CYLINDRICAL BATTERY WORLD LEADER

# Kumyang

CYLINDRICAL BATTERY
Kumyang

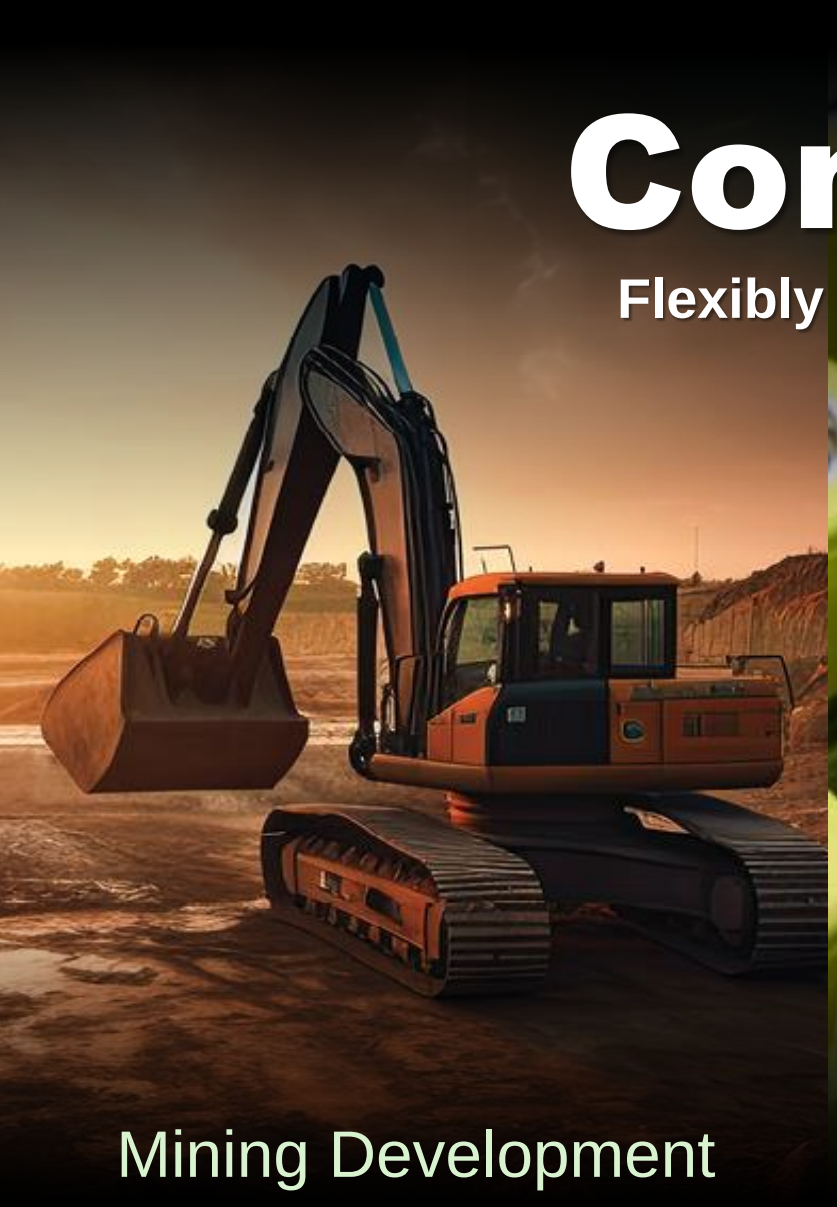
South Korea's first domestic blowing agents
Leading the global blowing agents market with the largest share
The world's first eco-friendly blowing agents production company

Accumulating extensive expertise and cutting-edge technology
in the field of fine chemicals since 1955,

**We have expanded into resource development, battery materials, and secondary battery business**

# Competitiveness

**Flexibly responding to change through innovation and meeting challenges**



## Mining Development Resource Acquisition

Securement of lithium mines
for stable supply of raw materials

## Notable Technical Achievements

Capable of production of high-nickel(97%) and
single-crystal cathode materials at the world's highest level

## Automated Mass Production via Production Line

Completion of a large-scale production line
capable of producing 300 million cells annually by 2024

