



# High-End Elecfoil Global No.1

COMPANY PROFILE





# High-End Elecfoil Global No.1

## CONTENTS

04-07	LOTTE GROUP
08-09	LOTTE Chemical Head Quarter
10-11	LOTTE ENERGY MATERIALS
12-13	Growth Strategy
14-15	Business Sites
16-17	History
18-19	Elecfoil Production Process
20-21	Key Strengths
22-27	Product Portfolio(Elecfoil for battery · Elecfoil for PCB · Application)
28-31	ESG



# LOTTE GROUP

Lifetime Value Creator that adds value of abundance to human life, LOTTE

LOTTE is continuously challenging and innovating in various fields such as food, retail, tourism, and chemicals, providing new lifestyles and creating a more convenient and enjoyable daily life. LOTTE is building a happier tomorrow where everyone grows together.

## VISION



**New Today, Better Tomorrow**

# Lifetime Value Creator

## Our Resolution for the Next 50 Years

To promote sustainable growth over the next 50 years, LOTTE has chosen to focus on qualitative growth and declared a new vision.

“Lifetime Value Creator” represents our resolution to make LOTTE a brand that provides our customers with the very best value throughout their lives.

## MISSION

**We enrich people’s lives by providing superior products and services that our customers love and trust**

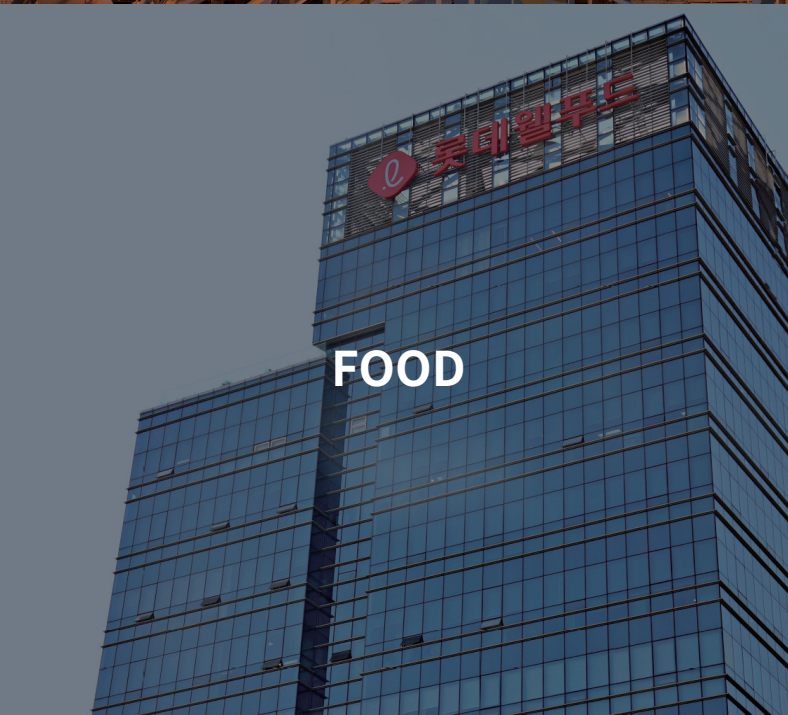




## CHEMICAL



## SHOPPING



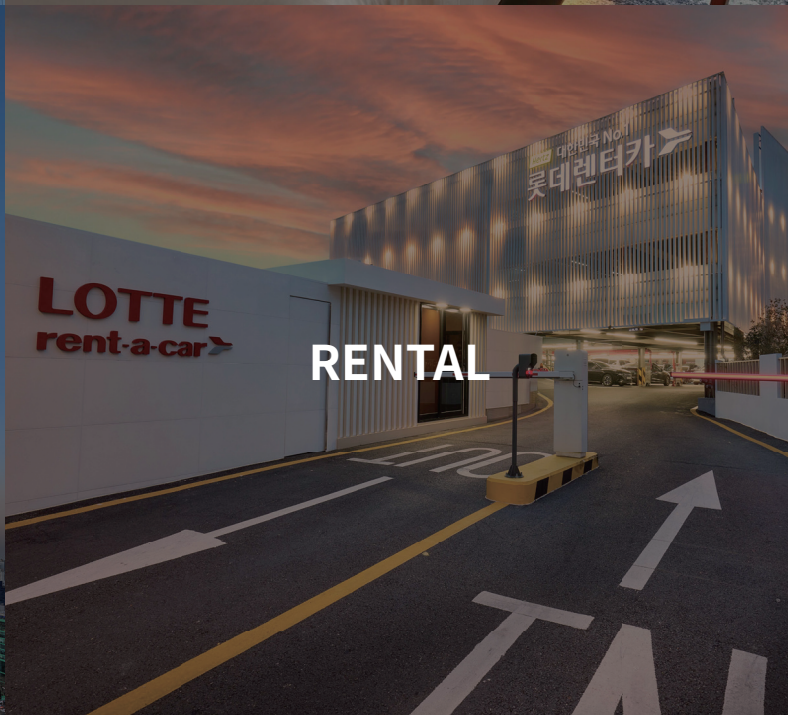
## FOOD



## HOTEL



## CONSTRUCTION



## RENTAL

LOTTE is delivering abundant value worldwide and is advancing to become a top 10 global group in Asia.

Based on a stable financial structure, the LOTTE continues to grow steadily each year. Additionally, Lotte has built a diverse business portfolio that encompasses chemicals, construction, food, retail, tourism, and services.



Current business rankings

**6th** place



Number of affiliates

**98**

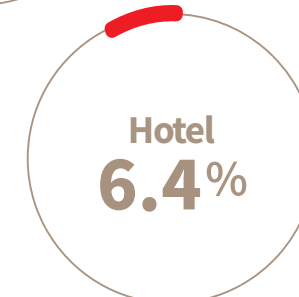
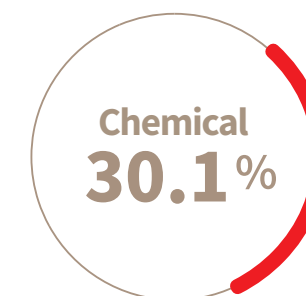


Assets

KRW**129.7** trillion

\* Source: May 2023 announcement by the Korea Fair Trade Commission

## SALES BREAKDOWN BY BUSINESS IN 2023



Total revenue **71.8** trillion KRW(2023)

\* Since 2017, total sales have been reported based on financial accounting standards rather than the previous management accounting standards.



# LOTTE GROUP's Chemical Head Quarter

LOTTE Group's Chemical Division leading Korea's chemical industry based on a history of challenges and innovation

The LOTTE Group's Chemical Division, which includes LOTTE CHEMICAL, LOTTE FINE CHEMICAL, LOTTE ENERGY MATERIALS, LOTTE ALUMINIUM and other subsidiaries, is dedicated to becoming the world's leading chemical company.

From basic raw materials to high-value specialty products and secondary battery materials, LOTTE Chemical Division provides products that enhance the quality of life.

