts from the CSIR-CLRI with senior principal scientist, P. Suresh Kumar; scientist, Dr. M. Sathish; technical officer, Amit Kumar Prajapati, and technician, Arun Raj as the resource persons. At the launching programme, Suresh Kumar emphasised that the goal was to foster awareness and skill development in leather product manufacturing among SHGs, entrepreneurs, and graduates in the Longleng. SDO Longleng, Meyazungba Jamir highlighted the growing trend of preferring entrepreneurship over traditional government jobs in Nagaland. He underlined the importance of breaking down societal stigmas attached to certain professions.

He said the leather training initiative, a first in the region, holds the potential to become a significant platform for the people of Longleng. Jamir then encouraged trainees to honour their trainers, interact with them, and aspire to establish the Longleng district as a hub for leather product manufacturing.The program was chaired by literature cum development secretary PBCA, Philip Nyam; executive secretary PBCA, Tialemba Phom, welcomed the attendees, while vice principal of Yingli College, Dr. B. Henshat Phom delivered the closing remarks.

*(NAGALANDPOST.COM – 04/08/2023)*

## RAIN DELAYS LEATHER TOYS' DRYING, MAKERS WORRIED



Lack of adequate sunlight and fresh air required for drying leather toys has makers of Indore in a fix just ahead of the peak export season, leaving them worried about a likely delay in readying the products and international dispatches.

Leather toys require strong sunny weather for drying as the filling of the toys are done with paper pulp and the structure is covered with sheep or goat leather. Leather toys of Indore are among a few other items of Madhya Pradesh that have received geographical indication tag though it is gradually losing its market amid rising competition and drop in domestic production. A leather toy manufacturer Surendra Thakur said, "Enquiries and orders for leather toys have started coming and dispatches usually start from October. Preparations have started and we are hoping for better orders but continuous rain has slowed down the process of drying and overall processing of the toys."

Lack of sunny weather increases the moisture content in leather toys and slows the process of leather covering and drying. Manufacturers said they are pinning hopes on demand from the United States to get some good deals this season. The United States and European countries are the major market for leather toys in the world. Indore is famous for making life sized tanned leather toy animals such as elephant, giraffe, horse, tiger and black panther.

These leather toys used as décor items are available in various sizes starting from 6 inches to life size products. Another leather toy manufacturer wishing anonymity said, "India was known for its leather toys but now there has been a slowdown in demand. Many things have contributed to this decline like economic downturn in the world, competition and local labour challenge among others."

*(ToI – 02/08/2023)*

# Mechanistic Approach of Photochemical Chlorination of Synthetic Hydrocarbon

### BY SRI ASUTOSH TARAPHDAR

## WHY PHOTOCHEMICAL CHLORINATION IS PREPARABLE THAN THERMAL CHLORINATION

### INTRODUCTION

The total energy of a molecule is the sum of electronic energy, vibrational energy, rotational energy and translation energy. The first three energies are quantized :

$$E_{TOTAL} = E_{ELECTRONIC} + E_{VIBRATIONAL} + E_{ROTATIONAL} + E_{TRANSLATIONAL}$$

$$E_{ELECTRONIC} \gg E_{VIBRATIONAL} > E_{ROTATIONAL}$$

That is, they can change only by discrete jumps ($4E = h\gamma$). Translational energy is not quantized and changes in a continuous manner. There are two different means by which energy can be supplied to molecules. First, changing the temperature produces a continuous increase in energy. Second, a quantum of energy may be absorbed by the molecule from a beam of quanta ( a light beam ). These two modes of energy input give rise to thermal chemistry and photochemistry,

### Thermal Energy

Ordinarily we think of supplying energy to a reacting system by increasing the reaction temperature. As the temperature is raised the molecules move more rapidly ; i. e. translational energy increases. A molecule can move with any velocity. ( Translation energy is not quantized ). At a given temperature, there will be an energy distribution among the molecules, some moving much more rapidly and some much more slowly than the average.

Only a few molecules will have sufficient energy to react. At a higher temperature a larger fraction of molecules will have sufficient energy and the rate will increase ( Fig below ) :-
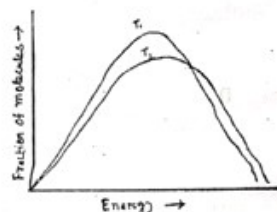


As the temperature is raised, molecules can acquire additional vibrational energy and rotational as well as translational energy.

346

JOURNAL OF ILTA

Vibration energy and rotational energy are quantized, that is, they can change only by discreate jumps. This can be illustrated most simply for diatonic molecule by means of a Morse Curve ( Fig. below ) :-
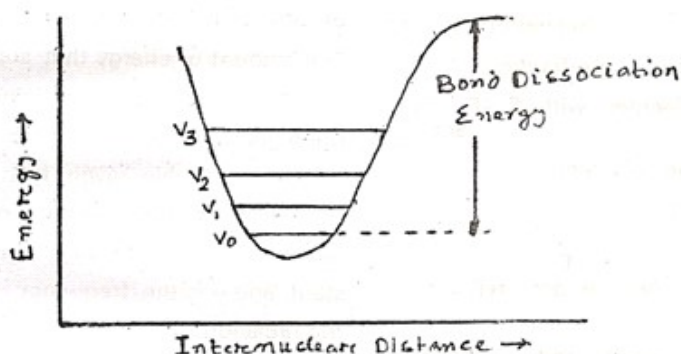


If we imagine two atoms coming together from a distance, they may eventually join to form a chemical bond, and the energy of the system will decrease. If the internuclear distance decreases below the equilibrium position, nuclear-nuclear repulsion increase repidly, and the energy rises. The molecule thus finds itself in a "potential well" corresponding to a chemical bond.

Within this potential well the molecule can occupy any of a number discreate vibrational energy levels. Notice that the lowest energy level is not at the bottom of the well, and mole-

cules will continue to vibrate even at absolute zero. When energy is supplied to the molecule, higher vibrational states ($V_1$ $V_2$ etc.) may become populated. Only the exact amount of energy needed to go from Vo to $V_1$, $V_2$, $V_3$ or some higher level may be absorbed. In typical organic molecules $V_1$ lies from 2 to 10 Keal / mole abore $V_0$. Molecules at room temperature have an average thermal energy content of about 0.6 Keal/mole. It is thus obvious that most molecules are in their lowest vibrational energy level under these conditions. As the temperature is raised some of the additional energy will go into populating higher vibrational levels. Many chemical reactions, especially those that are intramolecular, involve these higher vibrational levels.

At still higher temperature, enough vibrational energy may be absorbed to bring about

rapture of a bond. The minimum energy required to do this is known as the 'bond dissociation energy' and is shown in Fig. 1-2. The amount of energy required to dissociate a bond varies widely, depending on the structure of the molecule and the nature of the atoms involved in the bond. Typical bond dissociation energies are 101 K cal/mole for the c—c bond in ethane.

### 1.2 Activation Energy

In general, energy must be supplied to molecules in order to bring about a chemical transformation. This is true even though reaction may be a favourable one in the sense that its equilibrium lies almost completely in the forward direction. The reacting molecules must first acquire enough energy to traverse the energy barrier separating reactants and products. This barrier is known as the 'activation energy' for the reaction in question. It may be so low that molecules have enough thermal energy at room temperature that they can cross it. Under these conditions a spontaneous reaction will occur. When the activationl energy for a process exceeds

November, 1995

347
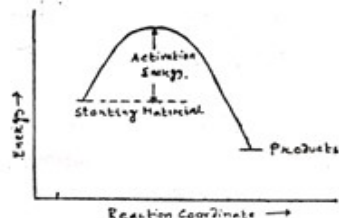
that available at room temperature, additional energy must be supplied to the system before a chemical change occurs. The higher the activation energy, the slower the reaction at a given temperature. The activation energy is intimately associated with the rate of a chemical reaction. A reaction that occurs rapidly (i.e. has a large rate) under a given set of experimental conditions has a lower activation energy than one that proceeds more slowly under those same conditions. The rate of a chemical reaction of the type B C depends on the concentration of B, the activation energy of the reaction, and the temperature. The rate of production of C will be given by the product of a rate constant K and the concentration of B.

