III

Energy & Functional Materials

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Representative Director &
Managing Executive Officer

Ⅲ Energy & Functional Materials

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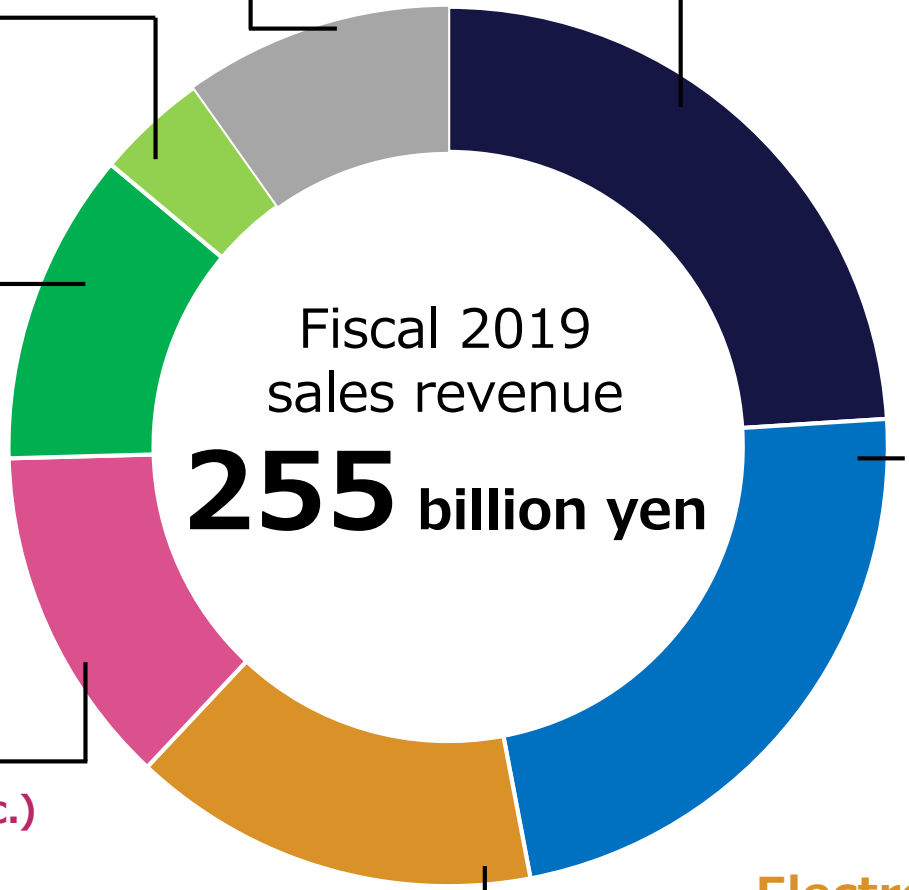
Ⅲ-1 Vision for Energy & Functional Materials

Contribute to Solving Environmental and Energy Issues through Innovative Technologies

Active injection of resources into growing businesses

- ☑ Expand sales of core products and accelerate R&D
- ☑ Secure stable revenue sources through higher added value
- ☑ Improve profitability of underperforming businesses and products
- ☑ Create new businesses in the fields of environment, energy, and high-performance materials

Ⅲ-1 Product Groups by Sector



Health & Crop Sciences
- Super engineering plastics
- Resorcinol

Others

Automotive
- Synthetic rubber
- Resorcinol
- Super engineering plastics
- Aluminum