## LOTTE GROUP's Chemical Head Quarter



[LOTTE CHEMICAL]



[LOTTE FINE CHEMICAL]



[LOTTE ENERGY MATERIALS]



[LOTTE ALUMINIUM]

- LOTTE CHEMICAL
- LOTTE FINE CHEMICAL
- LOTTE ENERGY MATERIALS
- LOTTE ALUMINIUM
- LOTTE CHEMICAL TITAN

- LOTTE CHEMICAL USA
- LOTTE MCC [JV with Mitsubishi Chemical (JPN)]
- LOTTE INEOS CHEMICAL [JV with INEOS (UK)]
- LOTTE Versalis Elastomers [JV with Versalis (ITA)]
- LOTTE GS CHEMICAL [JV with GS Energy (Kor)]



# LOTTE ENERGY MATERIALS

LOTTE Energy Materials is recognized for its superior technological capabilities by global battery companies.

LOTTE Energy Materials has the industry's only High-End hybrid Elecfoil(Electrodeposited copper foil) product that simultaneously satisfies ultra-thin, high strength, and high elongation properties, and is strengthening its investment in future businesses by focusing its R&D capabilities on next-generation battery materials for the secondary battery market.

In addition, we are becoming a global green company that practices ESG-centered management with the goal of achieving RE100 by operating competitive global bases with renewable energy.

## BUSINESS AREA

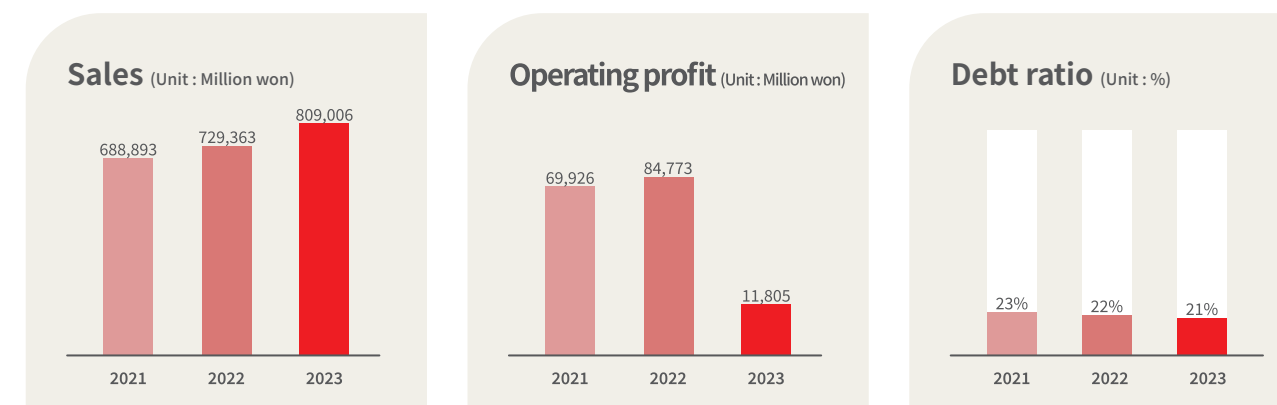
<b>Elecfoil</b>	Elecfoil for battery(I2B, I2S) / Elecfoil for PCB(ICS, FCCL / Tape)
<b>Construction</b>	LOTTE Eco Wall / LOTTE Tech

## COMPANY OVERVIEW

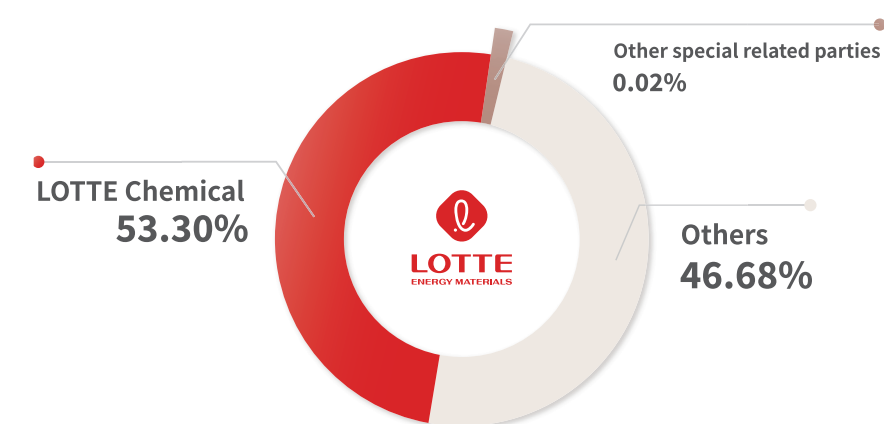


\* As of 2023, Currency in Korean Won (KRW)