Rate of production of $C = \dfrac{dc}{dt}$

$$= K(B)$$

$$K = Ae^{-E_A/RT}$$

$$E_A = E_{act} + \tfrac{1}{2}RT$$

A is a constant

The rate constant K is a function of the activation energy and temperature. Only those molecules that have energy in excess of the activation energy will react. The fraction ($N_*/N$) of molecules with $E > E_{act}$ is a function of temperature. This fraction

$$N_* / N = e^{-E_{act}/RT}$$

is quite small. Values of $N_*/N$ are tabulated below for a reaction with $E_{act} = 25$ K cal/mole. In the gas phase at one atmosphere, molecules collide about $10^9 - 10^{10}$ times per second. The probability of reaction is related to the product of $N_*/N$ and collision frequency. The small

| $N_*/N$ for | Temperature(°C) |
|---|---|
| 10-19 | 20' |
| 10-15 | 100' |
| 10-12 | 200' |
| 10-10 | 300' |
| 10-8 | 400' |
| 10-7 | 500' |

fraction of molecules with sufficient energy is offset by the high collision frequency.

## PHOTOCHEMICAL ENERGY

A second means of exciting molecules involves absorption of electromagnetic radiation. The amount of energy that such radiation contains depends upon its wavelength according to the relationship given below, where E is the energy per molecules, h is Planek's Constant, and $\gamma$ is the frequency of the radiation.

$$E = h\gamma$$
$$= \dfrac{C}{\lambda}$$

The frequency $\gamma$ and wavelength $\lambda$ are inversely related. The engergy of light in cal/mole is given by the expression

$$E \ (K \ cal \ / \ mole) = \dfrac{2,86 \times 10^5}{\lambda^{(\wedge')}}$$

An energy of 1 K cal / mole corresponding to radiation of wavelength

286,000 A° or $\dfrac{10^8 A°/cm}{286,000A}$ 0

$$\approx 353 \quad cm^{-1}$$

In the infrared portion of the spectrum. Ten K cal/mole corresponds to 3530 cm$^{-1}$, also

348

in the infrared region of the spectrum, when electromagnetic ratiations of these frequencies is absorbed, molecules are excited to higher vibrational states. Radiation of shorter wavelength ( higher frequency ) contains more energy. Visible light has a wavelength of 4000 $A^0$ ( violet ) to 8000 $A^0$ ( red ). Light of these wavelengths contains 71-36 K cal/mole. Ultra-violet light is of even shorter wavelength ( 2000-4000 $A^0$ for the near ultraviolet, 100-2000 $A^0$ for the far ultraviolet ). Light of 2000 $A^0$ corresponds to an energy of 143 K cal / mole. Light in the ultraviolet visible region has energy sufficient to excite molecules to higher electronic states.

You are undoubtedly familiar with the idea that the absorption of light by an atom involves the excitation of an electron to a higher - energy orbital. Thus a hydrogen atom with a single 15 electron can absorb light and excite the elcetron to the 25 orbital. The absorption of electromagnetic radiation thus produces a transition from the ground electronic state ( IS' ) to the first excited state ( 25' ). When we discussed molecules, we need to consider molecular orbitals rather than atomic orbitals. Let us complete our Morse Curve (Fig.-2). There we have drawn the energy curve that results when two atoms come together to form a bond. In fig.-4, the lower Curve Correspond to the ground electronic state, and the upper curve to an excited electronic state. Light of the correct frequency ($4E = h\gamma$) can be absorbed by the molecule. The transition involves excitation of an electron from a bonding molecular orbital to an antibonding molecular orbital. A great deal more will be said later about the shape and properties of molecular orbitals, both bonding and antibonding, and the chemical and physical consequences of this form of energy absorption. Absorption of light provides the means of introducing a large amount of energy (36-143 K cal/mole ) into a molecule. Clearly, the introduction of so much energy will have profound effects on the molecule. Photo-chemistry is the study of the Chemistry of electronically excited molecules product by the absorption of electromagnetic radiation.
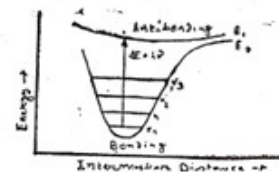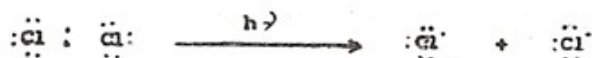


Now, thermal chlorination i. e thermal excitation and photochemical chlorination i. e. photochemical excitation provide two complementary methods of introducing energy into chlorine molecules. Thermal excitation introduces energy randomly into translational rotational, and vibrational modes, producing an energy distribution in the system such that most chlorine molecules have about the same amount of energy, i. e. only a few molecules will have sufficient energy to react on the other hand absorption of ultraviolet light excites an individual chlorine moleculein in stantaneously to an excited electronic state. This process involves promotion of an electron from bonding molecular orbital to an antibonding molecular orbital. A large amount of energy is thus placed in a single chlorine molecule. It has been found that the absorption maximum of chlorine is at $\lambda - 340$ n. m. 94 k−cal/mole, but bond dissociation energy of chlorine molecule is

November, 1995

349

58 k–Cal / mole. So in this process more chlorine free radical will be formed than thermal excitation expending same amount of energy in both case. That's why photochemical chlorination is energitically feavourable over thermal chlorination

### Mechanism of Photochemical Chlorination Mepasin :-

Now we shall study what actually happens in the photochemical chlorination of mepasin. First ultraviolet light is applied on chlorine gas to supply bond dissociation energy for formation of chlorine free radical.

$$:\overset{..}{\underset{..}{Cl}} : \overset{..}{\underset{..}{Cl}} : \xrightarrow{\quad h\nu \quad} :\overset{..}{\underset{..}{Cl}}{}^{.} \quad + \quad :\overset{..}{\underset{..}{Cl}}{}^{.}$$

An atom or group of atoms possessing an odd ( unpaired ) electron is called a free radical. Free radicals are represented by writing a dot on the head of symbol. Like, chlorine free radical is represented as $Cl^.$. Thus the above reaction,

$$Cl - Cl \xrightarrow{\quad h\nu \quad} Cl^. + Cl$$
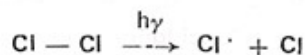
Since energy was supplied to each chlorine atom during breaking bond of chlorine molecule, the energy rich particle i e chlorine free radical will always want low to reduce energy for getting stability. But there is one way to reduce energy, that is formation of a new bond.

If $Cl^.$ wants to make a new bond, it must collides with some other species. Now what types of species are present here i.e in the system of chlorination of mepasin. There are three types :- (i) Chlorine free radical ( $Cl^.$ ) (ii) Chlorine molecule ( $Cl_2$ ) and (iii) Mepasin (R-H, where $R = C_nH_{2n+1}$ i e alkylradical and $n = 10-20$).

Now, if one chlorine free radical collides with another chlorine free radicals we will have,

$$Cl^. + Cl^. \longrightarrow Cl - Cl.^.$$

It is probable. But as the concentration of chlorine free radical is very very low, the reaction is not productive. If there is any probability of collision then it is called probable and if the chance of collision be high and ultimate change is occured then the collision is called productive.

Secondly if one chlorine free radical collides with a chlorine molecule, we will have,

$$Cl^. + Cl - Cl \rightarrow Cl - Cl \quad Cl^.$$
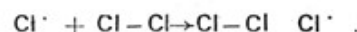
It is probable but not productive because ultimate change can not be identified through this reaction, although the chance of collision between these two is high, as the concentration of $Cl_2$ is next to R–H in the system. Thirdly, if one chlorine free radical collides with a Mepasin. we will have,

$$R - H + Cl^. \rightarrow R^. + H - Cl$$
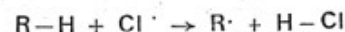
It is probable and also productive because concentration of mepasin is highest in the system, so the chance of collision between these two is the highest in the system and as well as, ultimate change is occured through this reaction.

Like, chlorine free radical $(Cl^.)$, alkyl free radical $(R^.)$ will also want to reduce energy by formation of a new bond. For bond formation $R^.$ must be collided with other species. Here, following Species are present for collision with $R^.$ in the system.