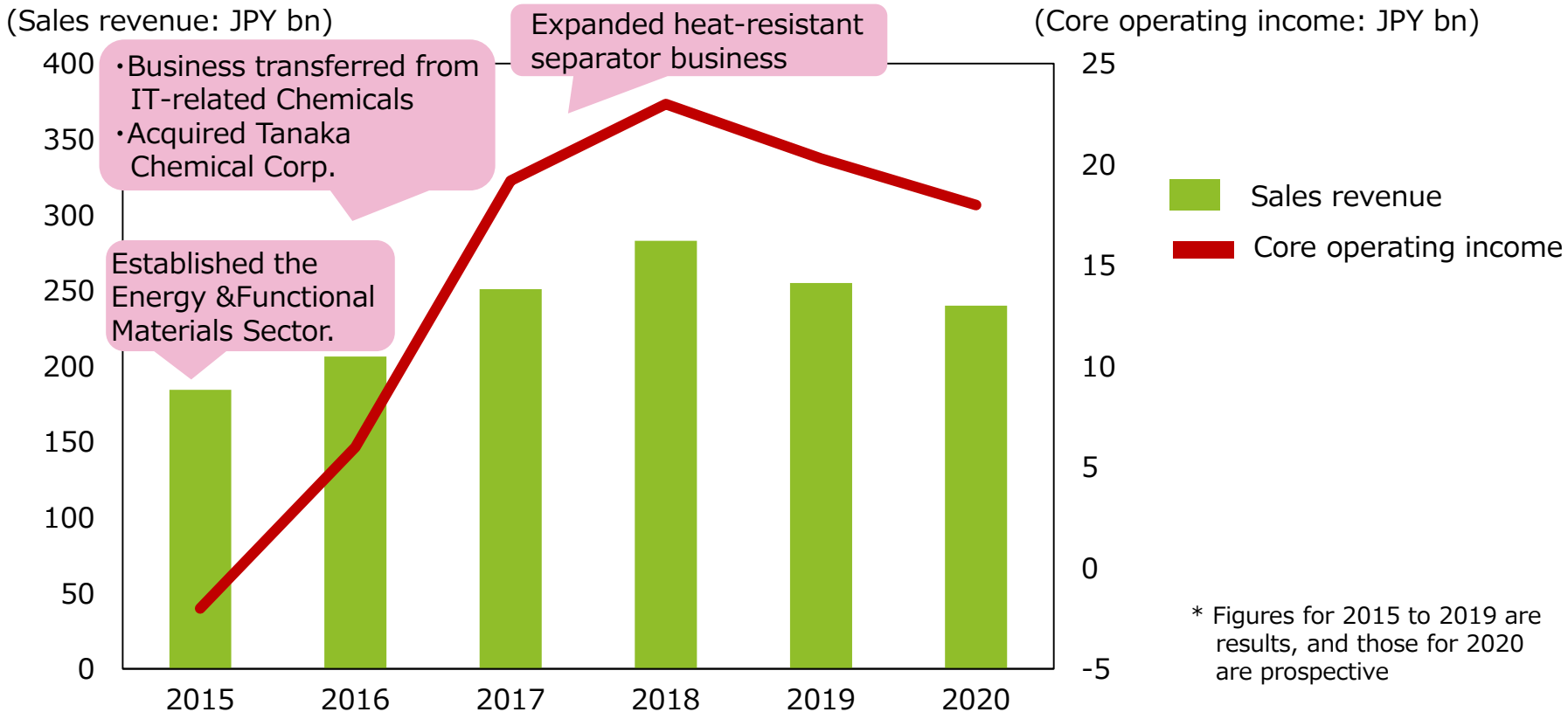
Industrial commodities (Aerospace, etc.)
- Super engineering plastics
- Alumina

Battery materials
- Heat-resistant separators
- Cathode materials
- High purity alumina

Living materials (building materials, etc.)
- Aluminum
- Resorcinol

Electronic goods
- Super engineering plastics
- Alumina

Ⅲ-1 Sector Performance



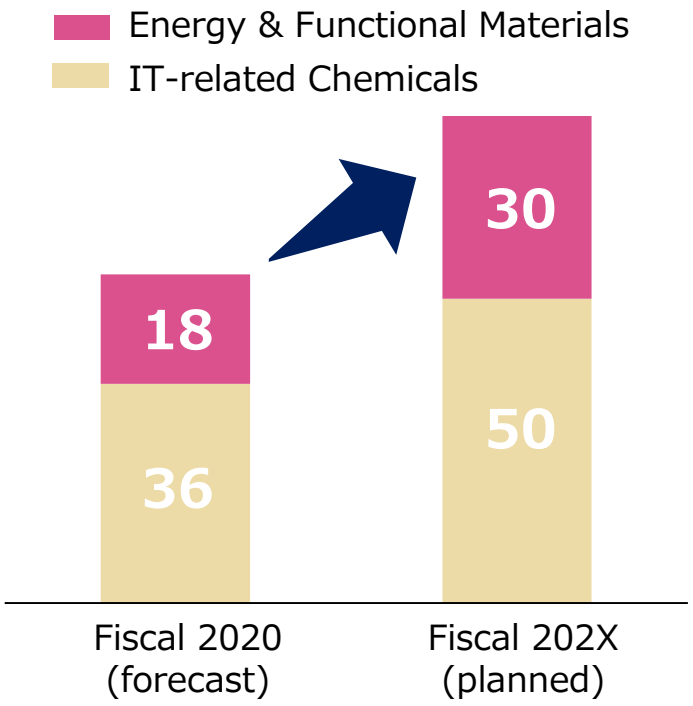
- ✓ Fiscal 2019 revenue and profit decreased from the previous year, impacted by lower market prices for aluminum and decreased shipments of heat-resistant separators.
- ✓ Fiscal 2020 earnings are expected to deteriorate, affected by decreased automotive demand due to the coronavirus pandemic.