## FINANCIAL HIGHLIGHTS



## SHAREHOLDER COMPOSITION RATIO



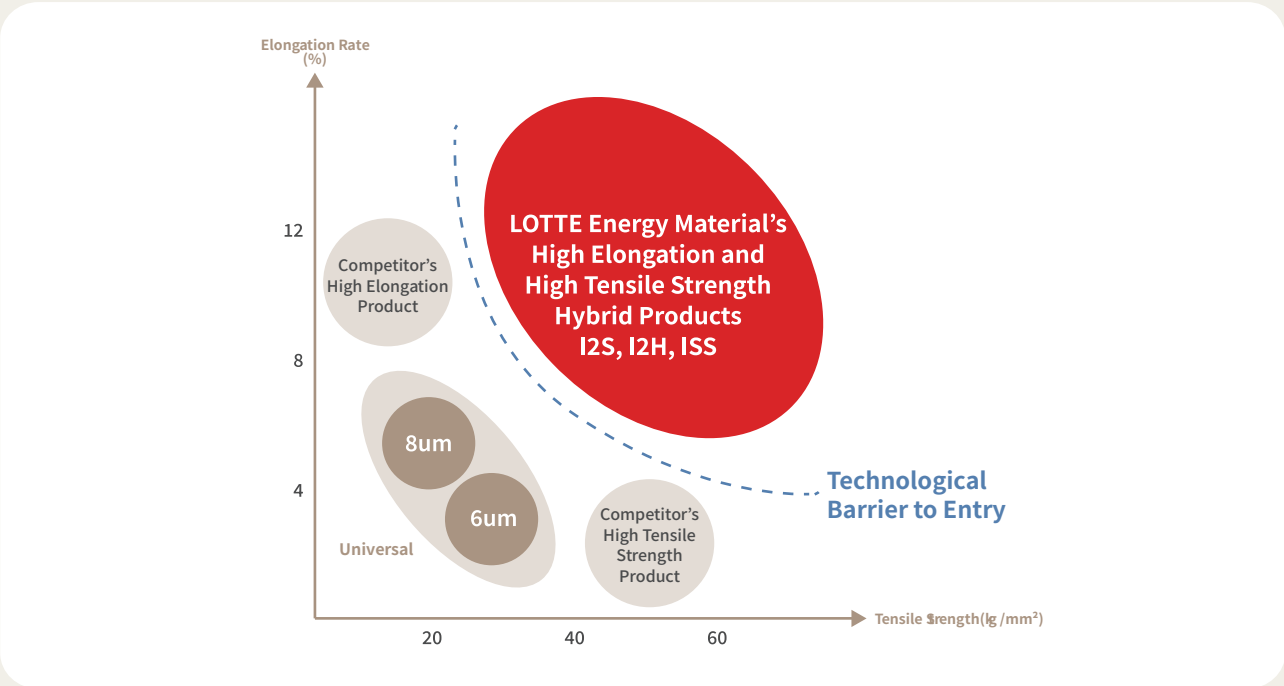
\* As of 2023



# Growth Strategy

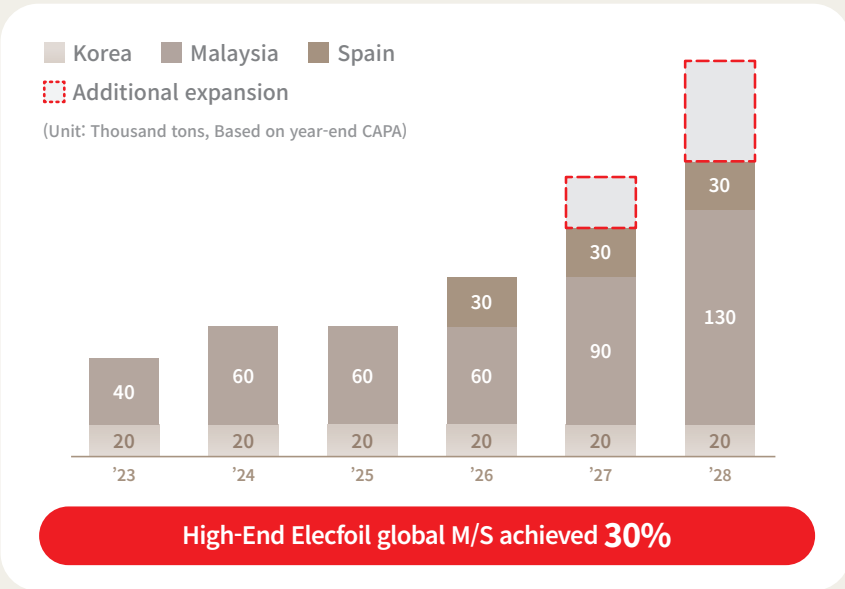
## 1. High-End hyper-gap technology

Industry's only hybrid ultra-thin/high-strength/high-elongation product



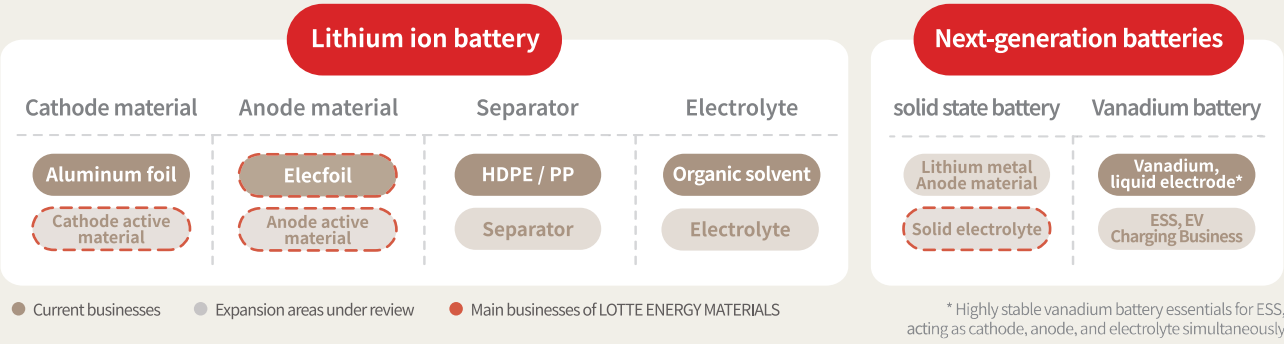
## 2. Global operations strategy

- Continued expansion in Malaysia to address local customer needs in Europe and North America for high-end products and to ensure global supply stability.
- The domestic corporation will serve as a hub for technology development and sales, while the overseas corporation will operate as a production base (utilizing renewable energy)



- Korea**
  - Technology development hub, global sales
  - GOC, R&D Center operation
- Malaysia**
  - Cost Competitiveness Center
  - Electricity costs at 40% and labor costs at 20% compared to Korea
  - Global Balancing Site
- Spain**
  - Addressing new High-End customers in Europe
  - Entry of multiple new battery companies
  - Limited competition with Chinese competitors
- USA**
  - Localize for high-growth markets
  - Focused investment of K-battery companies
  - Leveraging the Benefits of Excluding Chinese Competitors, such as IRA

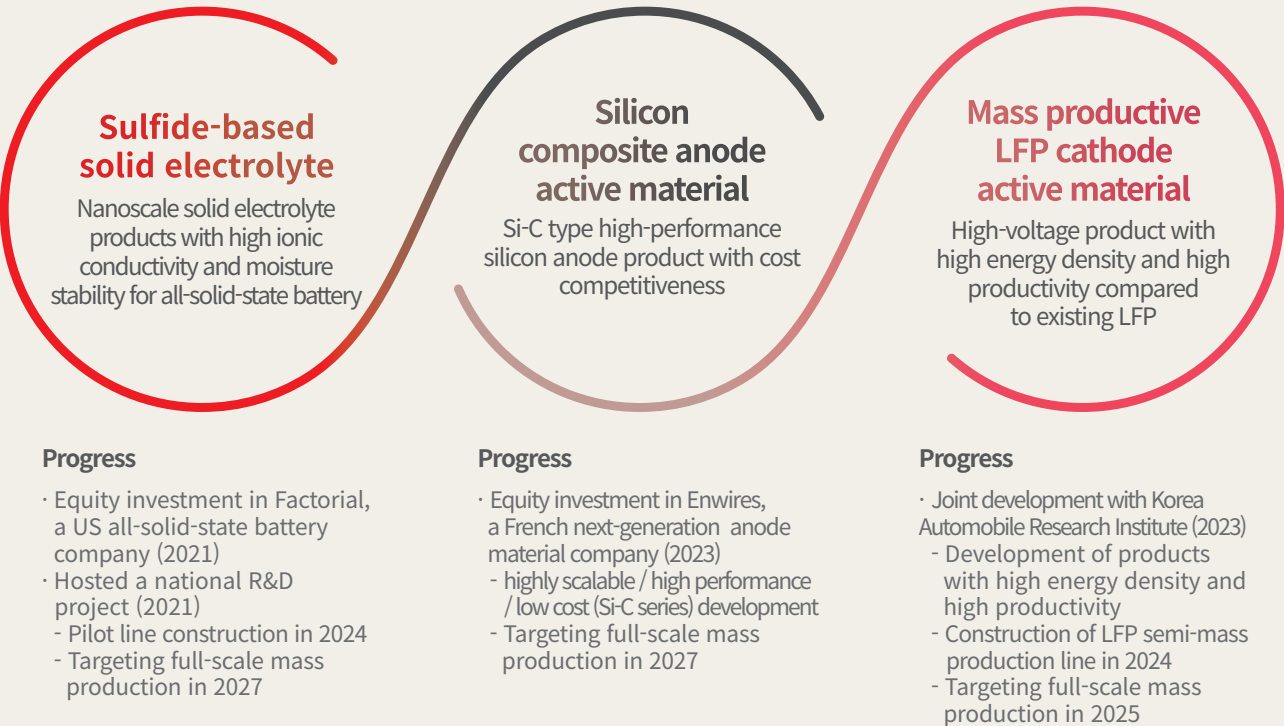
## 3. LOTTE Group chemical battery material business



2030 Goal : Sales of 7 trillion won (Accumulated investment in total : 7 trillion KRW)

Total Solution Provider	Collaborative research on battery materials	Creating customer value
LOTTE Chemical Division to Customers R&D, marketing collaboration	Chemicals R&D Focused Competencies	Contribution to customer innovation in next-generation battery technology