# KY 2030 VISION

**Leaping to become a global company that leads
the world's equitable development and growth through change and challenge**

## Mineral-resource development supply-chain construction

Active development in the field of rare minerals through private resource development cooperation with government agencies in Mongolia and the DR Congo


## Top-5 battery company and global enterprise

Growing into a global company with unique technology, being a strategic partner to world-renowned car manufacturers

## Competitive advantage Value chain construction

Securing a competitive edge through the development of innovative technology and changes in the value chain

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# CYLINDRICAL BATTERY
# WORLD LEADER

## 01 Company Overview

- Major Milestones
- Factory Status
- Overseas Subsidiaries

## 02 Current Businesses

- Blowing Agents
- Eco-Friendly Blowing Agents

## 03 Emerging Businesses

- Resource Development
- Refining
- Battery Materials
- Secondary Battery Manufacturing
- Battery Recycling
- Hydrogen Fuel Cells

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# Company Overview

# 01 Company Overview / Major Milestones

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## 1950s Startup Phase

1955 Establishment of Geumbuk Chemical Industries Co., Ltd.
First domestic production of saccharin
1971 Production of blowing agents
1974 Completion of the blowing agents factory in Busan (Sasang District)
1976 IPO (Listed on the Korea Stock Exchange)
1978 Rebrands the company as Kumyang
Busan Excellent Export Award

## 1980s Growth Phase

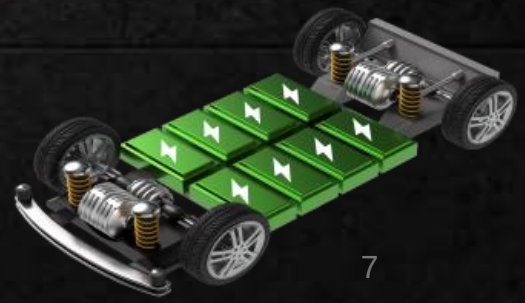
1985 Establishment of Kumyang Research Institute
1987 $10 Million Export Tower Award

## 2010s Leap Phase

2002 Model Taxpayer Award
2012 Selected for Trade Champs Club by Korea Trade Insurance Corporation
2014 Busan Small and Medium Business Award
2015 Order of Industrial Service Merit (Honest Tax Payment)
2016 Selected as World Class 300
MOU signed with
Qinghai Salt Lake Industry Co., Ltd.
2019 Blowing agents designated as a World-Class Product and Kumyang honored as a manufacturer

## 2020s~ New Growth Phase

2020 Establishment of Kumyang Innovation (Hydrogen Fuel Cell Business)
2020 KY ECO (Eco-friendly Product Sales) established
2023 New headquarters completed
2023 Groundbreaking of Gijang battery factory
2024 Secondary battery R&D center completed
Expected completion of Gijang factory (December)



Establishment of a global network through overseas production plants and subsidiaries (1998-2019)
(Overseas subsidiaries: 6 in China, 1 in Germany, 1 in the USA, 1 in Pakistan)

- Acquisition of a stake in a DR Congo mine
- Acquisition of a stake in a Mongolian mine

# Challenging and innovating as a global cylindrical battery company


## Pioneering 70 years of meeting challenges through the development of eco-friendly materials

- A global leader in the field of advanced materials since its establishment in 1955
- Transitioned to a blowing agents production plant in 1974 and went public in 1976
- Since grown into a strong small business representing Busan, won the Busan Small and Medium Business Award in 2014
- Building a secondary battery R&D center in 2024 to realize the value of coexistence with the local community
- Transitioning to future new businesses through change and innovation to grow into a global company

## Growing into a leading small-and-medium-sized enterprise (SME) focused on advanced materials through dedicated research and development

- Decades of accumulated core technology in raw material extraction and fusion research with future advanced materials
- Securing stable lithium raw materials through mineral resource development and acquiring secondary battery-related technologies
- Signed an MOU with China’s Qinghai Salt Lake in 2016 to ensure the acquisition of lithium
- Invested in the DR Congo's Lukoshi mine in 2022 and Mongolia's Monlaa mine in 2023
- Completing vertical integration from raw material mining, refining, cathode material processing, to secondary battery manufacturing