Ⅲ-1 Sector Earnings Forecast

Boosting earnings power by playing a part in specialty chemicals

Current Priority Management Issues and Business Strategy (May 2020)

■ Core operating income (JPY bn)



✓ **Secure and enhance profits in businesses with stable earnings (Resorcinol, Alumina, etc.)**

While at the same time,

✓ **Increase earnings power by actively injecting resources in growing areas in a timely manner**

Active injection of resources

Battery materials

- Active investment in proportion to market expansion
- Accelerate development toward commercialization of next-generation batteries

5G/ mobility

Super engineering plastics

- Expand LCP sales for materials such as those needed in high frequency infrastructure
- Expand sales of automotive materials for lightweight vehicles

Preventing the Spread of the Coronavirus

Supplying raw materials for antiviral drugs (Koei Chemical Co., Ltd.)

- Building a supply system
- Ensuring prompt and stable supply

Avigan®
(RM: Pyridine)

Remdesivir
(RM: Pyrrole)

Fulfilling social responsibility to help abate the coronavirus pandemic

Ⅲ Energy & Functional Materials

Ⅲ-2 Positioning of Major Products

1 Stable revenue sources	• Alumina/High Purity Alumina • Resorcinol
2 Areas for active injection of resources	• Super Engineering Plastics • Heat-resistant separators • Cathode materials

1 Stable revenue sources

- **Alumina/High Purity Alumina**
- **Resorcinol**

2 Areas for active injection of resources

- Super Engineering Plastics
- Heat-resistant separators
- Cathode materials

Ⅲ-2 Maintain/Enhance Stable Revenue Sources

Use product groups with the global top share to secure stable earnings

	Main usage
Alumina/ High Purity Alumina	Lithium-ion secondary battery materials Heat-dissipating fillers for resin Sapphire use (LED substrate, crystal of watch) Components for semiconductor manufacturing equipment

Provide high value-added products, using particle size and shape control technology

	Main usage
Resorcinol	Adhesives for tires Ultraviolet ray absorbers Fire retardants

Maintain a stable supply system through multiple production facilities (Chiba, Oita).

Maintain/Enhance Stable Revenue Sources
(High Purity Alumina)

Our High Purity Alumina Lineup

Meet wide-ranging needs with diverse products

Large

Specific surface area

Small

NXA Series

AKP-700,AKP-53,AKP-50

AKP-20,AKP-30,AKP-3000

AA-03

AKP-15,AA-07

AA-05

AA-1.5

AA-3

AA-5

AA-10

AA-18

Ceramics,
Lithium-ion secondary batteries (LIB),
Abrasives, Fillers

Resin fillers,
Special fluorescent material

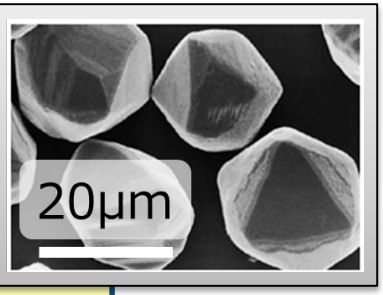
Thermal spraying

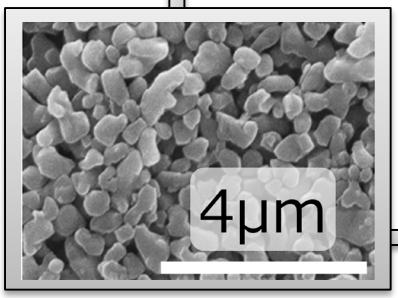
Sapphire ingredient,
Catalyst carrier, Spacer

AKQ Series

Resin fillers,
Sapphire ingredient

AKX Series





Small

Particle size

Large

Ⅲ-2 Maintain/Enhance Stable Revenue Sources (High Purity Alumina)

✓ 40 years from the start of production, we are aiming to solidify global top market share status, and accelerate growth even further

Market needs

- High strength, high corrosion resistance, and high heat resistance
- Ultrafine, uniform qualities, and stable supply