(i) Another alkyl free radical $(R^.)$.

(ii) Chlorine free radical (Cl·).

(iii) Mepasin molecule (R — H).

(iv) Chlorine molecule (Cl — Cl).

Here, all collisions are probable but one of them is productive. Now, we shall find out the productive collision.

Firstly, if R· collides with another R·, we will have.

$$R· + R· \longrightarrow R· — R·$$

This collision is probable but not productive because concentration of R· is very very low in the system. Although the source of R· is R — H and the concentration of R — H is the highest in the system, yet, the concentration of R· is very very low because at the time of above reaction few R· are formed from few R — H by few Cl·.

Secondly, if a R· collides with a Cl·, we will have,

$$R· + Cl· \longrightarrow R — Cl$$
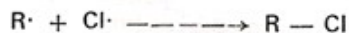
This collision is probable but not productive because chance of collision is very low due to low concentration of Cl· in the system.

Thirdly, if a R· collides with a R—H, we will have,

$$R· + R — H \longrightarrow R — H + R·$$

It is probable and also the chance of collision that is reaction rate is high due to high concentration of R—H, yet it is not productive because no ultimate change is occured through the collision.

Fourthly, if R· collides with a Cl — Cl, we well have,

$$R· + Cl — Cl \longrightarrow R — Cl + Cl·$$

This collision is probable. This collision is also productive because here both the chance of collision i.e. reaction rate is high ( the concentration of $Cl_2$ is next to R—H in the system ) and ultimate chance is occured through out the collision.
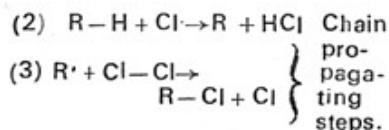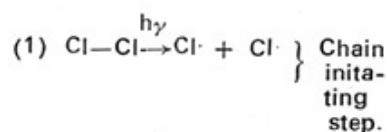
Here, the new chlorine free radical attacks mepasin to form a alkyl free radical, which attacks a chlorine molecule to form a chlorine free radical, and so the sequence is repeated over and over.

In fact, this process can not go on forever, with the decreasing concentration of chlorine molecule and mepasin the unproductive collisions will be predominated. Like,
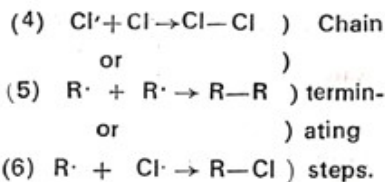
$$Cl· + Cl· \longrightarrow Cl — Cl$$

$$R· + R· \longrightarrow R — R$$

$$R· + Cl· \longrightarrow R — Cl$$

This type of collision terminates the process destroying reactive species i. e. free radical.

We can show the mechanism of photochemical chlorination of mepasin in a jist form as follows :—

(1) $Cl — Cl \xrightarrow{h\gamma} Cl· + Cl·$ } Chain initating step.

(2) $R — H + Cl· \rightarrow R· + HCl$ } Chain propagating steps.
(3) $R· + Cl — Cl \rightarrow R — Cl + Cl·$

then (2), (3) (2), (3) etc. until finally.

(4) $Cl· + Cl· \rightarrow Cl — Cl$ ) Chain
  or
(5) $R· + R· \rightarrow R — R$ ) terminating
  or ) ating
(6) $R· + Cl· \rightarrow R — Cl$ ) steps.

**Reaction Kinetics :**

How fast Marsol is formed depends upon how fast alkyl radical is formed. It has been found that the energy of activation (East) for alkyl radical (R·) formation from mepasin (R H) is higher than that of alkyl halide i. e. Marsol ( R—Cl ) formation from R· with Cl—Cl, So, in this case graph of potential energy -vs- progression of reaction will be as follows :-

November, 1995

351
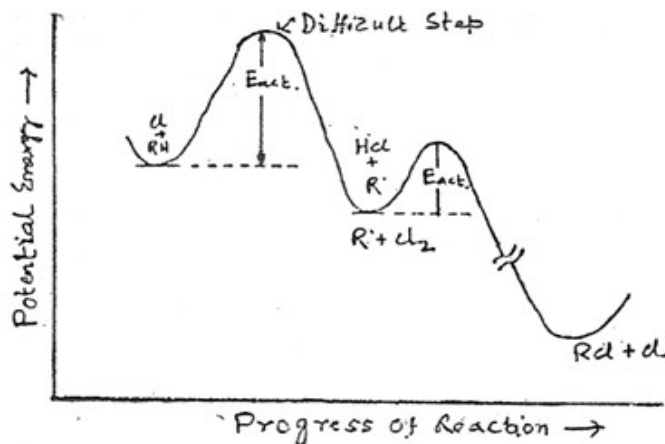
from the above graph it is clear that the formation of alkyl radical is rate controlling step. Formation of the alkyl radical is difficult, but once formed the radical is readily converted into the Marsol i. e. alkyl halide.

**Rate of Reaction :—**

A chemical reaction is the result of collisions of sufficient energy and proper orientation. The rate of reaction, therefore must be the number of effective collisions occur during each second within each $cm^3$ of reaction space. We can then express the rate as the product of three factors.

The collision frequences depends upon

(a) how closely the particles are crowded together, that is, concentration or pressure ;

(b) how large they are ; and

(c) how fast they are moving, which in turn depends upon their weight and temperature.

The probability factor depends upon the geometry of the particles and the kind of reaction that is taking place.

For closely related reactions it does not very widely.

The energy factor is the most important for rate determining. Energy factor is the fraction of collision that are sufficiently energetic. This factor depends upon the temperature and upon the energy of activation.

Now in the chlorination of mepasin we can change the concentration and temperature, and this change the collision frequency which in turn change the rate of reaction. Since the probability factor depends upon the geometry of the particles and the particles are fixed here i. e. R—H & Cl· , the reaction rate can not be changed. On the other hand by changing the temperature we can change the energy factor effectively and thus the reaction rate. Actually, the sufficiently energetic collision means the energy content of the particles which are collided must be higher than the

| number of effective collisions per $cm^3$ per sec. | | Total number of collisions per $cm^3$ per sec. | | Fraction of collision that have sufficient energy. | | fraction of collisins that have proper orientation. |
|---|---|---|---|---|---|---|
| | = | | × | | × | |
| rate of reaction. | = | collision frequency | × | energy factor | × | probability factor ( orientation factor ) |

activation energy of the reaction, In this way we can control the reaction rate. In method of chlorination we shall apply these controlling tools.

## Orientation of chlorination -

Since the mepasin is $C_n H_a + 2$ ( where $n = 10 - 20$ ). We shall obtain mainly two families of isomeric product through chlorination i. e. — primary substituted alkyl chloride and secondary substituted alkyl chloride. Now we shall find out the percentage yield of these two families of products.

As an example let us take chlorination of propane. The relative amounts ot n—propyl chloride and isopropyl chloride obtained depend upon the relative rates at which n—propyl radicals and isopropyl radicals are formed. If, say, isopropyl radicals are formed faster, then isopropyl chloride will be formed faster, and will make up a large fraction of product. As we can see, n— propyl radicals are formed by abstraction of primary hydrogen, and isopropyl radicals by abstraction of secondary hydrogens.
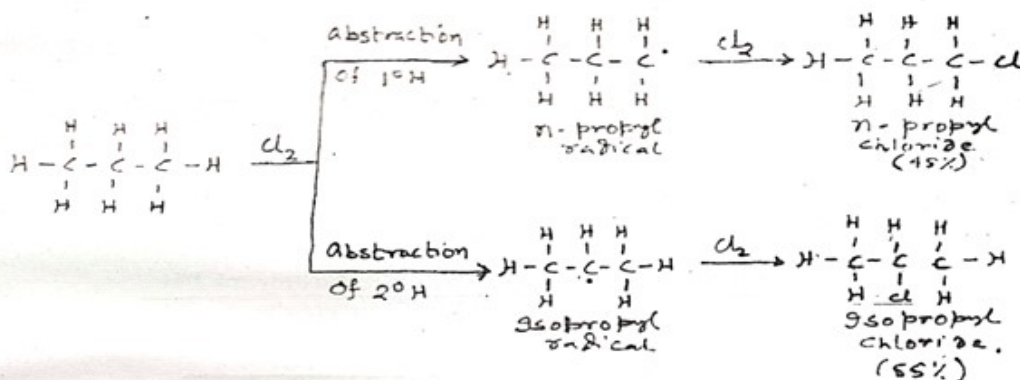


Thus orientation is determined by the relative rates of competing reactions. In this case we are comparing the rate of abstraction of primary hydrogen with the rate of abstraction of secondary hydrogens. What are the factors that determine the rates of these reactions, and in which of these factors may the two reactions differ ?