## 4. Development of next-generation battery materials





# LOTTE ENERGY MATERIALS Global Network

LOTTE Energy Materials produces High-End Elecfoil through key domestic and overseas sites



## Overseas sites



MALAYSIA



SPAIN



USA

## Domestic sites



Seoul Office



Uiwang Center

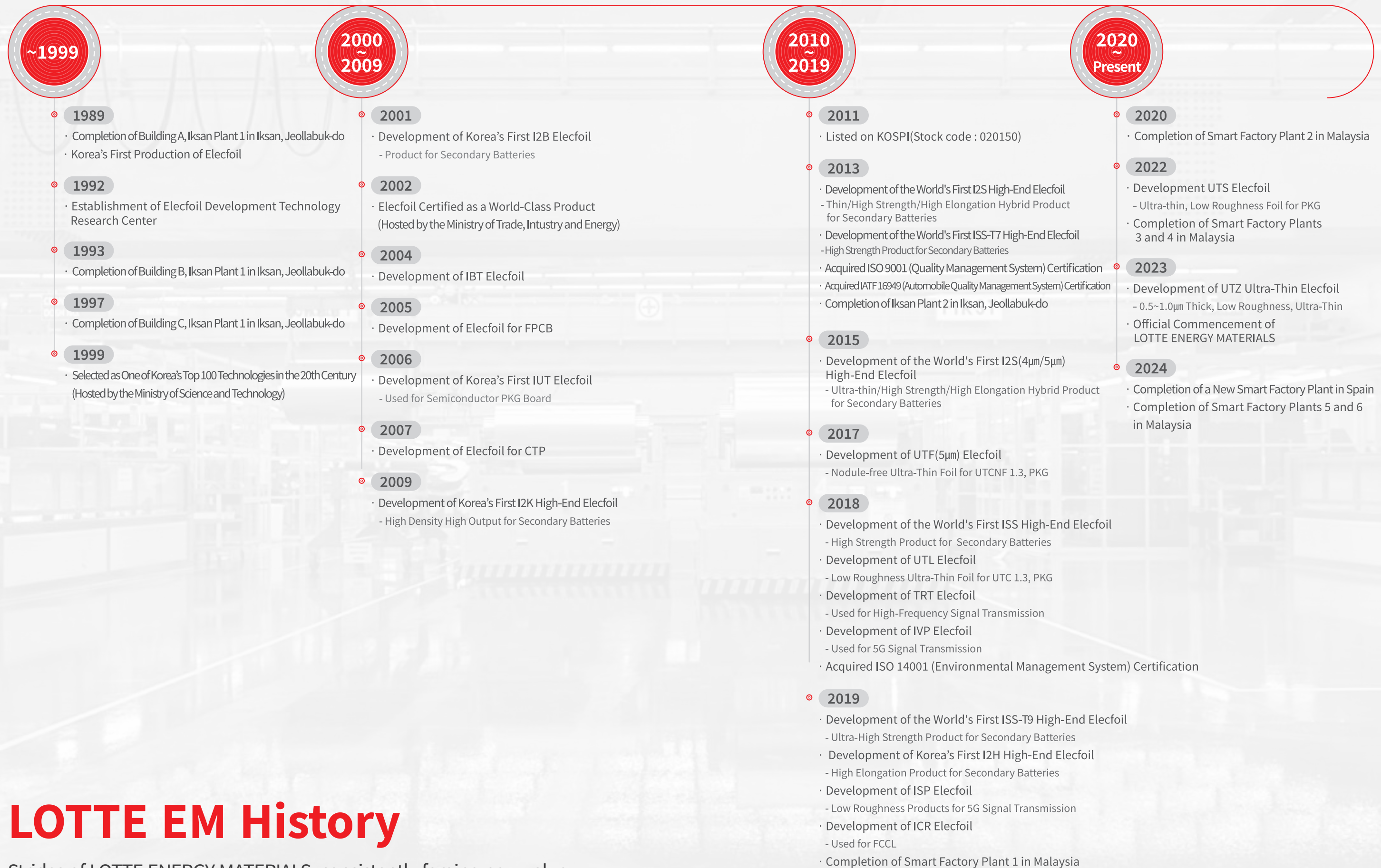


Iksan Plant 1



Iksan Plant 2



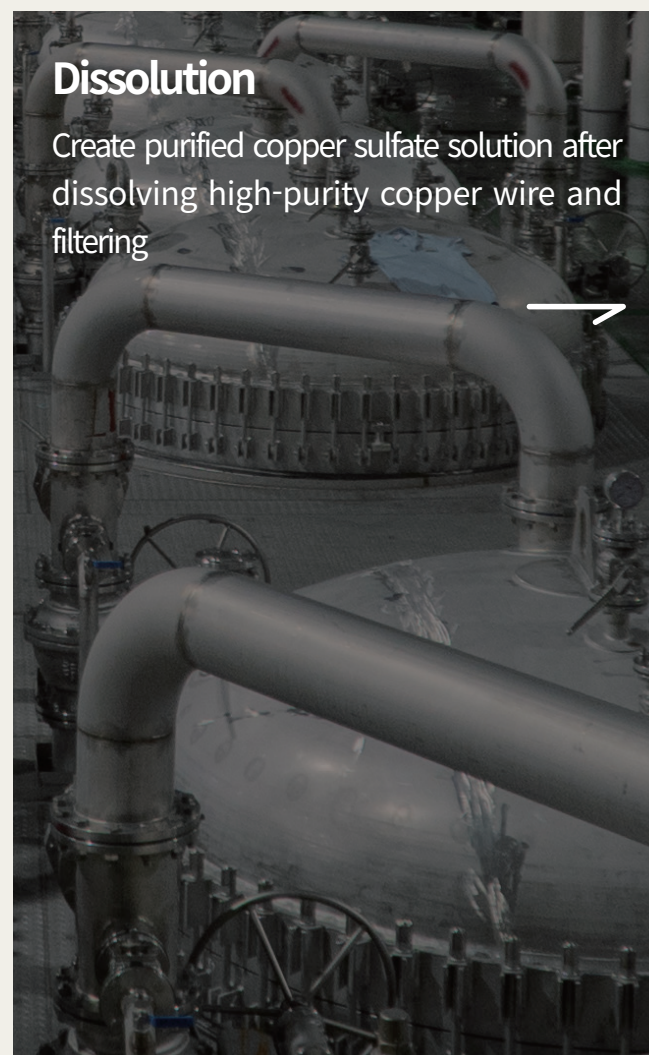


# LOTTE EM History

Strides of LOTTE ENERGY MATERIALS, consistently forging new value

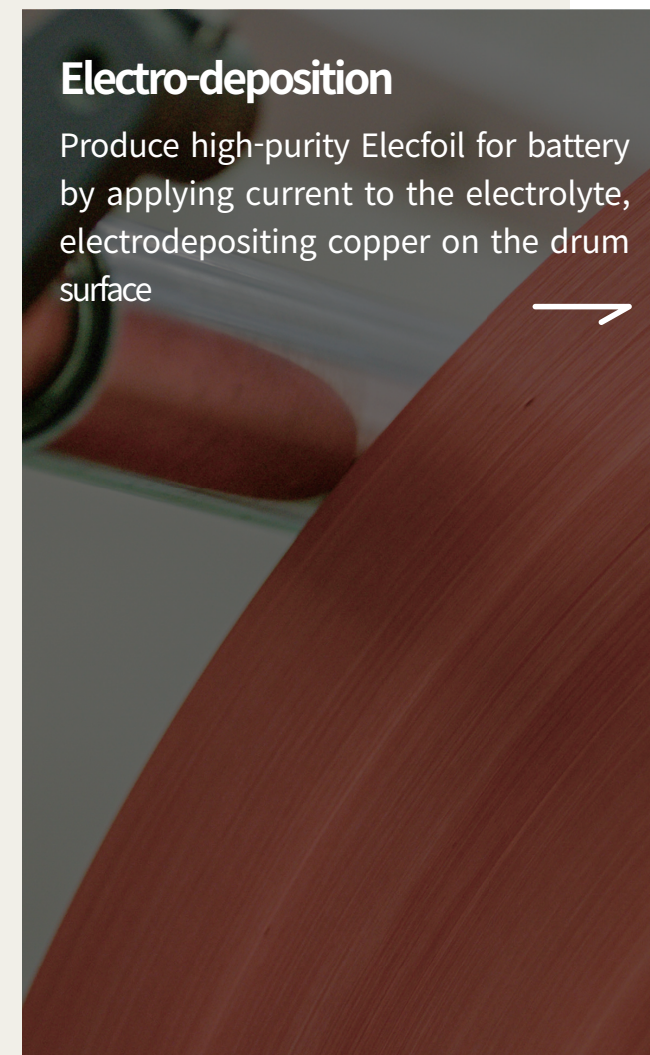


LOTTE Energy Materials’  
ultra-thin/high-strength/high-elongation  
High-End Elecfoil is produced using  
**selected production processes**  
and **technologies**



### Dissolution

Create purified copper sulfate solution after dissolving high-purity copper wire and filtering



### Electro-deposition

Produce high-purity Elecfoil for battery by applying current to the electrolyte, electrodepositing copper on the drum surface



### Slitting

Cut Elecfoil according to the customer's needs, and package them after quality inspection

**Production Process.**



# High-End Elecfoil Global No.1

We possess key materials for secondary batteries, such as High-End Elecfoil, and high-performance PCB foil used across various electronic products. Additionally, we manufacture high-performance FCCL and TAPE for smart devices, and our technological capabilities are recognized by global enterprises.

