Global advanced materials company

LG Chem
Contents

Introduction of LG Chem

- Introduction of LG Group
- Introduction of LG Chem
- Business of LG Chem
Introduction of LG Chem

History

1947
Established as Lucky Chemical Industrial Co. (now LG Chem)

1958
Established as Goldstar Co. (now LG Electronics)

1987
Completed ‘Lucky Gold Star Tower’

1995
Established as a New Corporate Identity (Lucky Goldstar → LG)

1996
Established as LG Telecom (now LG U+) 

2003
Established as LG Corp.

2017
LG Group’s 70th Anniversary
Introduction of LG Chem

LG Group

Subsidiary

Chemicals

LG Chem
LG Hausys
LG Household & Healthcare
Farm Hannong
etc.

Electronics

LG Electronics
LG Display
LG Innotek
etc.

Telecommunications & services

LG U+
LG CNS
LG International
LG Sports
e tc.

* Figures represent the number of affiliates
* Total of 70 including LG Corp.
* As of 2019

24

14

32
Total of 70

250,000 (person)

USD 137.2 Billion
LG Way

No. 1 LG

Vision

Behavioral Mode

Management Principles

Customer – Value Creation

People – Oriented Management

Jeong-Do Management
To Be a Global Leader
Growing with customers by providing innovative materials and solutions

- Customer Value Creation
- Strong Implementation
- Mutual Respect
LG Chem | Sustainability

LG Chem’s Innovative Sustainability

Vision

Deliver advanced, innovative and sustainable solutions for our environment and society

Strategy items

Leading Sustainable Innovation for Customer
- Responsible Products
- Circular Economy
- Environment Protection

Managing the Impacts of Climate Change
- Climate Change
- Renewable Energy
- Water Management

Making a Positive Contribution to Society
- Responsible Supply Chain
- Human Rights / Diversity
- Safety / Wellness

5 Core tasks
2019: The First Korean Chemical Company To Enter GLOBAL TOP 10

* By Chemical & Engineering News Published by ACS(American Chemical Society)
Brand value of chemical Companies “Global No. 4”

* By Brand Finance Group in the UK

<table>
<thead>
<tr>
<th>Rank</th>
<th>Brand</th>
<th>Change</th>
<th>2020 Value</th>
<th>2019 Value</th>
<th>Change %</th>
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<tr>
<td>1</td>
<td>BASF</td>
<td></td>
<td>$7,878m</td>
<td>$8,253m</td>
<td>-4.5%</td>
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<tr>
<td>2</td>
<td>Dow</td>
<td></td>
<td>$4,843m</td>
<td>$6,819m</td>
<td>-29.0%</td>
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<tr>
<td>3</td>
<td>سيبارك</td>
<td></td>
<td>$4,334m</td>
<td>$3,964m</td>
<td>+9.3%</td>
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<tr>
<td>4</td>
<td>LG Chem</td>
<td></td>
<td>$3,500m</td>
<td>$3,338m</td>
<td>+4.9%</td>
</tr>
<tr>
<td>5</td>
<td>Linde</td>
<td>NEW</td>
<td>$2,861m</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>LyondellBasell</td>
<td></td>
<td>$2,637m</td>
<td>$3,073m</td>
<td>-14.2%</td>
</tr>
<tr>
<td>7</td>
<td>Asahi Kasei</td>
<td>▲ 3</td>
<td>$2,368m</td>
<td>$2,246m</td>
<td>+5.4%</td>
</tr>
<tr>
<td>8</td>
<td>Mitsubishi Chemical</td>
<td></td>
<td>$2,287m</td>
<td>$2,535m</td>
<td>-9.8%</td>
</tr>
<tr>
<td>9</td>
<td>Dupont</td>
<td>▼ 4</td>
<td>$2,200m</td>
<td>$3,261m</td>
<td>-32.5%</td>
</tr>
<tr>
<td>10</td>
<td>Air Liquide</td>
<td>▼ 3</td>
<td>$1,982m</td>
<td>$2,594m</td>
<td>-23.6%</td>
</tr>
</tbody>
</table>
Introduction of LG Chem