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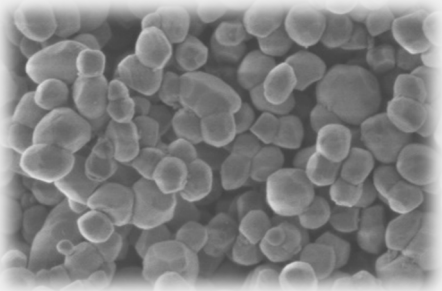
Our own technology

- Particle size precision control technology
- Highly productive manufacturing method

NXA (Ultrafine Alumina)

- World-first mass production of alpha alumina with a particle size of 0.0001mm
- Achieved fine and uniform particle distribution
  ⇒ Expanding use to precision abrasives and dental materials in addition to existing uses



Moving on to the medium volume trial production phase with an eye to launching in fiscal 2022

Ⅲ-2 Maintain/Enhance Stable Revenue Sources (Resorcinol)

Strengths in the Resorcinol Business

Reliability

- Multiple production facilites (Chiba, Oita)
- Global stock points

Stable Demand

- Adhesives for tires, ultraviolet ray absorbers, pharmaceuticals, crop protection products, etc.

Clean Process

- Less energy consumption per unit
- Low effluent load

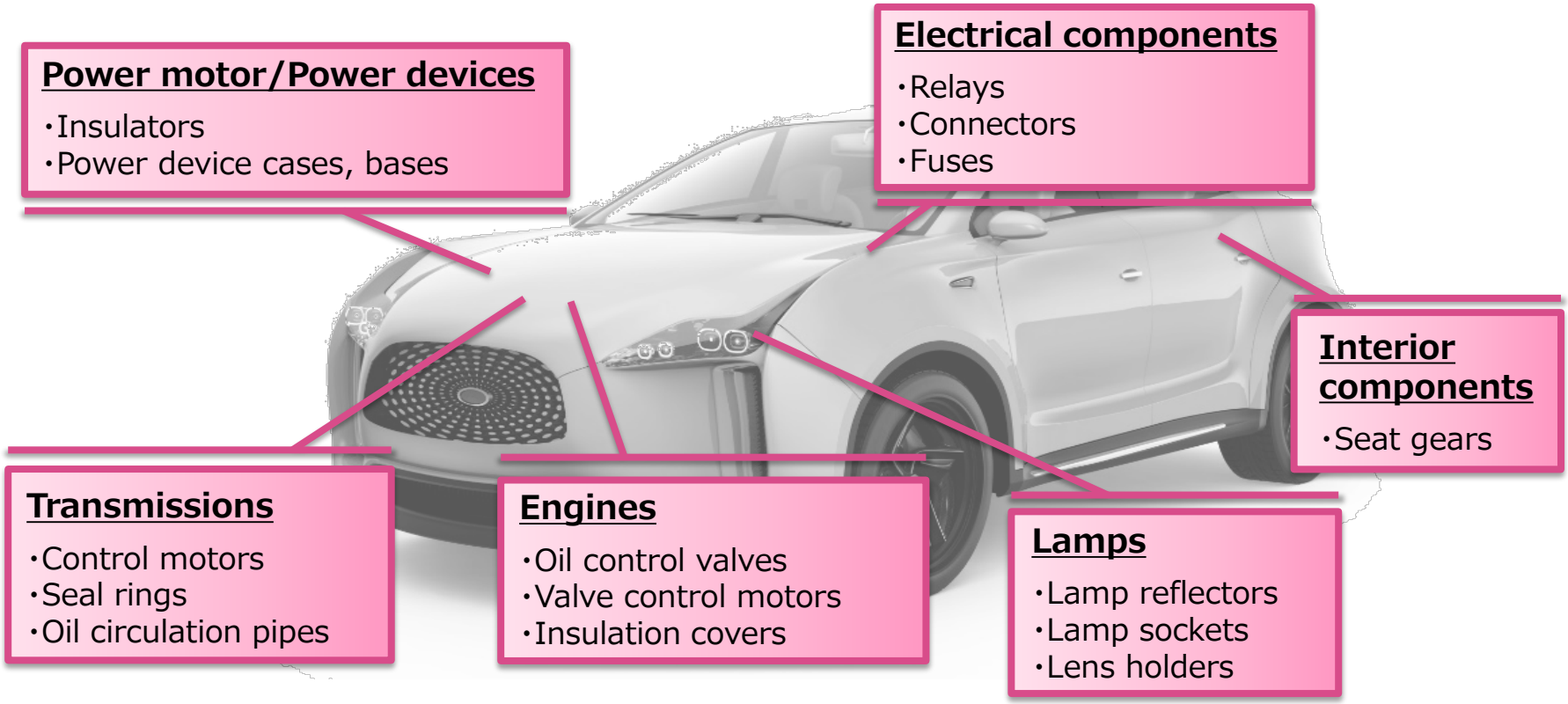
- Fulfill responsibility for stable supply as the world's top manufacturer
- Accelerate business growth by expanding into diverse uses, such as pharmaceuticals, crop protection products, and feedstock for resin