**Ultra Thin** —◎  
4~5 $\mu$ m Thickness

**High Strength** —◎  
50 ~ 60kg/mm<sup>2</sup>

**High Elongation** —◎  
12 ~ 15%





# High-End Elecfoil for Secondary Battery

Elecfoil(Electrodeposited copper foil) for secondary battery is an essential component utilized as the anode current collector in lithium-ion battery, which are integral to electric vehicle (EV) battery technology. LOTTE ENERGY MATERIALS is at the forefront of innovation and production, focusing on High-End Elecfoil engineered to meet the stringent demands for increased strength and elongation. These properties are crucial for enhancing the driving range, ensuring the safety of charge-discharge cycles, and boosting the energy density of EVs. Also, we are pioneering the industry with unique combination of ultra-thinness, high strength, and high elongation properties and a portfolio of patents.



## GRADE SPEC

Grade	Thickness	Strength	Elongation
High-End Product	6μm or less Ultra-thin Elecfoil	50~60 kgf/mm <sup>2</sup> High strength	12~15 % High elongation
Universal Product	8~10μm	30~40kg/mm <sup>2</sup>	8~8.5%

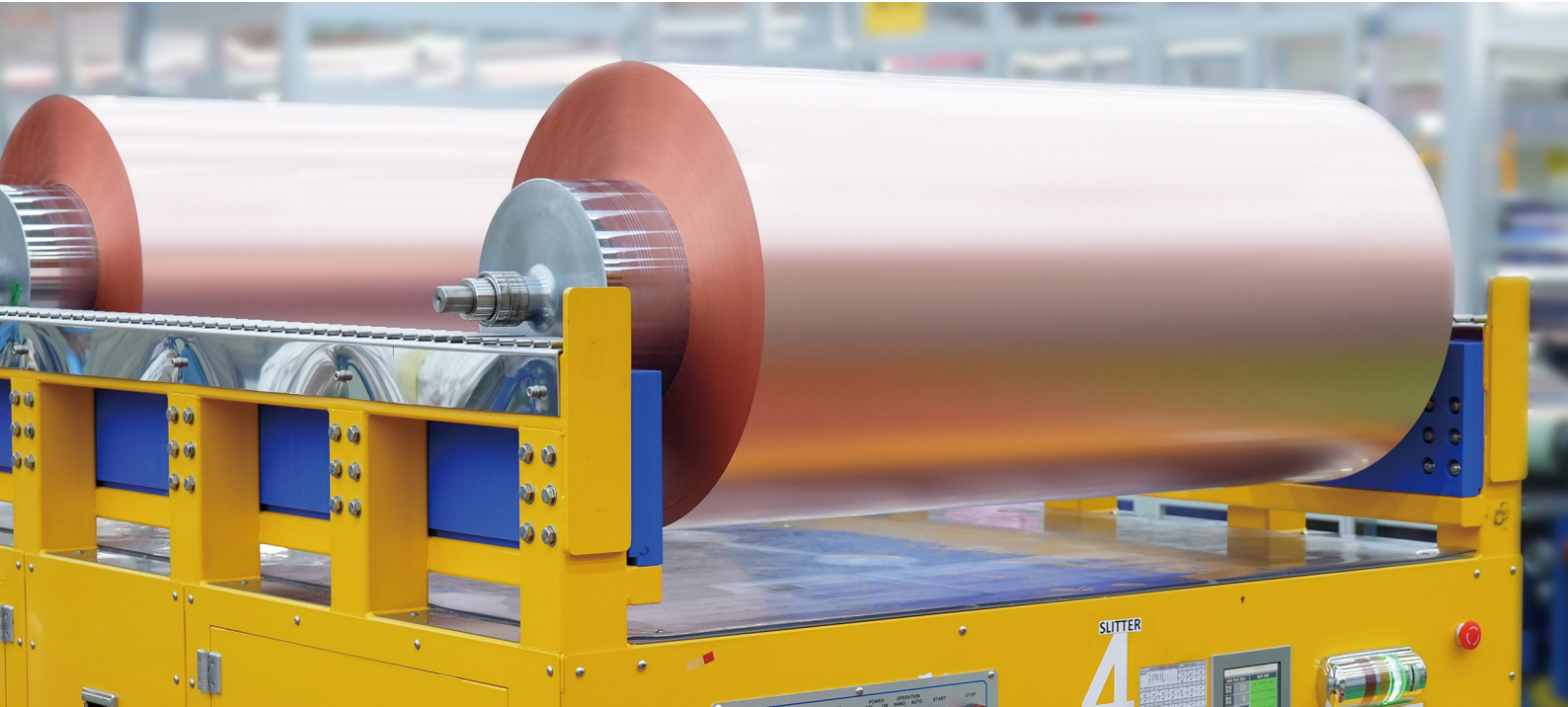
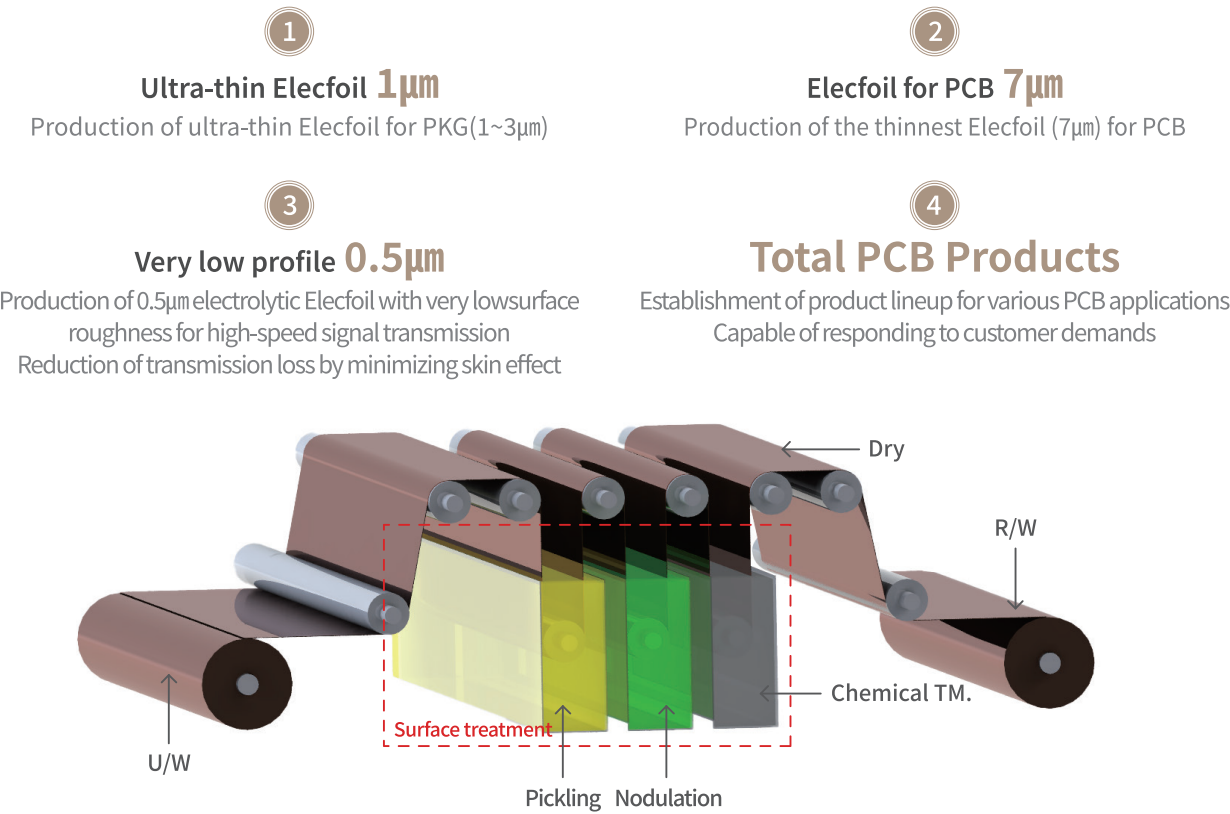
## Product