First of all, there is the collision frequency. This must be the same for the two reactions, since both involve collisions by the same particles and at the some environment a propane molecule and a chlorine atom.

Next, there is the probability factor. If a primary hydrogen is to be abstracted. the propane molecule must be so oriented at the time of collision that the chlorine atom strikes a primary hydrogen ; if a secondary hydrogen is to be abstracted, the propane must be so oriented that the chlorine collides with a secondary hydrogen. Since there are size primary hydrogens and only two secondary hydrogens in each molecule, we might estimate that the probability factor favours abstraction of primary hydrogens by the ratio of 6 : 2 or 3 : 1.

November, 1995

353

Considering only collision frequency and our guess about probability factors, we predict that chlorination of propane would yield n - propyl chloride and isopropyl chloride in the ratio of 3 : 1. But in practice it is found that the two chlorides are formed in roughly equal amounts, that is, in the ratio about 1 : 1 or 3 : 3. The proportion of isopropyl chloride is about three times as great as predicted. Evidently, about three times as many collisions with secondary hydrogens are successful as collisions with primary hydrogens. If our assumption about the probability factor is correct, this means that E act is less for abstraction of a secondary than for abstraction of a primary hydrogen.

Study of the chlorination of a great many alkanes has shown that these are typical results.

After allowance is made for difference in the probability factor, the rate of abstraction of hydrogen atom is always found to follow the sequence $3° > 2° > 1°$. At room temperature, for example, the relative rates per hydrogen atom are 5,0 : 3.8 : 1.0. Using these values we can predict quite well the ratio of isomeric chlorination products from a given alkane.

For example :



n - alkane → n - alkyl chloride + Sec. alkyl chloride
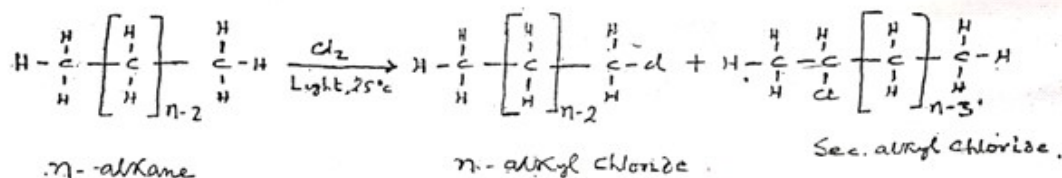
$$\frac{n\text{ - alkyl chloride}}{Sec\text{ - alkyl chloride}} = \frac{\text{no. of } 1°H}{\text{no. of } 2°H} \times \frac{\text{reactivity of } 1°H}{\text{reactivity of } 2°H}$$

$$= \frac{6}{2n-4} \times \frac{1.0}{3\,8}$$

$$= \frac{3}{3\,8\,(n-2)}$$

$$= \frac{30}{38\,(n-2)}$$

i. e. equivalent to
$$= \frac{\left(\frac{30 \times 100}{30 + 38\,(n-2)}\right)\%}{\left(\frac{38\,(n-2) \times 100}{30 + 38\ \ n-2}\right)\%}$$

$$= \frac{\left(\frac{1500}{19n-23}\right)\%}{\left(\frac{1900\,(n-2)}{19n-23}\right)\%}$$

Now in case of mepasin n lies between 10 to 20, So,
When n = 10. then,

$$\frac{n - \text{alkyl chloride}}{\text{Sec} - \text{alkyl chloride}} = \frac{\left(\dfrac{1500}{19 \times 10 - 23}\right) \%}{\left(\dfrac{1900(10 - 2)}{19 \times 10 - 23}\right) \%}$$

$$= \frac{\left(\dfrac{1500}{190 - 23}\right) \%}{\left(\dfrac{1900 \times 8}{190 - 23}\right) \%}$$

$$= \frac{\dfrac{1500}{167} \%}{\dfrac{15200}{169} \%}$$

$$= \frac{9 \%}{91 \%}$$

When, n = to, then,

$$\frac{n - \text{alkyl chloride}}{\text{Sec} - \text{alkyl chloride}} = \frac{\left(\dfrac{1500}{19 \times 20 - 23}\right) \%}{\left(\dfrac{1900(20 - 2)}{19 \times 20 - 23}\right) \%}$$

$$= \frac{\left(\dfrac{1500}{380 - 23}\right) \%}{\left(\dfrac{1900 \times 18}{380 - 23}\right) \%}$$

$$= \frac{\left(\dfrac{1500}{357}\right) \%}{\left(\dfrac{34200}{357}\right) \%}$$

$$= \frac{4\%}{96\%}$$

Thus, in Marsol, the percentage of n - alkyl chloride lies between 4% n to 9% and that of sec - alkyl chloride 91% to 96%

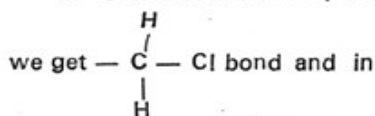November, 1995                                                                                                355

So, Marsol is mainly sec—alkyl chloride and for good fat liquoring effect chlorine is inserted in the mepasin chain in such a manner, as if the distance between two succe-ssive chlorine atom be 4-carbon atoms. This type of insertion is governed by me relative concentration of mepasin and chlorine.

| | | |
|---|---|---|
| 15% chlorine in mersol | | |
| 32-35% ,, | ,, | .; |
| 75% ,, | ,, | ,, |

plasticiser preparation
Patliquor preparation (Leather)
Flame retardant preparation.

### Sulphochlorination :

Chlorine itself is a good leaving agent, but it has been found that it's potentiality towards leavingness enhances much more promptly when attach with a mepasin via—$so_2$—group. In sulphochlorination, hydrogen of mepasin is replaced by —$so_2$—Cl group. Since in synthetic fat-liquor preparation, chlorine is replaced by another nucleophile suphochlorination is favour in practice. Now I shall explain why sulfochlorination is advantageous than chlorination.
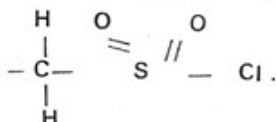
In chlorination of mepasin we get
$$-\overset{\overset{\displaystyle H}{|}}{\underset{\underset{\displaystyle H}{|}}{C}}-Cl$$
bond and in sulfochlorination we get

$$-\overset{\overset{\displaystyle H}{|}}{\underset{\underset{\displaystyle H}{|}}{C}}-\overset{O}{\underset{}{\overset{O}{S}}}-Cl.$$

The next step of synthetic fatliquor preparation is replacement of chlorine by suitable nucleophile. Thus the case of this substitution depends upon the bond strength of
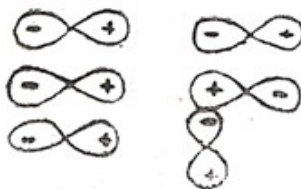$$-\overset{|}{\underset{|}{C}}-Cl$$
in chlorinated mepasin and
$$-\overset{O\ O}{\overset{||\ ||\cdot}{S}}-Cl$$
in sulfochlorinated mepasin, i.e. more weakness of those bonds makes reaction more easy. Now it has been found that the bond strength of the particular bond depends upon mainly :-

(i) Anti bonding :

(ii) Bonding :

(iii) Non-bonding :

(i) The volume of the overlapped orbitals, and

(ii) The orientation of the overlapped orbitals.