1 Stable revenue sources	• Alumina/High Purity Alumina • Resorcinol
2 Areas for active injection of resources	• **Super Engineering Plastics** • **Heat-resistant separators** • **Cathode materials**

Expanding Automotive Use
(Super Engineering Plastics)

- **Heightened need for better fuel performance and for lightweight components**
  ⇒ Multi-material car body with the use of resin, etc.

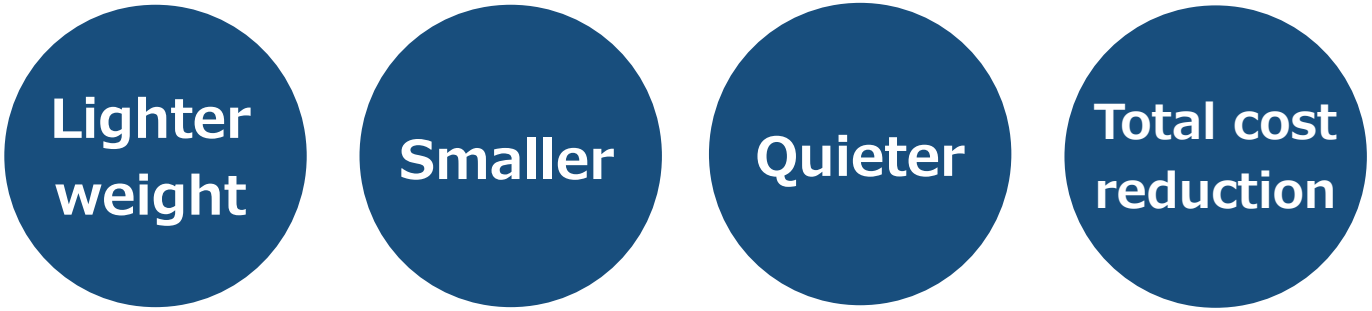
Applicable components (including candidate components)



Ⅲ-2 Expanding Automotive Use (Super Engineering Plastics)

Increasingly adopted for use as materials replacing metal automotive components

- Super Engineering Plastics (PES/LCP) are well positioned as components where **heat resistance, dimensional accuracy, thin design, and sliding performance** are required in addition to lighter weight.
- Proposing designs that leverage the processability and functionality of super engineering plastics