Product name	Characteristics	Thickness
<b>ISS-T7</b> (Ultra-high strength)	Boasts ultra-high strength properties that are maintained both at room temperature and under high-temperature conditions. Additionally, it resists deformation even when subjected to the substantial loading of anode active materials required for high-capacity battery and anticipated in next-generation battery. <ul style="list-style-type: none"> <li>· Ultra-high strength characteristics</li> <li>· Improving battery manufacturability</li> <li>· Improving battery processability</li> <li>· Cost reduction for customers</li> </ul>	6 ~ 12μm
<b>ISS-T6</b> (Ultra-high strength)	Boasts ultra-high strength properties that are maintained both at room temperature and under high-temperature conditions. Additionally, it resists deformation even when subjected to the substantial loading of anode active materials required for high-capacity battery and anticipated in next-generation battery. <ul style="list-style-type: none"> <li>· Ultra-high strength characteristics</li> <li>· Improving battery manufacturability</li> <li>· Improving battery processability</li> <li>· Cost reduction for customers</li> </ul>	6 ~ 12μm
<b>ISS</b> (High-strength)	Features high strength and high heat resistance, ensuring superior manufacturability during battery production. Deformation after charge and discharge cycles is prevented, making it ideal for use in high-capacity battery. <ul style="list-style-type: none"> <li>· Maintaining high strength characteristics after thermal history</li> <li>· High tensile strength characteristics at room temperature</li> <li>· Improving battery manufacturability</li> <li>· Improving battery processability</li> <li>· Cost reduction for customers</li> </ul>	4 ~ 12μm
<b>I2S</b> (Medium strength)	Features high strength and high heat resistance, ensuring superior manufacturability during battery production. Deformation after charge and discharge cycles is prevented, making it ideal for use in high-capacity battery. <ul style="list-style-type: none"> <li>· Maintaining medium strength and medium elongation characteristics after thermal history</li> <li>· Medium strength and medium elongation characteristics at room temperature</li> <li>· Improving battery manufacturability</li> <li>· Improving battery processability</li> <li>· Cost reduction for customers</li> </ul>	4 ~ 12μm
<b>I2B</b> (Universal)	Currently most widely used Elecfoil in lithium-ion battery. Both sides(Shiny and Matt side) exhibit similar level of low surface roughness. <ul style="list-style-type: none"> <li>· Secured high-speed mass production technology</li> <li>· Secured wide-width and long-length technology</li> </ul>	6 ~ 20μm
<b>I2S-H</b> (Medium strength · high elongation)	It is a Elecfoil with high elongation while having the same tensile strength at room and high temperatures as I2S, a medium-strength Elecfoil. It can improve processability when manufacturing battery with increased energy density. <ul style="list-style-type: none"> <li>· Maintaining medium strength and high elongation characteristics after thermal history</li> <li>· Medium strength and high elongation characteristics at room temperature</li> <li>· Improving battery processability</li> <li>· Improving battery stability</li> </ul>	4 ~ 12μm
<b>I2H</b> (High elongation)	Boasts high elongation properties while maintaining the same tensile strength at room temperature as I2B, the universal Elecfoil. Minimizes the risk of Elecfoil rupture during the battery's charge and discharge cycles <ul style="list-style-type: none"> <li>· High elongation characteristics at room temperature</li> <li>· Improving battery processability</li> <li>· Suppressing Elecfoil rupture</li> <li>· Improving battery stability</li> </ul>	6 ~ 20μm
<b>ISS/I2S</b> (Ultra-thin)	Designed for ultra-thin battery, with a thickness of 5μm or less. High strength properties of I2S and ISS are incorporated to enhance the battery's capacity and output. <ul style="list-style-type: none"> <li>· Medium strength and medium elongation characteristics at room temperature</li> <li>· High-quality production of High-End ultra-thin Elecfoil</li> <li>· Improving battery energy density</li> </ul> <p>&lt;Development history&gt;</p> <ul style="list-style-type: none"> <li>· World's first development of Elecfoil in 2015(I2S)</li> <li>· Customer approval and mass production of 5 μm I2S in 2018</li> </ul>	4 ~ 5μm



# Korea's sole manufacturer of Elecfoil for PCB

PCB foil, a crucial component in electronic devices such as TVs, computers, and smartphones, is a Elecfoil integral to PCB. This copper is extracted through an electrolytic process from a CuSO4 solution, where it undergoes sophisticated refinement. LOTTE ENERGY MATERIALS has pioneered the development and market introduction of high-performance specialty PCB foils in Korea, catering to the industry's trend towards smaller and more complex devices. Our innovation and early market entry have secured us the leading global market share in this advanced material sector.