# Creating a sustainable future with dreams of global coexistence and prosperity

## Equipping South Korea, a powerhouse of energy, with the engine of growth

- Accumulating raw materials and technologies to grow as a global leader in the advanced materials field
- Laying the foundation for sustainable growth and constructing a value chain for mass battery production systems
- Established Kumyang Innovation in 2020 for the eco-friendly hydrogen fuel cell business
- Producing materials in partnership with SMLAB, a company specializing in the world's highest quality single crystal cathode materials

## Kumyang, rising to the top of the battery world

- Realizing the powerful challenge and dream towards becoming the leading global cylindrical battery company
- Completed the Energy Technology Quantum Center in 2023 as a forward base for continuous research and development
- Invested approximately 1.2 trillion won in building a cylindrical battery factory covering 182,960㎡ in Gijang
- Starting full-scale production of batteries at a scale of 300 million cells (16.2G) from 2025

Kumyang’s incredible journey from being an SME to a rapidly growing global company

# 01 Company Overview / Status / Factory & Corporate

CYLINDRICAL BATTERY Kumyang

CEO: KWANG-JY RYU
Established: November 17, 1955
Capital: 29 billion won
Sales: 2,131 billion won
Market Cap: 7 trillion won (as of Jan. 2024)

01 Head Office Building

## Domestic Factories

01 SASANG

02 JISA

03 BONGRIM

## Overseas Factories

01 KUMYANG NEIMENGGU

02 HANKUM NEIMENGGU

03 KUMYANG NEW MATERIAL (LIANYUNGANG)

## Overseas Subsidiaries

USA / KUMYANG USA Inc.  GERMANY / KUMYANG EUROPE GmbH
PAKISTAN / KUMYANG PAKISTAN LIGHT INDUSTRY (PVT.) LTD.
MONGOLIA / MONLAA LLC  DR Congo / CHARLIZE RESSOURCES SAS

# Research and Production Facility-1

## Energy Technology Quantum Center

· Purpose: Construction of Energy Technology Quantum Center for development of secondary batteries and hydrogen fuel cells
· Area: Total floor area of 13,194 $m^2$
(2 basement floors, 10 above ground floors)
· Completion: 2023

# Research and Production Facility-2


## Secondary Battery R&D Center

· Purpose: R&D Center for securing base technology for 46 Series cylindrical secondary batteries

· Area: Land area – 2,831 $m^2$, Total floor area – 3,695 $m^2$

· Completion: January 2024

# Secondary Battery Gijang Factory

· Purpose: Production plant for mass production of 21,700 and 46 series cylindrical secondary batteries
· Area: Land area - 180,296 $m^2$ , Total floor area - 124,497 $m^2$
· Completion: Expected by the end of 2024

## Research and Production Facility-3


# Single Crystal Cathode Material Factory
(Affiliate)

**Leading the eco-friendly battery market with the world's finest quality single-crystal cathode materials**

**Producing one of the four core materials of the secondary battery, ultra high-nickel / lithium & manganese-rich cathode materials, etc., through the single crystal dry process**

## Research and Production Facility-4

# Current Businesses

01 Blowing Agents
02 Eco-Friendly Blowing Agents

Achieving domestic localization of blowing agents through differentiated material technology

**Leading the global blowing agents market with the biggest share**
**An innovative eco-friendly global corporation**


· **Applications**
Automotive (Weather Strip), Shoe Midsoles, Mats,
Wallpaper, Windows, Construction Interior Materials, etc.

· Sales of associated products
including EVA, PVC, TiO2, etc.