- Automotive use has been steadily increasing

FY2015	FY2019	FY2024
19 cases	28 cases	40 cases

Twice the level of FY2015

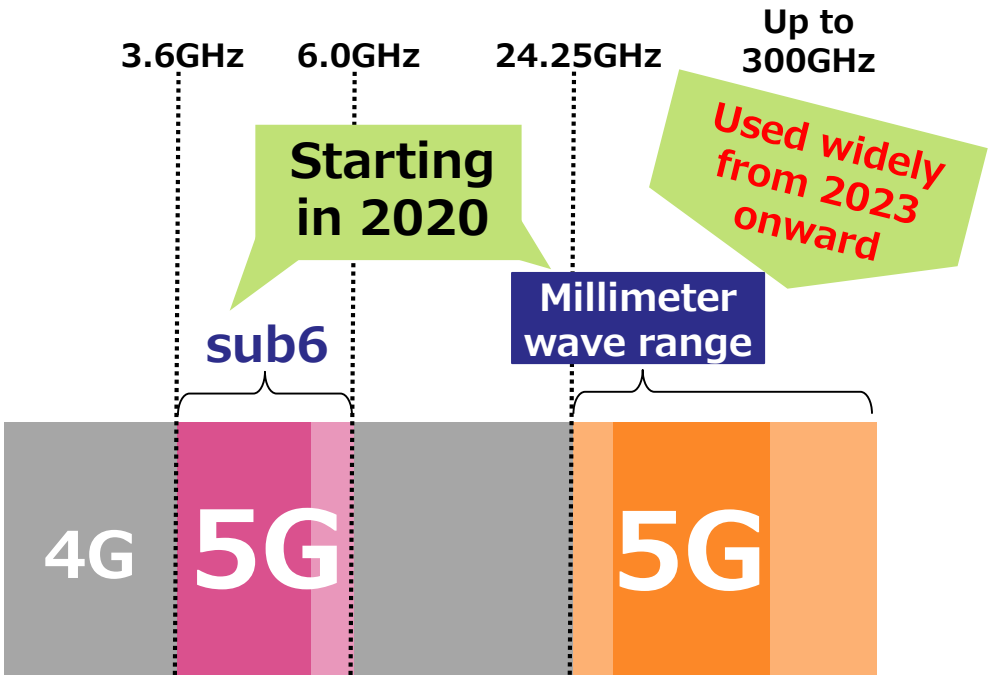
Ⅲ-2 Paradigm Shift

Paradigm Shift【ITC】

5G

- Enhanced Mobile Broadband **eMBB**
- Ultra-Reliable Low Latency Communications **URLLC**
- Massive Machine Type Communications **mMTC**

5G frequency bands



For a full-scale implementation of millimeter wave range

- Performance required for 5G-compatible components

Low transmission loss

Technology to process signals and communications without deterioration

Ⅲ-2 Making arrangements for 5G penetration (Super Engineering Plastics)

Our proprietary technology

- Molecular structure design, synthesis technology
- Mass production technology for soluble LCP
- Compound design, mass production technology
- Machining support technology utilizing material properties

We flexibly provide **materials with optimal transmission properties**, using a permittivity control method based on low dissipation factor performance due to our proprietary molecular designs.

Circuit board applications

- **Adopted as a film substrate material for smartphones**

Provided in 2 types of LCP

Solution type: Solution casting method (applicable to PI process)

Melting type: Inflation, extrusion

Connector applications

- **Adopted for use in high-speed data transmission connectors for data centers**