LG Chem | History

1947 Established as Lucky Chemical Industrial Corporation
1969 Listed on Korea Stock Exchange
1974 Renamed company to Lucky Corporation
1976 Completed the Yeosu PVC Resin Plant
1979 Opened the Daedeok Central R&D Center

1980’s Earlier

1995 Renamed to LG Chem, Ltd.
Completed construction of Tianjin PVC Plant in China
1998 Completed construction Cheongju plant for rechargeable batteries

1990’s

2001 Spun-off the company (LGCI, LG Chem, LG Household & Healthcare)
2003 Acquired Hyundai Petrochemicals
2004 Completed construction of Ochang Techno Park
Established LG Chem (China) Investment Co., Ltd
2005 Established a polarizer back-end subsidiary in Poland
2007 Merged with LG Petrochemicals Co., Ltd
2009 Spun-off Industrial Materials Business (LG Hausys)

2000’s

2010 Started construction of automotive battery plant in Michigan, USA
2015 Established LG Chem Nanjing New Energy Solution Co., Ltd. In China
2016 Acquired Dongbu Farm Hannong (Farm Hannong)
2017 Merged with LG Life Sciences Co., Ltd
Established LG Chem Wroclaw Energy Sp. z o.o. in Poland
2019 Launched Osan Tech Center in China

2010’s
Introduction of LG Chem

LG Chem | Financial Results

Sales in 2019
USD 24.5 Billion

Operating profit in 2019
USD 0.8 Billion
LG Chem | R&D Status

R&D Expense
Unit: Million USD

- 2014: 437
- 2015: 506
- 2016: 643
- 2017: 772
- 2018: 892
- 2019: 969

R&D Workforce
Unit: Person

- 2014: 3,100
- 2015: 3,400
- 2016: 4,400
- 2017: 4,800
- 2018: 5,300
- 2019: 5,700
LG Chem | Domestic Sites

- **Headquarter/R&D Campus Magok**
  - Est. 1987/Est. 2018

- **R&D Campus Gwacheon**
  - Est. 2015

- **Leadership Center / Tech Center**
  - Est. 1991/Est. 2019

- **R&D Campus Daejeon**
  - Est. 1979

- **Osong Plant**
  - Est. 2009
  - Bio Similar, Vaccine

- **Iklsan Plant (3)**
  - EP, ABS / Pharmaceutical / Battery Materials

- **Naju Plant**
  - Est. 1984
  - Octanol, Butanol, Plasticizers

- **Yeosu Complex**
  - Est. 1976
  - NCC, PVC, ABS, SAP, PE, AA

- **Paju Plant**
  - Est. 2011
  - LCD Glass

- **Daesan Complex**
  - Est. 2005
  - NCC, SSBR, PVC

- **Ochang Plant**
  - Est. 2005
  - Rechargeable Batteries, Polarizer, Stripper

- **Cheongju Complex**
  - Est. 1980
  - OLED Material, Photoresist, Cathode Material, RO membrane

- **Gimcheon Plant**
  - Est. 2008
  - SAP

- **Ulsan Plant**
  - Est. 1974
  - Plasticizers

- **Onsan**
  - Est. 1979
  - Fine Chemical
Introduction of LG Chem

LG Chem | Overseas Sites

- Manufacturing Subsidiaries (24)
  - Beijing
  - Tianjin (3)
  - Ningbo
  - Quzhou
  - Guangzhou (2)
  - Nanjing (3)
  - Chongqing
  - WuXi (2)
  - Huizhou
  - Shenzhen
  - ShangHai
  - XiAn
  - Tokyo

- Sales Subsidiaries (13)
  - Delhi
  - Ho Chi Minh
  - Haiphong (2)
  - Bangkok
  - Jakarta
  - Kuala Lumpur

- Regional Branch Offices (5)
  - Atlanta
  - Torrance
  - Troy
  - Holland
  - Evansville