The world's first eco-friendly blowing agents developed in 2020, free from harmful substances such as formamide and ammonia

**Product Specification**

| Classification | Eco-friendly Blowing agents | Blowing agents (ADCA) |
|---|---|---|
| Formamide | Free | Detected |
| Ammonia | Free | Detected |

**Applications**

| | |
|---|---|
| Mats (E-Beam Foam) | Puzzle mat EVA ZERO, Yoga mat SANTOSHA Neoprene |
| Flooring, Wallpaper | Development of noise-reducing flooring completed, application to construction material companies planned |
| Shoes (Sole) | Certification by Nike and application to global sports companies planned |
| Automobiles | Pursuing certification from global manufacturers |

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# Emerging Businesses

01 Resource Development & Refining
02 Battery Materials
03 Secondary Batteries
04 Battery Recycling
05 Hydrogen Fuel Cells

*At the heart of eco-friendly energy*
*Kumyang's secondary battery business*

# Battery Blue Ocean

*Expansion of opportunities due to soaring demand for secondary batteries driven by global environmental changes*

1. Replacement of fossil fuels

2. Internal combustion engines


3. The Battery of Things


4. European environmental policies

# K VALUE CHAIN

From mine development, raw material acquisition and material production to battery manufacturing building a stable and efficient value chain for the continuous growth and mass production of secondary batteries, alongside relentless research and development

## Mineral Resource Development

- Investment in the DR Congo's Lukoshi mine (60% stake)
- Investment in Mongolia's Monlaa mine (60% stake)

## World-class material production

- Mass production of ultra high-nickel (97%)
- LMR cathode materials through a dry process

## Battery Manufacturing

- Development of cylindrical battery technology
- Constructing a mass production of annual 300 million cells

01 02 03 04 05

## Stable procurement of raw materials

- World-leading blowing agents technology for raw material extraction owned by Kumyang
- Refining and processing of key secondary battery materials such as lithium

## Continuous research and development

- Operation of a secondary battery R&D center
- Creating a foundation for sustainable growth through R&D

## K-VALUE CHAIN 1

# Global Resource Development / Refining

- Maximizing efficiency through cooperation with South Korea's advanced resource development agencies
- Completing a value chain with stable supply of raw materials, material processing, and battery mass production
- Securing concrete supply chains with global business networks via global market exploration over 50 years


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**The initiation of critical minerals development in Mongolia has been made possible via Kumyang's proactive efforts and South Korea's advanced mineral development technology.**

Ensuring a stable and secure supply of minerals for secondary battery to drive the future of the field of 4$^{th}$ industry

# Monlaa Mine Overview in Mongolia

Location : Mongolia / Dornogovi Province / Khatanboulag City (MV013875 & MA021485)
Area : 44,040 $m^2$
Partner : Monlaa LLC (CEO: KHISHIGJARGAL ENKHSAIKHAN)
Minerals : Lithium, Tungsten, Iron, Zinc, etc.
Ownership : Kumyang (60) : Monlaa (40) ▶ USD 60,000,000 investment
Progress : Equipment overhaul and mining of approved mines such as tungsten
Lithium / Feasibility Study followed by mining permit acquisition and mining commencement planned


▲ Location map of Monlaa mine in Mongolia


## Monlaa Mine Development Company in Mongolia Securing a 60% stake

Securing stable resources by acquiring a 60% stake in Monlaa, which owns the development rights to the Elstei mine in Mongolia, for $60 million

▲ Layout of Monlaa mine facilities in Mongolia

## Exterior Site of Monlaa Mine in Mongolia

## Interior Site of Monlaa Mine in Mongolia

The essence of the battery industry lies in key minerals and advanced technological capabilities

# Securing stable materials through independent mine development

Pioneering the future with the aggressive spirit of Genghis Khan

- Developing mineral deposits and infrastructure and owning shares in corporations to push mining development projects with integrated strategy and management
- Enhancing the value of invested mines and increasing profitability through operational efficiency
- Discovering viable mines and attracting domestic and international investors for capital procurement to realize sustainable resource development projects



EAGLE News Report Scene in Mongolia

## Signing a memorandum of understanding with Mongolia's state-owned enterprise Erdenes Mongol LLC

On January 16, 2024, in Ulaanbaatar, Mongolia, an important Memorandum of Understanding (MOU) was signed with NARANTSOGT SANJAA, CEO of Erdenes Mongol LLC, the largest state-owned enterprise in Mongolia specializing in minerals and energy. This MOU establishes a foundation for development and cooperation in the mining and mineral sectors between Mongolia and South Korea.