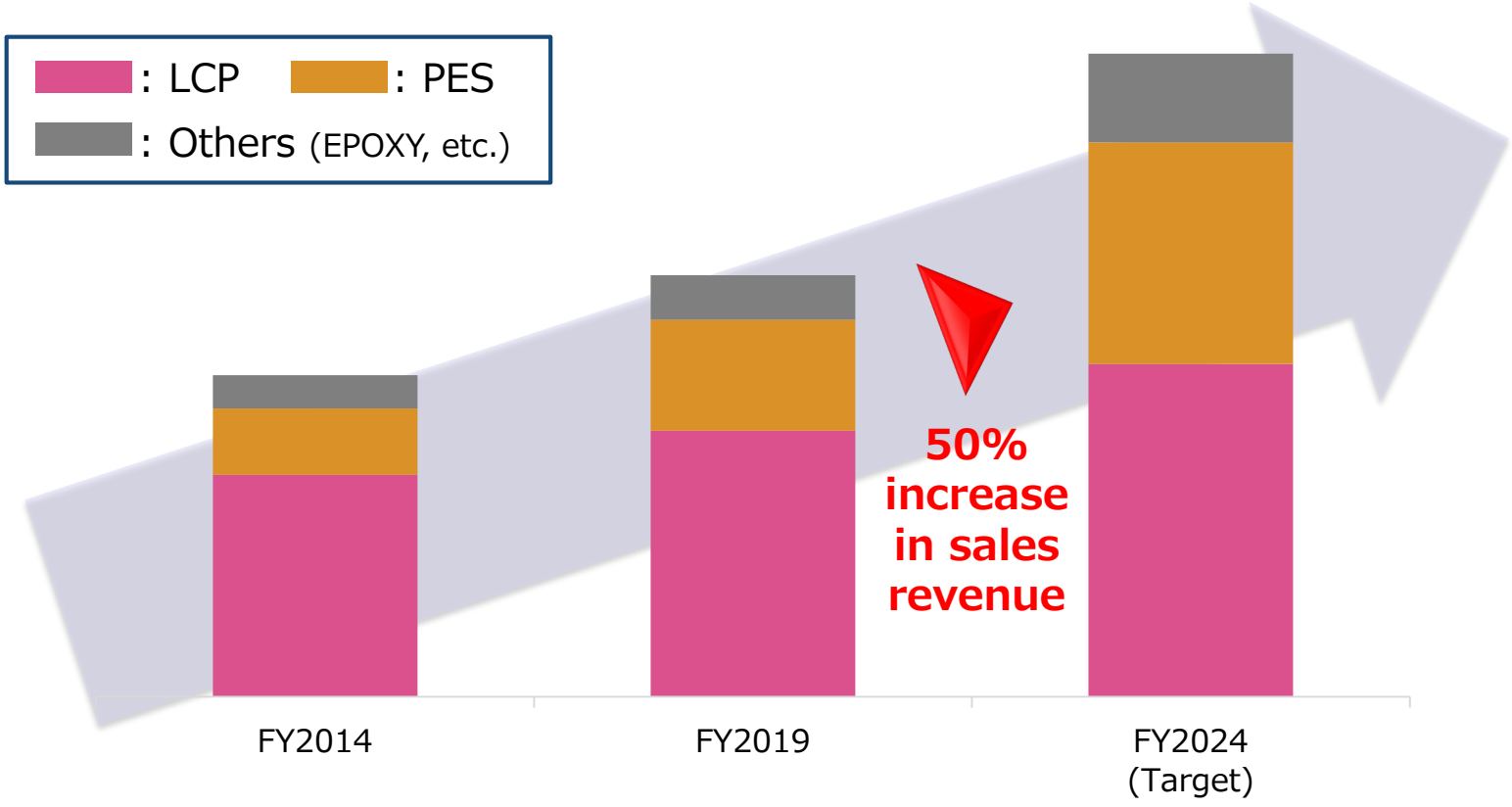
Expanded permittivity control grade

Provide materials that enable both low transmission loss and flexible impedance matching performance

Ⅲ-2 For Future Business Expansion (Super Engineering Plastics)

- Expand business by supplying materials widely considered indispensable for growing industries such as the automotive industry and IT/Telecommunications.

Target sales revenue for Super Engineering Plastics business



Ⅲ-2 Paradigm Shift【Automobile】

CASE

Connectivity

Sharing

Automatic driving

Electrification

EV policy trends in various countries

UK

Terminating sales of gasoline/diesel cars, including hybrids, **by 2035**

US

California State declared total abolition of gasoline cars **by 2035**

France

Terminating sales of gasoline/diesel cars **by 2040.**

China

Subsidies for EVs are extended to 2022. Total abolition of new gasoline car sales **by 2035** is under consideration.

Spain

Achieve no CO_2 emission from all new cars sold **by 2035**

(Source) “Status of the Greening of Tax Systems and Carbon Taxes in Japan and Overseas” by the Ministry of the Environment.

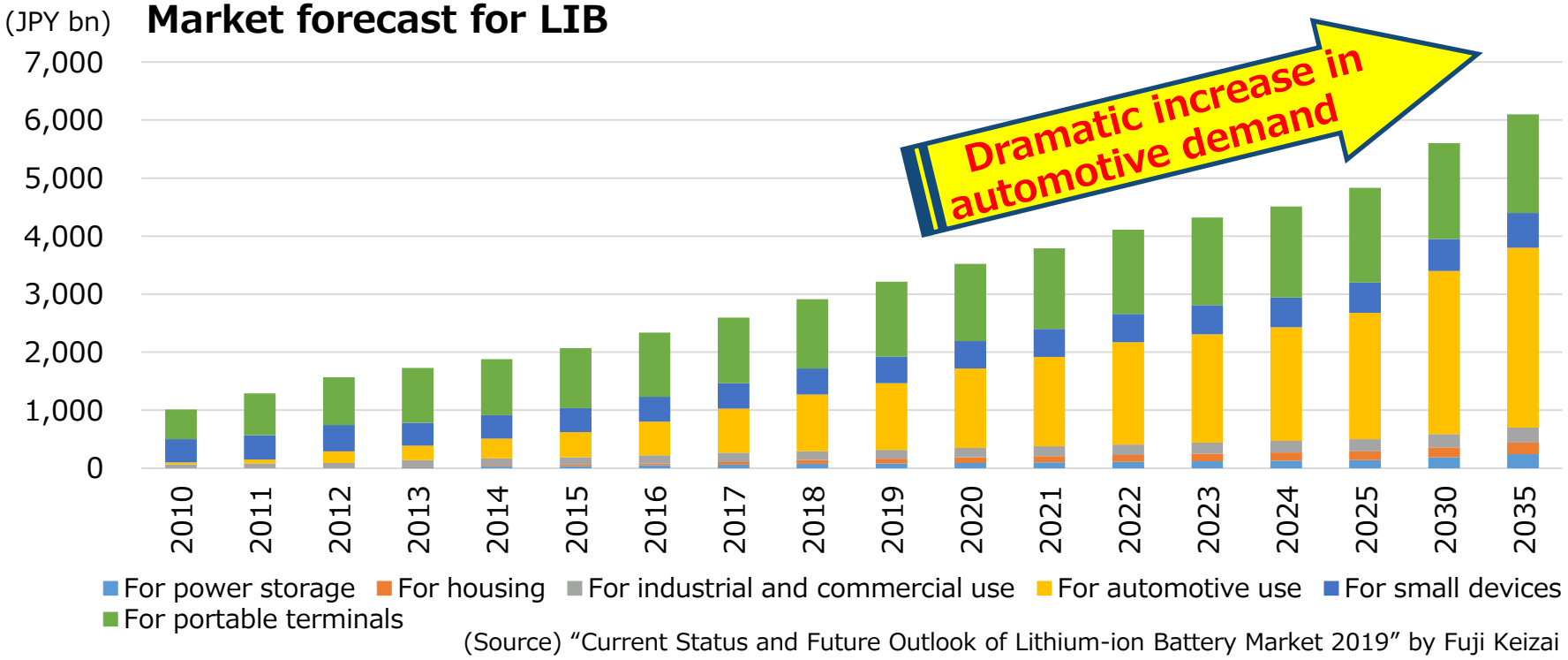
Need for EVs is expected to increase in the future.