According to the orientation these following things are found ;-        ( See below )

And, if the volume difference between two overlapped orbitals be high then, inspite of proper orientation i. e. bonding orientation the bond becomes weak in nature due to generation of partial antibonding charactor, like as follows ;-
( See in page no 357 )

Now in both case i, e. in C — Cl bond and S — Cl bond, the orientation of atomic orbitals are bonding like, but the orbital volume of chlorine is too much bigger than that of sulphur, whereas orbital volume of carbon and chlorine are more or less equal. That is why the bond between sulphur and chlorine is weaker than the bond between carbon and chlorine. For this reason, the substitution of chlorine from sulfochlorinated mepasin is easier than chlorinated mepasin.

i. e. no-bonding

i. e. firm-bonding

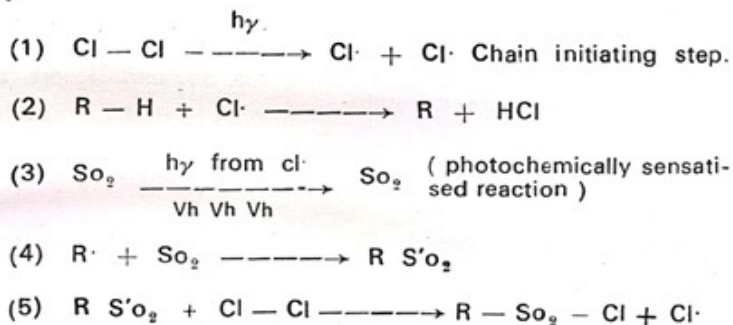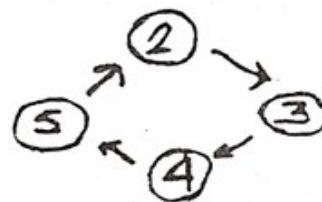i. e. week type of bonding.

356

## Mechanism of sulfochlorination :-

Mechanism of sulfochlorination of mepasin is more or less same as the mechanism of chlorination of mepasin. The main difference is, here the Sulphuri of Sulphur-dioxide first photochemically sensatized by taking some energy from chlorine free radical and then it become free radical by alkyl free radical. If any element contains 3 K - Cal/Mole energy in excess, it can sensatized photochemically neighbouring species transfering energy through spin riversal. Since chlorine free radical has 36 k-cal/mole energy in excess, because chlorine absorbs 94 k - cal/mole energy but utilis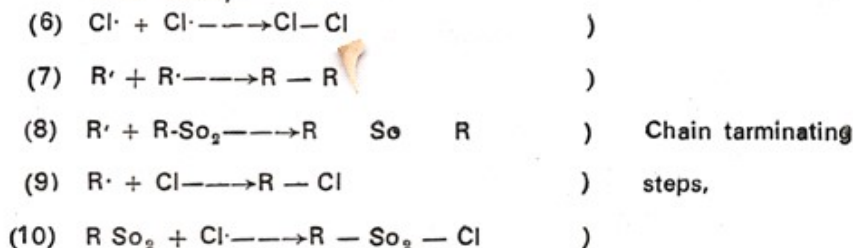es 58 k-cal/mole for tree radical generation, it can sanatise adjacent sulphur of sulphur dioxide through reversing the spin ftom triplet state to singlet state. However, the mechanism of sulfochlorination of mepasin can be shown as follows :-(See in the First & Second column)
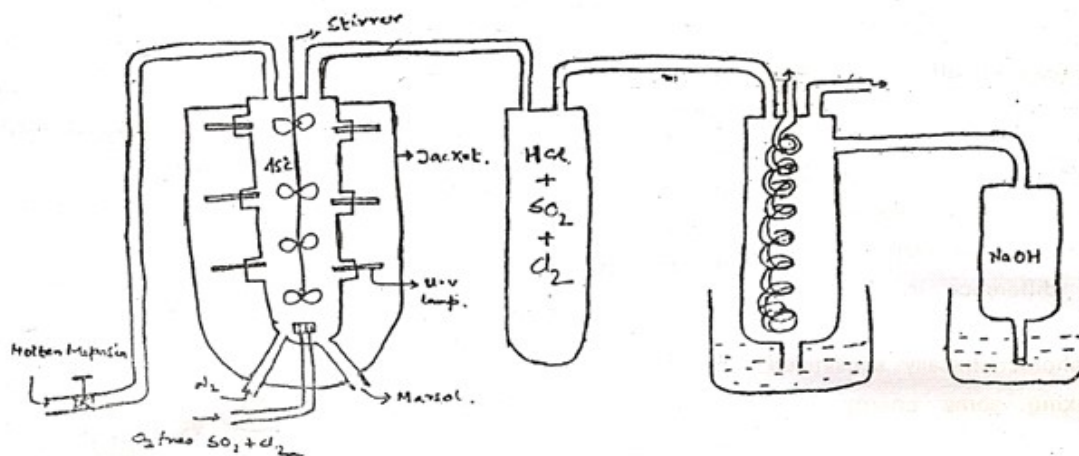
Then



(1) $Cl - Cl \xrightarrow{h\gamma} Cl\cdot + Cl\cdot$ Chain initiating step.

(2) $R - H + Cl\cdot \longrightarrow R + HCl$ )

(3) $So_2 \xrightarrow[Vh\ Vh\ Vh]{h\gamma\ from\ cl\cdot} So_2$ ( photochemically sensatised reaction ) ) 
chain propagating steps.

(4) $R\cdot + So_2 \longrightarrow R\ S'o_2$ )

(5) $R\ S'o_2 + Cl - Cl \longrightarrow R - So_2 - Cl + Cl\cdot$ )

until finally :

(6) $Cl\cdot + Cl\cdot \longrightarrow Cl - Cl$ )

(7) $R' + R\cdot \longrightarrow R - R$ )

(8) $R' + R-So_2 \longrightarrow R\ So\ R$ ) Chain tarminating

(9) $R\cdot + Cl \longrightarrow R - Cl$ ) steps,

(10) $R\ So_2 + Cl\cdot \longrightarrow R - So_2 - Cl$ )

November, 1995

357

Preparation Method of Marsol i. e. chlorinated or Sulfochlorinated hydro Carbon



$N_2$ is first passed through pyrogallol to free make from oxygen ( $O_2$ )

and then nitrogen gas is perged to the reaction vessel covered with water cooler jacket. Then molten mepasin is sent to the reacting vessel. Reacting vessel is equipped by stirrer and ultra-viol lamps. Then chlorine gas, in case of chlorination or chlorine and sulphur gases, in case of sulfochlorination are sent to the reacting vessel where stirrer mixes then with molten mepasin, Then ultraviolet lamps

1. $Cl - Cl \longrightarrow 2\ Cl\cdot,\ \wedge H = +\ 58\ k - cal/mole$
2. $R - H + cl\cdot \longrightarrow R\cdot + HCl,\ \wedge H = 1 = k\ cal/mole$
3. $R\cdot + Cl - Cl \longrightarrow R - Cl + Cl\cdot\ \wedge H = -\ 26\ k-cal/mole$

are suitched on. The inside temperature is maintained at 45°C which is optimum in this reaction Chlorinate or sulfo-chlorinated mepasin is collected from the pipe fitted at the bottom of reacting vessel. The bye - product HCl and excess unreacted $Cl_2$ and $So_2$ are sent to a chember where air is circulated and then to a coil carrying water to dissolve HCl. The excess undissolved HCl

gas is allowed to go a vessel containing NaOH to form brine solution and the undissolved gases, $So_2$ and $Cl_2$ are allowed to pass in to the atmosphere.