- R&D Center (1)
  - Munich

Asia
- Beijing (Est: 2004) • Polizer
- Tianjin (Est: 2004) • EP
- Guangzhou (Est: 2002) • EP
- Nanjing (Est: 2003) • Mobile Battery, Polizer
- Huizhou (Est: 2003) • ABS
- Wuxi (Est: 2017) • ESS Battery Pack
- Shenzhen (Est: 2014) • Automotive Battery
- Quzhou (Est: 2018) • Precursor
- Taipei (Est: 2004) • Polizer
- Jakarta
- Kuala Lumpur

Australia
- Sydney
- Melbourne
- Adelaide

America
- Atlanta
- Torrance
- Troy
- Holland (Est: 2000) • Automotive Battery
- Evansville (Est: 2018) • Sealing
- Sao Paulo
- Mexico City

Europe
- Wroclaw (Est: 2005) • EP
- Moscow
- Frankfurt
- Istanbul
Introduction of LG Chem

LG Chem | Business Area

- **Petrochemicals**
  - NCC
  - PolyOlefins
  - PVC/Plasticizers
  - ABS
  - Acrylates/SAP
  - Rubber/Special Polymers

- **Energy Solution**
  - IT&New Application Battery
  - Automotive Battery
  - ESS Battery

- **Advanced Materials**
  - Automotive Material
  - IT Materials
  - Industrial Materials

- **Life Sciences**
  - Primary Care
  - Specialty Care
  - Aesthetic
Petrochemicals Company
Petrochemicals Company

Establishment (Year)
1976

Sales ($)
13.3 Billion * As of 2019

Workforce (Person)
Domestic 5,484 / Overseas 2,271

Business Area
Petrochemical Products

2019
Launched Osan Tech Center

2015
Launched Hwanam Tech Center in Nanjig, China

2010
Acquired Dow Polycarbonate business
Established Manufacturing Subsidiary in China
(Rubber / Special Polymers)

2007
Merged with LG Petrochemicals Co., Ltd.

2003
Acquired PVC Business of Hyundai Petrochemicals Co., Ltd.

1995 ~ 1998
Established Manufacturing Subsidiary in
China / India / Vietnam (PVC, ABS)

1976
Completed Yeocheon PVC resin factory
Entry into the petrochemical business
# Production Capacity (As of 2019)

<table>
<thead>
<tr>
<th>Product</th>
<th>Capacity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ethylene</td>
<td>2,400</td>
</tr>
<tr>
<td>Propylene</td>
<td>1,430</td>
</tr>
<tr>
<td>LDPE/EVA</td>
<td>465</td>
</tr>
<tr>
<td>POE</td>
<td>300</td>
</tr>
<tr>
<td>PP</td>
<td>385</td>
</tr>
<tr>
<td>PVC</td>
<td>1,245</td>
</tr>
<tr>
<td>VCM</td>
<td>1,390</td>
</tr>
<tr>
<td>CA/EDC</td>
<td>997</td>
</tr>
<tr>
<td>Plasticizer</td>
<td>380</td>
</tr>
<tr>
<td>BPA</td>
<td>495</td>
</tr>
<tr>
<td>HDPE</td>
<td>550</td>
</tr>
<tr>
<td>Oxo-Alcohol</td>
<td>299</td>
</tr>
<tr>
<td>Acrylic Acid</td>
<td>631</td>
</tr>
<tr>
<td>SAP</td>
<td>480</td>
</tr>
<tr>
<td>ABS</td>
<td>2,040</td>
</tr>
<tr>
<td>PS</td>
<td>142</td>
</tr>
<tr>
<td>EPS</td>
<td>136</td>
</tr>
<tr>
<td>Specialty Resin</td>
<td>508</td>
</tr>
<tr>
<td>Synthetic Rubber</td>
<td>515</td>
</tr>
</tbody>
</table>
Naphtha Cracking Center (NCC)

LG Chem’s naphtha cracking center (NCC) processes produce basic materials for the petrochemical industry, including ethylene and propylene. The raw materials produced from the BPA processes are used in polycarbonate (PC) resins and epoxy materials.