The agreement aims to support collaborative mining initiatives and explore joint projects in critical minerals with the ultimate goal of advancing to contracts for future collaborative projects. It focuses on conducting joint research on essential minerals and enhancing human resources through educational seminars and workshops. This collaborative effort aims to execute joint projects, thereby fostering cooperation in mining and mineral development between the two nations.

Private meeting with President Ukhnaagiin Khurelsukh (Date: January 17, 2024, Location: Mongolian Presidential Office)

Combining South Korea's advanced mining development technology and
Mongolia's abundant resources, Kumyang ventures into private resource development

## *The fusion of South Korea's advanced mining technology and resources*

Leveraging the strengths and developmental potential of Korea and Mongolia to deepen a mutually complementary and beneficial economic relationship, continuously exploring various cooperative projects such as mine development, power plants, educational facilities, cultural and sports facilities, Korea town development, and establishment of training institutions for a related industry workforce, supporting Mongolia's growth and development, and aiding in the realization of Mongolia's long-term national development policy: Vision 2050.

# Lukoshi Mine Overview in DR Congo

Location : DR Congo / Tanganyika Province / Manono City (PR15324 & PR15325)
Area : 65,000 $m^2$
Partner : Charlize Ressources SAS (Representative: MOBULI MAPEMBA FRANK)
Minerals : Lithium, Tantalum, Cobalt, Tin, etc.
Ownership : Kumyang (60) : CRS (40) ▶ Total investment of USD 19,000,000 in three phases
Progress : Phase 1/ Pitting - Camp setup, exploration at specific points
Phase 2/ Deep exploration
- Exploring and analyzing a total of 20k meters at depths of 2~300 meters each
Phase 3/ Comprehensive exploration, profitability analysis
- Conducting Feasibility Study, estimating reserves, report writing, and applying for development permits, etc.

After Phase 3: Starting mineral sales through factory establishment and production operation (Estimated period: 12 months)

# Democratic Republic of the Congo


▲ Location map of Lukoshi mine in DR Congo

**Lukoshi Mine Development Company in DR Congo Securing a 50% stake**

(plan to increase to over 60%)

▲ Layout of Lukoshi mine facilities in DR Congo

## Site of Lukoshi Mine in DR Congo


## Site of Lukoshi Mine in DR Congo



## K-VALUE CHAIN 2

# Cathode Material Production

- Single-crystal cathode materials are one of the four core materials of batteries and significantly impact battery performance
- Acquiring 22.3% of SMLAB shares, which possesses world-class source technology for synthesizing single crystal cathode materials, and established a collaboration system as the largest shareholder
- SMLAB develops single crystal cathode materials to improve various problems of existing polycrystalline cathode materials

## Business Area

- Business in single-crystal ultra high-nickel 97% cathode material
- Business in additives for cathode material

## Secondary Battery Additives

- Installing production lines of additives for NCMA cathode material
- Official contract completion with LG Chem for supply
  (In supplying LG Chem Cheongju and Wuxi (China) plant)

## Lithium Hydroxide / Lithium Carbonate Business

- Collaborating with domestic cathode material companies
  on lithium hydroxide and anhydrous lithium hydroxide
- Promoting business for processing and supply
- Crushing processing 2 lines
  (each with 5,000 tons production capacity per year)
- Anhydrous lithium hydroxide processing single line
  (2,000 tons production capacity per year)


# Leading the eco-friendly battery with innovative research and technology, mass-producing single crystal cathode materials