**Quality controls parameters :-**

For chlorination, these following quality controls parameters are considered —

1. Temperature.
2. Reaction Zone.
3. Mixing.
4. Solubility.

1. Temperature :-

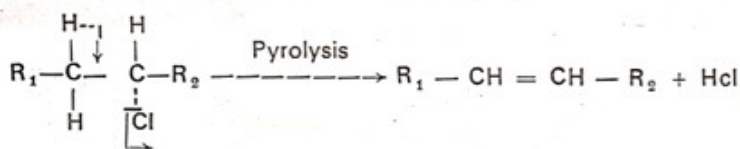In chlorination of mepasin these following reactions are happened,

358

For the exothermic Reaction the temperature of surrounding of the reacting system should be less than that of the reacting zone. otherwise the problem of heat dessipiation retards the reaction rate. In chlorination reaction, 3rd reaction, is exothermic and second is slightly endothermic and first one is highly endothermic but this energy is supplied by u-v-light. Now considering the reaction number second and third, it has been found that 45 C temperature is suitable i. e. optimum temperature for the reaction. If temperature of the reaction be raised over 45°C. these following problems are to face :

I. At high temperature pyrolysis of marsol takes place.

$$R_1-\underset{\overset{|}{H}}{\overset{\overset{H}{|}}{C}}-\underset{\overset{|}{Cl}}{\overset{\overset{H}{|}}{C}}-R_2 \xrightarrow{\text{Pyrolysis}} R_1-CH=CH-R_2 + Hcl$$

In this case chlorine from secondary position is removed with a hydrogen of adjacent secondary carbon atom and the product becomes unsaturated.

II. At high temperature chlorine of primary position also be removed as follows,
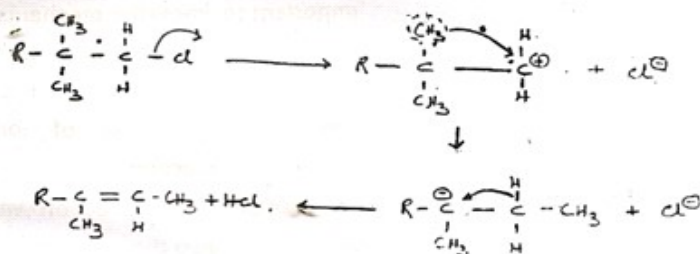


III. The third problem is with the increasd of temperature, the solubility of chlorine in mepasin decreases which creates a non-uniformity of chlorination.

**(2)  Reaction Zone**

Here the substrate, mepasin cannot mix homoginiously with chlorine because mepasin is liquid and chlorine is gas. If u-v light is sent to $Cl_2$ gas only, then chlorine from radical will be formed but instantaneously quenched by collides with another chlorine free radical or give a unproductive reaction colliding with a chlorine free radical if there is no mepasin molecule near to a chlorine free radical. So. u-v light is to apply in the mepasin, chlorine homogeneous system, this is the ideal condition for reaction zone,

**(3)  Mixing**

Mixing is one of the quality control parameter of chlorination of mepasin.  Stirrer is done the work of mixing of chlorine with mepasin, of mixing is not proper then concentration of chlorine will be not uniform through out the system and different extent of chlorination will occur which is not desirable.  So, before, on the switch of u-v lamp we should take case about the proper mixing of chlorine with mepasin.

**(4)  Solubility**

Solubility of chlorine gas in mepasin ( R—H ) is another quality control parameter of chlorination of mepasin, with the increase of temperature

solubility of chlorine in mepasin decrease as follows ;—
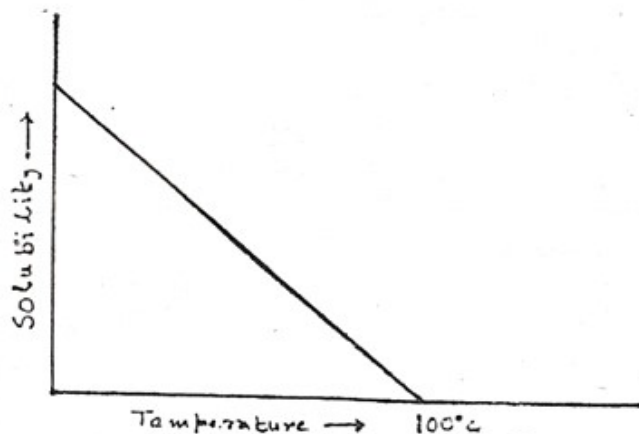


So we are to control the temperature as there is no chance of increase the temperature over 45°C which is optimum temperature. We want high solubility of $Cl_2$ in R—H, keeping other things ideal for reaction, for high uniformity of chlorine contain in chlorinated mepasin.

For sulfochlorination following things are to considered as quality control parameters :

1. Temperature.
2. $So_2$ & $Cl_2$ ratio.
3. U. V. light.

1. Temperature : Here temperature should be 45°C to 55°C. At high temperature solubility of $So_2$ is reduced at much higher rate than $Cl_2$. At and beyond 120°C the yield of sulfochlorinated product would be zero, since at 120°C no $So_2$ and $Cl_2$ will dissolved in mepasin. The solubility of $So_2$ and $Cl_2$ in mepasin is as follows :
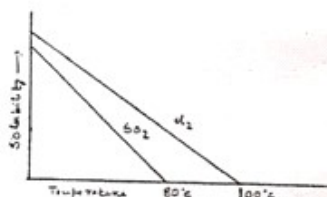


2. **Ratio of $So_2$ and $Cl_2$ :**

In sulfochlorination of mepasin we get always mixture of chlorinated and sulfochlorinated mepasin the percentage of chlorinated product is reduced by maintaining the above ratio. ( in the next column )

Partial Pressure of $So_2$ :
Partial Pressure of $Cl_2$ =

1.2 : 1 or
1.3; 1

3. For initiating the reaction we are to supply u-v light for supplying the bond dissociation energy of chlorine to produce chlorine free radical. We are to see that u-v-light's wave length should be 340 mm. because the absorbtion maximum of $cl_2$ gas is at 340 m.m

**Conclusion :**

As a leather Technologists, we are concerned with fatliquor in the fatliquoring operation of leather processing and on the other hand, properties of fat liquor are depended on sulphochlorination, so, it is utmost important to know the mechanism of sulphochlorination of mepasin. Like, extent of chlorination indicates the number of ions present in mepasin as well as the condition of interaction with leather and also the properties of leather obtained after treating with such type of synthetic fatliquor. Thus, Chemistry lies behind the chlorination of mepasin helps us to control over all about the synthetic fatliquoring of leather.

360

Reference :

(1)  Inorganic Chemistry
     part — P principles
     BY  R. L.  Dutta.

(2)  General  organic  chemistry
     By Sachin Kumar Ghosh.

(3)  Organic Chemistry
     by  Morrision  and  Boyd.

(4)  Organic Chemistry
     By B. S.  Bahl and  A.  Bahl.

(5)  Physical Chemistry
     By S. R. Palit.

(6)  An  introduction  to  the  principles  of  leather  Manufacture
     By S. S. Dutta.

(7)  Photochemical  Reaction  and  Photochemistry
     By  C. H. Depyl

November, 1995                                                                              361

# GST COLLECTIONS RISE TO RS 1.65 LAKH CR IN JULY



GST collection rose 11 per cent to over Rs 1.65 lakh crore in July as a result of anti-evasion measures and higher consumer spending. This is the fifth time since the rollout of the Goods and Services Tax (GST) regime that monthly collections have crossed the Rs 1.60 lakh crore mark — making it the new normal.

"Gross GST revenue collected in July is Rs 1,65,105 crore of which CGST is Rs 29,773 crore, SGST is Rs 37,623 crore, IGST is Rs 85,930 crore (including Rs 41,239 crore collected on import of goods) and cess is Rs 11,779 crore (including Rs 840 crore collected on import of goods)," the finance ministry said in a statement.

Revenues for the month were 11 per cent higher than GST revenues in July 2022, when it was about Rs 1.49 lakh crore. July 2023 is the second consecutive month when revenues from taxes paid on goods sold and services rendered showed an increase month-on-month.

It was Rs 1.61 lakh crore and Rs 1.57 lakh crore in June and May, respectively. The record high collection of Rs 1.87 lakh crore was witnessed in April. During July, revenues from domestic transactions (including import of services) were 15 per cent higher than revenues from these sources during the same month last year.