<table>
<thead>
<tr>
<th>BPA</th>
<th>Applications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ethylene/Propylene</td>
<td>Poly Carbonate</td>
</tr>
<tr>
<td>BD</td>
<td>Epoxy Resin</td>
</tr>
<tr>
<td>BTX</td>
<td></td>
</tr>
<tr>
<td>MTBE/Butene-1</td>
<td></td>
</tr>
<tr>
<td>SM</td>
<td></td>
</tr>
<tr>
<td>EO/EG</td>
<td></td>
</tr>
</tbody>
</table>
Polyolefins (PO)

LG Chem’s polyolefin (PO) processes produce synthetic resins, such as polyethylene (PE) and polypropylene (PP), used in containers and packaging materials, which are recognized in the global market for their outstanding quality.

Applications

- Medical Appliances
- Korean Floor Heating System
- Packing Materials
- Cable Insulator
- Solar Film
- Interior & Exterior Decoration of a Car
PVC / Plasticizers

LG Chem’s polyvinyl chloride (PVC) processes produce synthetic resins used for chassis and pipes, while plasticizers produce raw materials that add flexibility to the PVC. LG Chem’s CNT processes produce Carbon Nanotubes which have superior electrical, thermal, and mechanical properties.

Applications

- Sash
- Flooring
- Pipe
- Artificial Leather
- Cable Sheath
- Cathode Material
Acrylonitrile Butadiene Styrene (ABS)

LG Chem’s acrylonitrile butadiene styrene (ABS) processes produce high-performance materials, used in automobiles, home appliances, and IT devices, that have excellent heat resistance, impact resistance, and processability.

Applications

- Interior & Exterior Decoration of a Car
- Toy
- Home Application Housing
- Kitchen Container
- Products Container
- Building Insulation Material
Acrylates / SAP

LG Chem’s acrylate processes produce raw materials used for paint, adhesives, and SAP. SAP effectively absorbs fluids in diapers and items for sanitary purposes.

Applications

- Plasticizer/ SAP Resin
- Diapers
- Adhesives
- Cleaning agent for Semiconductors
- Paint
- Acrylic Fibers
Rubber / Special Polymers

LG Chem’s synthetic rubber processes produce raw materials used in tires and golf balls, and the specialty polymer processes produce special adhesives that are versatile.

Applications

- Tire
- Golf Ball
- Shoe Insole
- Impact Reinforcing Agent
- Asphalt Modifying Agent
- Medical Gloves
Energy Solution Company
Energy Solution Company

Establishment (Year)
1995

Sales ($)
7.2 Billion *As of 2019

Workforce (Person)
Domestic 6,571 / Overseas 13,753

Business Area
IT & New Application/
Advanced Automotive/ESS Battery

2018
Developed the world’s first L-shaped battery

2016
Supplied lithium-ion batteries for NASA spacesuits

2015
Signed an agreement with AES to supply first-ever
1GWh ESS battery

2013
Developed the world’s first hexagonal pouch battery
for smart watches

2010
Supplied the world’s first lithium-ion batteries for PHEV

2009
Supplied the world’s first lithium-ion batteries for HEV

1995
Started the development of lithium-ion batteries
LG Chem’s IT & New Application Battery Division was the first to mass-produce Lithium-ion Batteries domestically, and is now leading the global market through superior technology and productivity.
LG Chem produces world-renowned EV batteries, and has a product portfolio that encompasses all products related to car batteries from cells to modules, BMS, packs, and technical support.

**Automotive Solution**

| Cell | Battery Management System (BMS) | Module / Pack / Rack |

**Major Customers**

01 Petrochemicals Company
02 Energy Solution Company
03 Advanced Materials Company
04 Life Sciences Company
ESS Battery

With superior lithium ion battery technology and global production capacity, LG Chem supplies battery systems for ESS batteries in many different fields including electrical grid, household, commercial, and UPS (uninterruptible power supply).