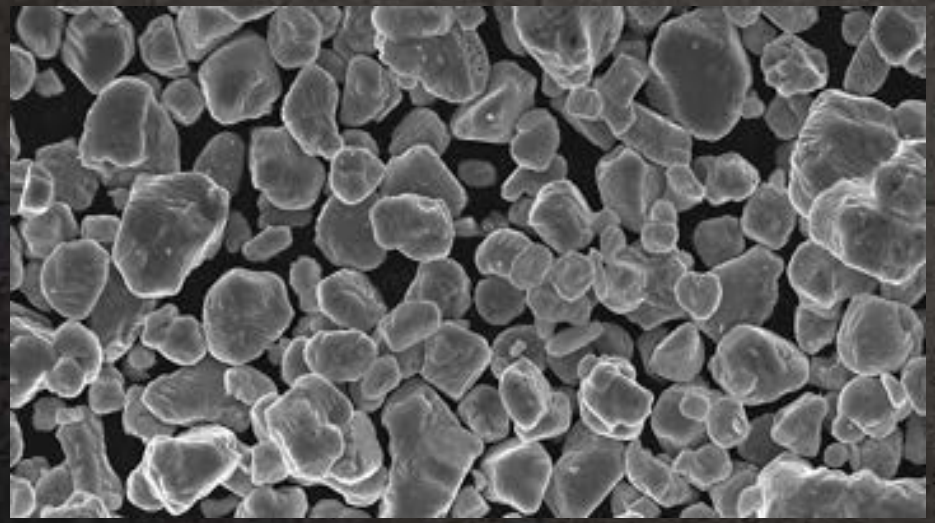
Cathode material, which constitutes more than 40% of a secondary battery's components, is a critical material for determining the battery's capacity and average voltage.

Strategic partnership with SMLAB, an Innovation company possessing top-tier technology with

# Revolutionary cathode material technology with unparalleled competitive advantage

The only global production of ultra high-nickel (Ni: 97%) cathode materials through a dry process.

Innovative technology enables the implementation of single crystal cathodes in all cathode materials, incl. NCM, NCA, NCMA, LMR, etc.



**High-capacity cathode materials are used in batteries required high performance (maximizing driving distance and operational time) applications such as electric vehicles, smart mobilities, and power tools**

Expanding production capacity from 10,000 tons per year (Current in Factory 1 and 2) to 42,000 tons per year by 2026, following the construction of Factory 3 in 2024
Starting the production and supply of single-crystal cathode materials in 2023 through a strategic partnership with Kumyang
Ensuring a stable procurement of raw materials such as lithium and additives from Kumyang's secondary battery materials division, thereby strengthening the supply chain
Planning to solidify the secondary battery value chain in the Busan-Ulsan-Gyeongnam region by supplying high-quality, cost-competitive single-crystal cathode materials that meet the high-quality standards of Kumyang's 21700 and 4695 cells

# Driving Innovative Changes and Growth in the Secondary Battery Business

Aiming to capture 30% of the global single-crystal cathode materials market
with single crystal ultra high-nickel for medium to large batteries
Leading to innovative performance improvements with a production target of 42,000 tons per year


**Optimal partnership through technical complements and strategic alliances for global market penetration**

**Enhancing battery capacity, stability, and lifespan by increasing the nickel content**

Producing cathode materials by purchasing lithium and precursor materials (nickel/cobalt/manganese) and supplying to secondary battery manufacturers

Through strategic relations with SMLAB, Kumyang can supply lithium raw materials and secondary battery additives to SMLAB, completing a major secondary battery value chain by using SMLAB single-crystal cathode materials for the production of 21700 and 4695 cells to supply to demand companies

## K-VALUE CHAIN 3

# Battery Manufacturing

- Possessing innovative cylindrical secondary battery manufacturing technology, completing the value chain from lithium raw materials to cathode materials to battery production
- Securing stable and continuous material technology capabilities through the business of processing lithium hydroxide / lithium carbonate and processing secondary battery additives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**Electric Vehicles (EV)**