## Product

Product name	Characteristics	Thickness
PCB	<b>Main products : ICS</b> High-quality PCB foil optimized for general Multilayer Rigid PCB. <ul style="list-style-type: none"><li>· Adhesive strength : Stable adhesion strength to various boards</li><li>· Etching : Stable circuit etching properties that enable various line widths to be implemented</li></ul>	8 ~ 35μm
FPC	<b>Main products : IHT / ICR / IRT</b> Elecfoil designed for superior adhesion to PI, offering excellent bending resistance without compromising on low surface roughness for flexible PCB applications. <ul style="list-style-type: none"><li>· MIT : Stable bending resistance can be secured</li><li>· High heat resistance : Elecfoil that does not deform even at high processing temperatures</li></ul>	7 ~ 35μm
RTF	<b>Main products : HRT / MRT / SRT</b> RTF(Reverse Treated Foil) product with excellent high-frequency properties up to ~10Ghz, featuring high adhesive strength with low-dielectric materials. <ul style="list-style-type: none"><li>· Surface profile : Rz ≤ 1.8, low surface profile</li><li>· Adhesive strength : P/S &gt;0.5, @18μm</li></ul>	12 ~ 70μm
HVLP	<b>Main products : IVP / ISP / LHZ / LSZ / New Product</b> Elecfoil engineered for low-loss, high-speed signal transmission, demonstrating exceptional performance at frequencies up to ~50GHz, making it suitable for the inner layers of High-End servers, routers, and switches. Elecfoil designed for high-speed data transfer, featuring reliable adhesive strength and low-loss properties when paired with Dk and DF resin materials. Ideal for use in 5G antennas, autonomous vehicles, and data centres, and is categorized into different grades based on its surface roughness to meet diverse application requirements. <ul style="list-style-type: none"><li>· Surface profile : Low surface profile and fine nodule size</li><li>· Adhesive strength : P/S &gt;0.4, @18μm</li></ul>	12 ~ 35μm
PKG - VLP	<b>Main products : LPF / LPS</b> High-performance Elecfoil with exceptional mechanical strength, facilitating the creation of Fine Pattern during circuit etching, making it an ideal material for Package Substrates. Maintains high adhesive strength despite low surface roughness, suitable for use in HDI(High Density Interconnection) applications. The product is differentiated by high-temperature elongation rate. <ul style="list-style-type: none"><li>· Surface profile : Rz ≤ 2.0, low surface profile</li><li>· Adhesive strength : P/S &gt;0.7, @12μm</li></ul>	7 ~ 12μm
PKG - UTC	<b>Main products : IUT / UTL / UTS / UTZ / UTFS</b> Material suitable for PKG Substrate applications in Memory, RF, and mobile DEP, characterized by low surface roughness and stable peel strength even at high temperatures. Ultra-thin Elecfoil with a thickness of less than 5 micrometers, ideal for creating fine patterns, comes with an attached carrier. The product is graded based on surface roughness. <ul style="list-style-type: none"><li>· Surface profile : Rz ≤ 1.5, low surface profile</li><li>· Adhesive strength : R/S 3~30, @ 220~240°C</li></ul>	1 ~ 5μm



FCCL (Flexible Copper Clad Laminate)

FCCL is a key material for constructing FPCB(Flexible Printed Circuit Boards), consisting of laminated layers of copper and insulating film, which is essential for smartphone substrates that require flexibility to accommodate component placing and bending. As a critical component of FPCB, FCCL plays a vital role in managing heat dissipation, signal interference, and speed within smartphones, depending on its material and performance properties. LEM is recognized for its technical expertise by supplying high-performance FCCL to global smartphone manufacturers.

Electrofoil

Lamination

Electrofoil

Insulation film(PI)

Processing (circuit pattern)

Electrofoil


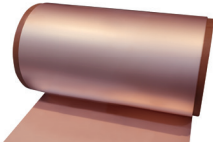
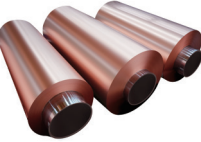
Circuit

Electrofoil

Insulation film(PI)

Bonding material

Surface protection layer



Electrofoil

FCCL

FPC

Feature

✓ Establishment of a stable supply chain

✓ Realization of low dielectric performance

✓ Uniform thickness stability

✓ Excellent heat resistance

✓ Excellent flexibility

Characteristics		Unit	EA-121212	EB-351235	IMIR-FB-4201242	EB-182018-R	EB-701270
Mechanical properties	Thickness	μm	36 ± 10%	82 ± 10%	96 ± 10%	56 ± 10%	152 ± 10%
	90° Adhesive strength	gf/cm	≥ 1,000	≥ 1,000	≥ 1,000	≥ 1,000	≥ 1,000
	Flexibility	Cycle	≥ 250	≥ 250	≥ 250	≥ 250	≥ 250
	Dimensional stability	%	-0.1 ~ +0.1	-0.1 ~ +0.1	-0.1 ~ +0.1	-0.1 ~ +0.1	-0.1 ~ +0.1
Thermal stability	Resistance to molten solder	30sec /288°C	pass	pass	pass	pass	pass
Chemical stability	Moisture absorption rate	%	3	3	3	3	3
	Flammability rating	UL-94	VTM-0	VTM-0	VTM-0	VTM-0	VTM-0
Application model			Refrigerator, Smartphone	Smartphone fold, Smartphone flip	Smartphone, Smartphone fold	Smartphone	Smartwatch
Application field			Home appliance wireless charging	wireless charging	wireless charging	PCM	wireless charging

Cu Tape (Copper Adhesive Tape)

Copper tape is an essential material for small and medium-sized devices (smartphone, tablet, car, TV, etc.) that require miniaturization and weight reduction. It effectively transfers and dissipates heat from high-performance components like CPUs and motherboards, and also shields against electromagnetic interference, reducing malfunctions in electronic devices.


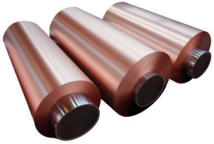
Electrofoil

Coating

Electrofoil

Acrylic adhesion

Converting (Assembly)