N A Shah Associates Partner, Indirect Tax, Parag Mehta said increased consumer spending for homes, cars, vacations, and other consumer items is also ensuring higher monthly GST collections. "The strong GSTN network has ensured detection of tax evaders at early stages.
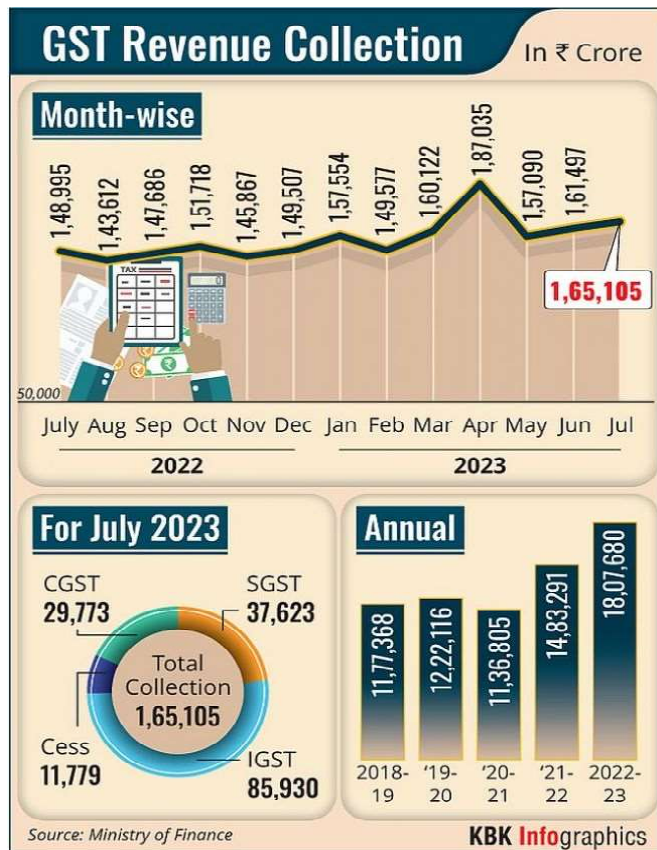


"Hence, on regular basis the department has been cracking down on tax evaders and fake invoicing entities. "Further the periodic clarifications on industry issues by the GST Council are also ensuring clarity in law, proper compliances, and higher collections by the authorities," Mehta said.

Deloitte India Partner MS Mani said the progressive reduction in the e-invoicing turnover limits accompanied by the large increase in number of state wise GST audits has led to all businesses becoming more GST compliant leading to increasingly stable GST collections month after month.

"The past trend of six key states generating almost 60 per cent of the nationwide GST collections continues in the current month as well. "The steady collections exceeding Rs 1.6 lakh crore over the past few months reflects an increasing awareness across businesses that GST compliance is essential and any non-compliance will get picked up immediately," Mani said.

KPMG in India National Head (Indirect Tax) Abhishek Jain said with the upcoming festive season, the collections are expected to go up in the coming months.

*(Rediff.com – 01/08/2023)*

# ITR FILING LAST DATE AY 2023-24: MISSED INCOME TAX RETURN DUE DATE? HERE'S WHAT YOU CAN DO NOW



Income Tax Return filing is a fundamental obligation for individuals and entities with taxable income. The process allows the government to track your financial activities, verify your tax liability, and ensure that you are paying your fair share of taxes. Timely filing of ITR not only demonstrates your compliance with tax laws but also aids in the efficient functioning of the government's revenue collection system.

Missing deadlines can have significant consequences, ranging from financial penalties to potential legal issues. In this article, we will delve into the importance of meeting the ITR filing deadline and explore the potential ramifications of missing it.

### The 31 July Deadline: Why is it Crucial?

According to Section 139(1) of the Income Tax Act, 31 July of the assessment year is the due date for filing tax returns for all persons who are not needed to perform an audit on their books of accounts. For example for F/Yr. 22-23, the due date of filing ITR is 31 July 2023. Since tax authorities expect taxpayers to fulfill their obligations punctually, therefore missing this date can have several consequences such as interest and late filing fees.

### Consequences of Missing the Deadline

- **Financial Penalties:** One of the immediate consequences of missing the 31 July deadline is the imposition of financial penalties. These penalties can vary depending on the jurisdiction and the amount of time by which the deadline has been exceeded. The longer you delay, the higher the penalty may become.

- **Interest on Outstanding Tax:** Apart from penalties, tax authorities often charge interest on any outstanding tax amount resulting from delayed filing. This interest accrues from the original due date until the date of payment.

- **Loss of Interest Benefits:** Timely filing of ITR ensures that you receive any refunds due to you promptly. However, if you miss the deadline, you may experience delays in receiving your refunds, potentially missing interest that you could have earned on that money.

- **Legal Consequences:** Repeatedly missing ITR filing deadlines can lead to legal issues. Tax authorities may initiate legal actions against persistent defaulters, which could involve fines, penalties, and even imprisonment in extreme cases.

- **Reduced Loan Eligibility:** Many financial institutions consider your ITR as a key document when assessing your creditworthiness. If you consistently miss ITR deadlines, it could affect your ability to secure loans or credit facilities.

- **Missed Opportunities for Deductions:** Filing ITR after the deadline might lead to oversight of various deductions and exemptions that you could have otherwise claimed. By missing these opportunities, you might end up paying higher taxes than necessary.

- **Increased Scrutiny:** Late filing can raise suspicion with tax authorities, leading to increased scrutiny of your financial affairs. This heightened attention could result in audits and investigations that consume time, money, and resources.

- **Negative Impact on Financial Reputation:** Delayed ITR filing could negatively affect your financial reputation. It may create the perception that you are not financially responsible or transparent, which could affect your relationships with financial institutions and potential business partners.

- **Carry forward losses:** A tax loss carryforward (or carryover) is a provision that allows a taxpayer to move a tax loss to future years to offset a profit. An individual

**ILTA**
Since 1950

or a business to reduce any future tax payments can claim the tax loss carry forward.

**Mitigating the Consequences**

If somehow you have missed the 31 July deadline for filing your ITR, do not lose hope, still, you can:

● **Belated Return:** Section 139{4} A taxpayer who has missed the ITR filing deadline of July 31, can file a belated ITR. The last date to file a belated ITR is December 31 every year. Hence, An assessee does not file his return within the timelines prescribed in the income tax act but files it after the due date is referred to as a belated return. The due date for filing a belated return is three months on or before the end of the relevant assessment year, i.e. 31st December.

● **Pay Outstanding Taxes:** If you owe taxes, make sure to pay them along with any penalties and interest to minimize further financial implications. If you have more than five lakh income so you have to pay Rs.5000 tax, and if you have less than five lakh income so you have to pay Rs.1000 tax. {Under section 234F}.if your income is less than the taxable limit then no late fees will be charged.

● **Consult a Tax Professional:** If you are uncertain about the process or the potential consequences of late filing, it is wise to consult a tax professional. They can provide guidance and help you navigate the situation effectively.

● **Keep Records:** Maintain proper documentation of your efforts to rectify the situation, including communication with tax authorities and evidence of payment.

● **Learn from the Experience:** Use this situation as a learning opportunity. Set reminders for future ITR filing deadlines and consider adopting better financial management practices.

**Conclusion**

Filing your Income Tax Return is not just a legal requirement; it is a responsible financial practice that contributes to the smooth functioning of the government and the economy. Missing the 31 July deadline can lead to various consequences, including financial penalties, interest charges, and legal issues. To avoid these ramifications, it is crucial to prioritize timely ITR filing and take corrective measures if you have missed the deadline. By doing so, you will not only maintain your financial reputation but also ensure compliance with tax laws and contribute to a well-functioning financial system.