**Electric Motorcycles (E-Motorcycle)**

**Drones and other E-mobility applications**


Advanced materials industry for eco-friendly recycling battery applications


**Energy Storage Systems (ESS)**

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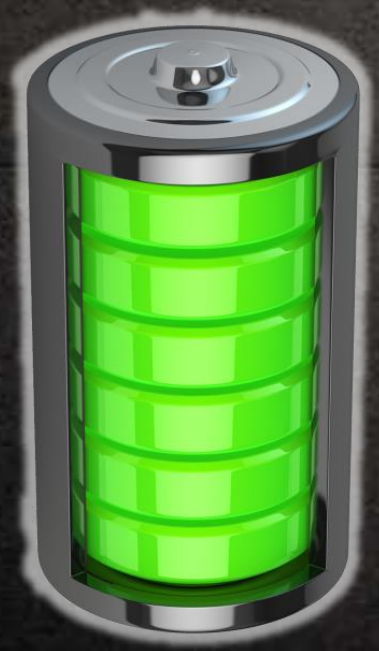
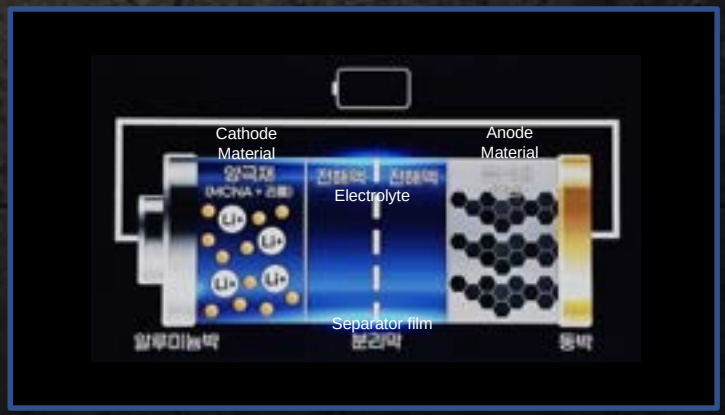


01 Cathode Material
- Cathode Material
- Cathode (Al)

02 Anode Material
- Anode Material
- Anode (Cu)

03 Separator Film
- Perforated PE/PP, etc.




04 Electrolyte
- LiPF6
- EC/EMC, etc.

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## Electrode Process

- Ultra high-nickel
- Single-crystal cathode material
- Mixing
- Coating
- Roll Press
- Slitting

## Assembly Process

- Winding
- JR Insert
- Beading
- EL Filling
- Crimping
- Washing
- Tubing

## Formation Process

- RT Aging
- Formation
- HT Aging
- DCIR
- Grading

## Pack Process

- Cell Inspection and Assembly
- BMS Assembly
- EOL Testing

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# 21700 Cylindrical Battery


## 21700 Cylindrical Secondary Batteries

- The 21700 battery has a larger capacity and higher energy density than the 18650 battery.
- Capacity increased by more than 50% through enlargement and change of cathode material.
- Lightweight battery, improved battery life, stability, and quality.

### Manufacturing Model (Cylindrical)

| Cell Model | Capacity (mAh) | Nominal Voltage(V) | Max Continuous Discharge Current(A) | Remark |
|---|---|---|---|---|
| KY INR21700-40P | 4,000 | 3.6 | 45.0 | TBD |
| KY INR21700-42P | 4,200 | 3.6 | 45.0 | TBD |
| KY INR21700-48E | 4,800 | 3.7 | 14.1 | |
| KY INR21700-49E | 4,900 | 3.7 | 14.3 | |
| KY INR21700-50E | 5,000 | 3.7 | 14.7 | |
| KY INR21700-55E | 5,500 | 3.67 | 16.2 | TBD |