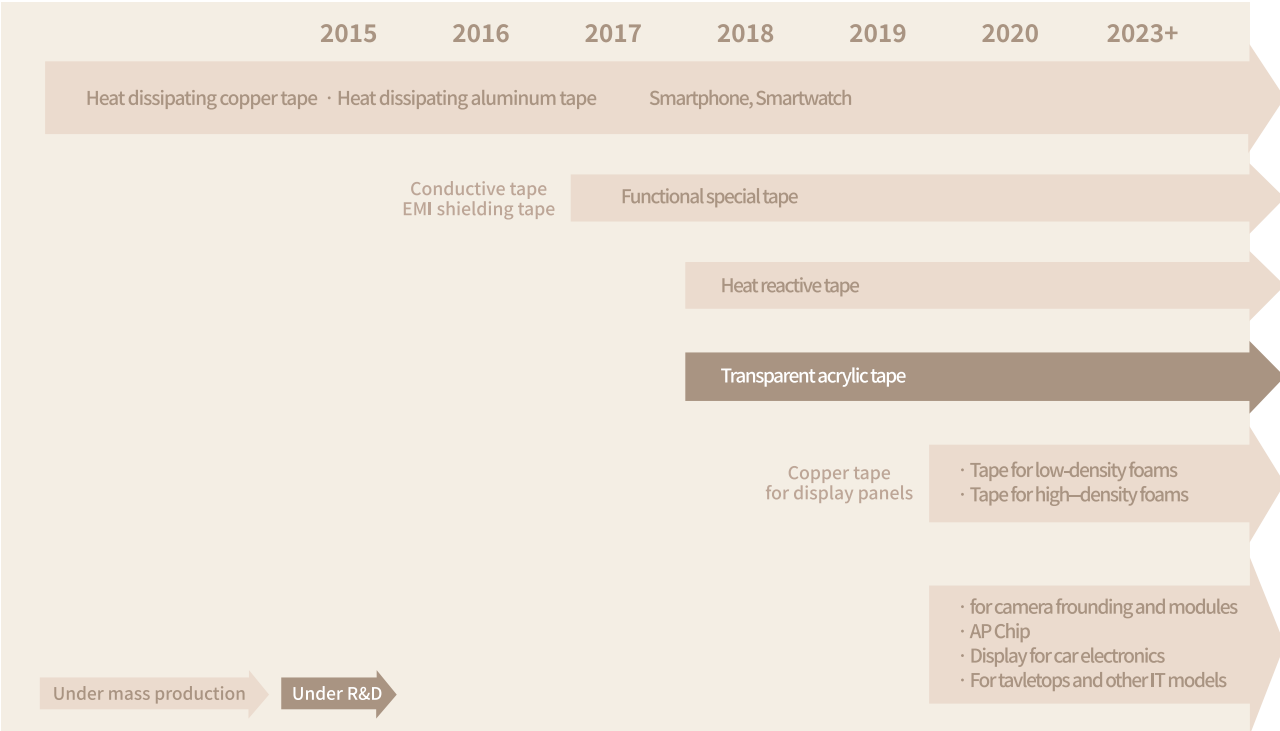


Electrofoil

Cu Tape

Field	Product Lineup	Structure	Application Model	Characteristics
OLED Display	IC XXX products IT XXX products	Copper or PI film /Adhesive layer Copper /Adhesive layer	Smartphone Display for car electronics	Excellent heat transfer properties Excellent adhesion performance Cost competitiveness
LCD	AT XXX products	Copper/Patterned adhesive layer	Smartphone	Excellent heat transfer properties Easy attachment Easy to handle
Insulation /Shielding	NT XXX products	Insulation/Copper /Adhesive layer	Smartphone	Excellent insulation properties Excellent shielding performance
Conductivity /Grounding	AT XXX products NT XXX products	Copper /Conductive adhesive layer	Smartphone, Tablet	Excellent shielding performance Excellent electrical conductivity

Product Group and Application Model





# ESG

## To create a sustainable tomorrow

We are practicing ESG management



### Compliance

Planning and operating a global level compliance program



### Ethical management

Establishment of a transparent, fair, and reasonable management culture



### Safety and environmental management

Investment in eco-friendly facilities and eco-friendly product development, and preemptive strengthening of the safety and health management system



### Social contribution

Enhancing corporate image and improving external trust through implementation of strategic social contribution programs



### Mutual growth

Creating fair trade relationships and supporting partners to strengthen their competitiveness



# ESG Environment

We recognise safety and the environment as top management priorities and pursue sustainable development.

**Creating a safe and healthy workplace**

- Compliance with internal standards that are stronger than legal standards
- Establishment of a bottom-up approach safety and health management system
- Strengthening internal and external safety and health networks

**Eco-friendly company**

- Compliance with internal standards that are stronger than legal standards
- Minimizing greenhouse gas and pollutant emissions
- Establishment of internal and external eco-friendly partnerships

Participants	Characteristics	Training cycle
Emergency response training (Iksan Plant 1, 2)	LOTTE ENERGY MATERIALS Iksan Plant 1 conducts emergency response training twice a year to minimize damage to life and property in the event of fire or chemical accidents (Including joint fire drills with local fire departments).	Twice a year
Safety and environment monitoring group	LOTTE ENERGY MATERIALS operates the safety environment monitoring group every week to proactively discover and improve over potential risk factors.	Weekly
Safety environment contest	LOTTE ENERGY MATERIALS holds a safety environment contest every year to raise awareness of the safety environment among all executives and employees.	Annually
TPM (Total Productive Maintenance)	At LOTTE ENERGY MATERIALS, all executives and employees participate in TPM activities on a regular basis to create a healthy and safe workplace.	Regularly

# ESG Society

We will fulfill our corporate social responsibility by protecting the environment, fostering mutual growth with the local community, and ersuring happiness for all

**Environment**

Improve awareness of a virtuous cycle of resources, and ecological conservation activities.

**Women and children**

Support customized programs for low-income, multicultural women and children.

**Local community**

Support the underprivileged in the region and improve residential environment such as firefighting and safety.

# ESG Governance structure

## Compliance Support System

In 2021, the Board of Directors established compliance control standards, appointed a compliance officer, and introduced a compliance support system.

In addition, we have established a Compliance Team to practice compliance management through regular compliance advice and periodic inspections and regularly report compliance support-related matters and review results to the Board of Directors.

<b>Establishment and operation of dedicated teams</b> <ul style="list-style-type: none"> <li>Establishment and operation of a Legal Team and a Compliance Team directly under the CEO</li> </ul>	<b>Reorganization of internal regulations</b> <ul style="list-style-type: none"> <li>Announcement of establishment of compliance control standards</li> <li>Establishment of various regulations in the field of anti-corruption and fair trade</li> </ul>	<b>Periodic training and ongoing consultation</b> <ul style="list-style-type: none"> <li>Online and offline training</li> <li>Regular consultation through the compliance management system</li> </ul>
<b>Audit and prevention of recurrence</b> <ul style="list-style-type: none"> <li>Investigation of violations and punishment of those involved in violations</li> <li>Reporting system that guarantees anonymity</li> </ul>	<b>Internal accounting control</b> <ul style="list-style-type: none"> <li>Operation of an effective internal accounting management system</li> </ul>	<b>Internal reporting, monitoring and risk detection</b> <ul style="list-style-type: none"> <li>Operation of an internal reporting channel</li> <li>Risk detection, explanation, and processing through a computerized monitoring system</li> </ul>

## Mutual Growth

We are striving to enhance the sustainable management of our partners to a global level by actively and comprehensively adhering to social responsibilities in areas such as labor, environment, human rights, safety, and ethics. LOTTE Energy Materials pursues sustainable mutual growth with our partners through the implementation of a supply chain management system that meets global ESG standards.







# High-End Elecfoil Global No.1



## Address

Seoul Office : 17F, Gangnam Building, 396, Seocho-daero, Seocho-gu, Seoul  
Uiwang Research Center : 4F, 50, Obongsandan 3-ro, Uiwang-si, Gyeonggi-do  
Iksan Plant 1 : 63-25, Seokam-ro 3-gil, Iksan-si, Jeonbuk-do  
Iksan Plant 2 : 11, Sandangupyeong-gil, Iksan-si, Jeonbuk-do

## Representative MAIL

lem\_pr@lotte.net

## Web Site

[www.lotteenergymaterials.com](http://www.lotteenergymaterials.com)