*Read and Let Read*

# JILTA

## (Encapsulated Leather Knowledge)

# ILTA PUBLICATION
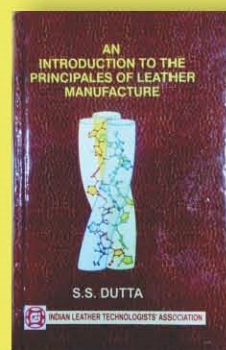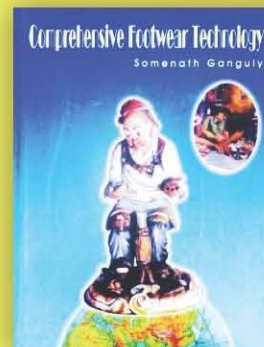
## Now available



Title of the Book
**Treatise on Fatliquors and Fatliquoring of Leather**

Author
Dr. Samir Dasgupta

Price per copy*
₹ 1500.00 / $ 60.00

Title of the Book
**Comprehensive Footwear Technology**
(Presently out of stock)
Author
Mr. Somenath Ganguly

Price per copy*
₹ 500.00 / $ 50.00





Title of the Book
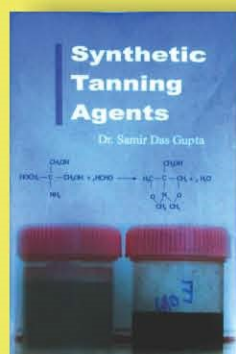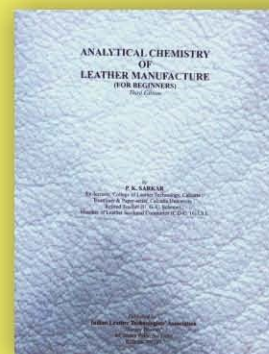**An Introduce to the Principles of Leather Manufacture**

Author
Prof. S. S. Dutta

Price per copy*
₹ 800.00 / $ 50.00

Title of the Book
**Analytical Chemistry of Leather Manufacture**

Author
Mr. P. K. Sarkar

Price per copy*
₹ 300.00 / $ 10.00





Title of the Book
**Synthetic Tanning Agents**

Author
Dr. Samir Dasgupta

Price per copy*
₹ 900.00 / $ 30.00

Title of the Book
**Hand- Book of Tanning**

Author
Prof. B. M. Das

Price per copy*
₹ 750.00 / $ 25.00



*Packing and forwarding charge extra

## Indian Leather Technologists' Association
[A Member Society of International Union of Leather Technologists' and Chemists Societies]

'Sanjoy Bhavan', 3rdFloor, 44, Shanti Pally, Kolkata- 700 107, WB, India
Phone : 91-33-2441-3429 / 3459 ✹ WhatsApp +91 94325 53949
E-mail : admin@iltaonleather.org; mailtoilta@rediffmail.com
Website : www.iltaonleather.org

ILTA
Since 1950

The Indian Leather Technologists' Association (ILTA) was founded by Late Prof. B. M. Das, the originator of Das-Stiasnay theory and father of Indian Leather Science on 14 th August' 1950. The primary objectives of the oldest Leather Technologists' Association which celebrated its Diamond Jubilee year in the 2010, are:

- To bring all concerned with the broad spectrum of the leather industry under one umbrella.
- To organize seminar, symposium, workshop in order to create information, knowledge and latest development for the benefit of all concerned. To offer a common platform for all to interact with each other in order to understand each other's problems and prospects.
- To publish monthly journal as a supplement to those above objectives. The monthly journal of ILTA is known as journal of Indian Leather Technologists' Association and is the most widely circulated technical journal concerning leather technology.
- To publish text books for the benefit of students at various levels of study, for the researchers and industry.
- To have interface between urban and rural sector.
- To assist Planning Commission, various Government Institutions, Ministry and autonomous bodies to formulate appropriate policies acceptable and adoptable to the industry.
- To organize practical training and to provide skilled manpower and to motivate good students for study.
- To conduct activities related to the growth of the export of leather and leather goods from India.

ILTA also organizes Prof. B. M. Das Memorial Lecture every year during the Foundation Day Celebrations on 14 th August and Sanjoy Sen Memorial Lecture on 14 th January, the birthday of our late President for several decades. Many reputed scientists, industrialists and educationists have delivered these prestigious lectures. Foreign dignitaries during their visits to India have addressed the members of ILTA at various times.

ILTA have published the following books:

1. An Introduction to the Principles of Physical Testing of Leather by Prof. S.S. Dutta
2. Practical Aspects of Manufacture of Upper Leathers by J. M. Dey
3. An Introduction to the Principles of Leather Manufacture by Prof. S. S. Dutta
4. Analytical Chemistry of Leather Manufacture by P. K. Sarkar
5. Comprehensive Footwear Technology by Mr. Somnath Ganguly
6. Treatise on Fatliquors and Fatliquoring of Leather by Dr. Samir Dasgupta
7. Synthetic Tanning Agents by Dr. Samir Dasgupta
8. Hand Book of Tanning by Prof. B. M. Das

ILTA presents awards in the name of Prof. B. M. Das Memorial, Sanjoy Sen Memorial and J. M. Dey Memorial Medals to the top rankers at the University graduate and post graduate levels. J. Sinha Roy Memorial Award for the author of the best contribution for the entire year published in the monthly journal of the Indian Leather Technologists' Association (JILTA). From the year 2023 ILTA has started to present a Scholarship namely Prof. Moni Banerjee Memorial Scholarship to a Student of B.Tech / M.Tech Leather Technology who is meritorious but financially crippled.

ILTA is the Member Society of IULTCS (International Union of Leather Technologists' and Chemists Societies) which is a 125 years old organization. The International Congress of this union is held in different locations of the world once in two years. In its 125 years history, for the first time the Congress was held in January 1999 outside the developed countries and that too in India at CLRI, Chennai. Indian Leather Technologists Association organized the Congress under the able leadership and guidance of Late Sanjoy Sen, the then President of ILTA and IULTCS and Dr. T. Ramasami, the then Vice-President of ILTA and Director, CLRI, Chennai. In 2017 IULTCS Congress was successfully held again at Chennai, India for the second time.

In order to promote and provide marketing facilities, to keep pace with the latest design and technology, to have better interaction with the domestic buyers, ILTA has been organizing LEXPO fairs at Kolkata from 1977, Siliguri from 1992 and Durgapur from 2010. To help the tiny, cottage and small-scale sectors industries in marketing, LEXPO fairs give the exposure for their products. Apart from Kolkata &amp; Siliguri and Durgapur, ILTA have held LEXPO at Bhubaneswar, Gangtok, Guwahati, Jamshedpur and Ranchi. In commensurate with the time, demand and new perspective of the modern leather users, ILTA has started to organize LEXPO at Kolkata from 2022 in a new shape with the Manufacturers and Exporters of Leather Goods from all over India.

ILTA has celebrated its Golden Jubilee with a year-long programme from 14 th August' 2000 to 13 th August' 2011 along with the first conference of South East Asian Countries at Netaji Indoor Stadium, Kolkata.

ILTA has also celebrated its Diamond Jubilee with a year long programme from 14 th August' 2010 to 13 th August' 2011 which included National Seminars, B. M. Das Memorial Lecture, Sanjoy Sen Memorial Lecture, Moni Banerjee Memorial Lecture, Y. Nayudamma Memorial Lecture and 3 day's AICLST (Asia International Conference on Leather Science and Technology) at Hotel 'The Stadle' at Salt Lake City, Kolkata.

The Association's present (as on 31.03.2023) strength of members is around 550 from all over India and abroad. Primarily the members are leather technologists passed out from Govt. College of Engineering and Leather Technology – Kolkata, Anna University – Chennai, Harcourt Butler Technological Institute – Kanpur, B. R. Ambedkar National Institute of Technology – Jalandhar and Scientists and Research Scholars from Central Leather Research Institute (CLRI).

In order to strengthen its activities, ILTA have constructed its own six storied building at 44, Shanti Pally, Kasba, Kolkata – 700107, West Bengal, India and have named it as "Sanjoy Bhavan".

This Association is managed by an Executive Committee duly elected by the members of the Association. It is absolutely a non-profit making voluntary organization working for the betterment of the Leather Industry. None of the Executive Committee members draws any remuneration for their services rendered but they get the satisfaction of being a part of this esteemed organization.

## Indian Leather Technologists' Association
[A Member Society of International Union of Leather Technologists' and

'Sanjoy Bhavan', 3rdFloor, 44, Shanti Pally, Kolkata- 700 107, WB, India
Phone : 91-33-2441-3429 / 3459 ✹ WhatsApp +91 94325 53949
E-mail : admin @ iltaonleather.org; mailtoilta @ rediffmail.com
Website : www.iltaonleather.org

ILTA
Since 1950