※ Standard size : Diameter 21mm & Height 70mm

# 46-series Cylindrical Battery


4680 4695 46120

## 46-series Cylindrical Secondary Batteries

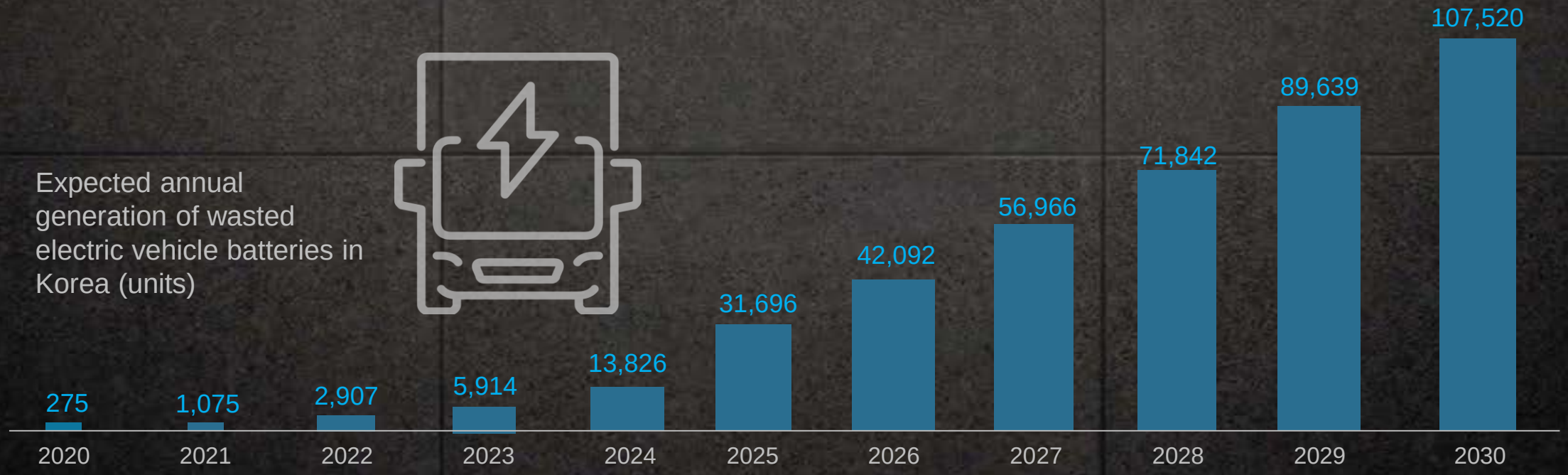
- Energy capacity 6.8 times, output 7 times, and driving distance improved more than 25% compared to 21700
- "Game Changer" in the global automotive industry
- Cost reduction through materials and process technology

### Comparison between 21700 and 4695

| Item | 21700 | 4695 |
|---|---|---|
| Diameter (mm) | 21 | 46 |
| Height (mm) | 70 | 95 |
| Weight (g) | 70 | 430 |
| Cell unit per EV | 4,400 | 650 |
| Energy capacity (mAh) | 5,000 | 34,000 |

# Battery Recycling Business

## Business that disassembles batteries to extract metals




Rapid growth anticipated for the domestic battery recycling market, in line with the growth of the electric vehicle market

According to the Ministry of Environment, about 275 wasted electric vehicle batteries were generated in 2020, with the number expected to exceed 100,000 by 2030, significantly increasing the demand for battery recycling

# *Joint development of fuel cells with the Korea Institute of Science and Technology*

KUMYANG INNOVATION × KIST 한국과학기술연구원 Korea Institute of Science and Technology

Development capabilities accumulated based on the technology transfer and cooperation program with KIST, conducting government projects and commercialization with KIST


**2020**
- Establishment of Kumyang Innovation Co., Ltd.
- Technology transfer from KIST: "Manufacturing technology for ultrafine nanoparticles and carbon adsorption technology

**2021**
- MOU for cooperation in fuel cell technology and material research and development with KIST
- Catalytic evaluation conducted with the assistance of KIST's Hydrogen and Fuel Cell Research Group
- Appointment of Jang Seok-young (former Vice Ministry of Science and ICT) as CEO

**2022**
- Securing electrode manufacturing technology using company's own catalysts
- Eco-friendly ship fuel cell demonstration TEST MOU (with Korea Maritime University)

**2023**
- Completion of hydrogen-powered ship demonstration operation

# Innovation and Spirit of Challenge

**Kumyang, with global network over 2,000 agents in 78 countries, continues to grow as a "global cylindrical battery company" leveraging its accumulated research technology and production know-how.**

**We prioritize values of our customers, striving to grow alongside them while considering the environment as our primary concern**
**We are committed to upholding the value of giving back to society and aim to leap forward as a representative company of South Korea, dedicated to the mutual prosperity of the nation and its communities**

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# CYLINDRICAL BATTERY WORLD LEADER

Kumyang, a global leader in advanced materials, is set to create the legend of the K-BATTERY, following the proud legacy of South Korea recognized worldwide through the strengths of K-POP and K-SEMICONDUTORS

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# THANK YOU