ESS Battery Solution

| Cell | Battery Management System (BMS) | Module / Pack / Rack | Container |

Major Customers

01 Petrochemicals Company
02 Energy Solution Company
03 Advanced Materials Company
04 Life Sciences Company
Advanced Materials Company
Advanced Materials Company

Establishment (Year)
2019

Sales ($)
4.2 Billion * As of 2019

Workforce (Person)
Domestic 3,924 / Overseas 2,934

Business Area
Automotive Materials / IT Materials / Industrial Materials

2019
Launched the Advanced Materials Company

2018
Established Chinese joint venture for manufacturing Precursor and cathode material

2016
Acquired GS E&M, a renowned cathode manufacturer

2006
Commercialized Battery Materials (Cathode, Electrolyte)

2003
Established IT&E Manufacturing Subsidiary in Nanjing, China

2000 - 2004
Commercialized LCD, OLED, Process materials

2000
Developed PDP phosphor for the first time in Korea and started production of polarizers
Automotive Materials

LG Chem is striving to provide the number one product in the automotive industry through stronger and lighter materials.

Applications

Exterior & Interior Decoration of a Car/Engine Parts

Major Customers

GM
HYUNDAI
Volkswagen
CHRYSLER
Mercedes-Benz
FORD
LG Chem produces unique solutions for IT devices with products such as OLED materials, display materials, and various high-functional films and semiconductors.

**Applications**

- OLED Display Materials
- Semiconductor Materials
- Rollable TV

**Major Customers**

- LG Display
- BOE
- Innolux
- AUO
- Samsung
- Samsung Display
- CSGT
LG Chem produces one of the key materials for secondary batteries, namely the material for positive electrodes, and concentrates on the development of high-capacity cathode material for mobile battery, electric vehicle, and energy storage battery markets as well.
04
Life Sciences Company
Life Sciences Company

Establishment (Year)
1984

Sales ($)
0.5 Billion * As of 2019

Workforce (Person)
Domestic 1,665 / Overseas 136

Business Area
Pharmaceuticals, Vaccines, Aesthetic

2019
Established Life Sciences Innovation Center in Boston, USA

2012
Developed 1st Korean diabetes medicine, ‘Zemiglo’

2003
1st Korean NCE approved by US FDA (Factive)

1996
1st Korean hepatitis B vaccine ‘Euvox’ approved by WHO PQ

1991
Developed World’s first 4th generation Cephalosporin

1984
Start of pharmaceutical business
(Established Pharmaceuticals business division)

1961
Acquire of manufacturing license pharmaceuticals products
LG Chem has developed Korea’s first diabetes medicine, Zemiglo, and arthritis medicine, Synovian, increasing its competitiveness in Korea as well as overseas, and has expanded its efforts to develop new drugs and to cooperate with other companies through partnership in the fields of diabetes and cardiovascular, musculoskeletal, and autoimmune diseases.
Specialty Drug

LG Chem is the first company in Korea that has successfully developed a drug for growth hormones and is also concentrating on the R&D of drugs for special diseases. Throughout the hepatitis B and pentavalent combination (5-in-1) vaccine that has been approved by the World Health Organization (WHO), LG Chem has been strengthening competitiveness in the global market.
Aesthetic

YVOIRE, the first hyaluronic acid filler developed by LG Chem with authentic in-house technology in Korea, is expanding its market shares with the recognition of superior product quality.

Representative Products

- **Hyaluronic Filler (Y-SOLUTION)**
- **Hyaluronic Filler (YVOIRE)**
- **Hyaluronic Filler (伊婉 in China)**
Farm Hannong, LG Chem's affiliate company, is the top domestic agricultural company holding the first place in the agricultural chemicals and the second place in the fertilizer & seed in market shares, and aims to be the leading green company in the international market through agriculture and ICT industry technologies.
Thank you