Ⅲ-2 Expanding Demand for Electric Vehicles (Battery Materials)

Trends in lithium-ion secondary batteries (LIB)

- LIB market expansion along with the spread of EVs
- Tighter pricing
- Expansion of battery capacity for longer cruising distance in EVs

Market forecast for LIB



(Source) "Current Status and Future Outlook of Lithium-ion Battery Market 2019" by Fuji Keizai

Ⅲ-2 Expanding the Battery Business in the EV Market (Battery Materials - Cathode materials)

Market needs

- Expansion of battery capacity for longer cruising distance for EVs

Cathode materials (NMC,NCA)

- ✓ **More penetration of high-nickel cathodes for higher capacity,**

But in exchange,

- ✓ **Decreased use of elements (Mn, Co, etc.) contributing to structural stability**

Increased capacity ⇔ **Tradeoff** ⇔ **Safety**

Advantages of aramid-coated separators

High heat resistance + **Light-weight** + **Less powder dust**

Durability

Ensuring safety in **high-nickel batteries** as well with aramid-coated separator.

Excellent safe performance of aramid-coated separators contributes to increasing the capacity of LIBs.

Ⅲ-2 Expanding the Battery Business in the EV Market (Battery Materials - Separators)

Approach for business expansion

Increase production capacity

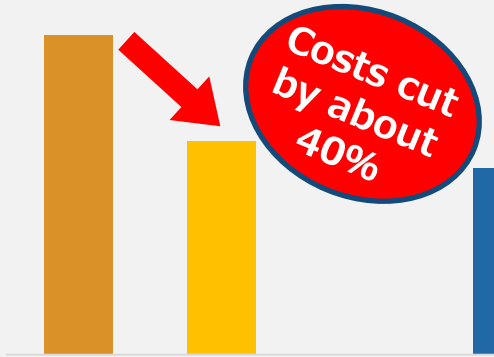
Our production capacity

2017	2021 expected
180 million ㎡	400 million ㎡

SSLM (South Korea) increased capacity in response to customer demand

Reduce costs through rationalization

Manufacturing costs of aramid-coated separators



Overhaul feedstock/manufacturing process, and improve cost competitiveness

Increase cost competitiveness and expand LIB business

Ⅲ-2 Expanding the Battery Business in the EV Market (Battery Materials - Cathode Materials)

Sumitomo Chemical
- Highly productive calcination process
- Analysis/Evaluation technology

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Tanaka Chemical
- Automotive precursor manufacturing technology
- Expertise with mass production

Business expansion through group synergy

To capture expanding demand
- ✓ Promote joint development of high-capacity cathode materials
- ✓ Consider installation of calcination equipment

Recent Initiatives at Tanaka Chemical

Sales

Concluded sales and manufacturing technical support agreements with a European battery manufacturer

Manufacturing

Completed phase 3 expansion in September 2020, started operations.

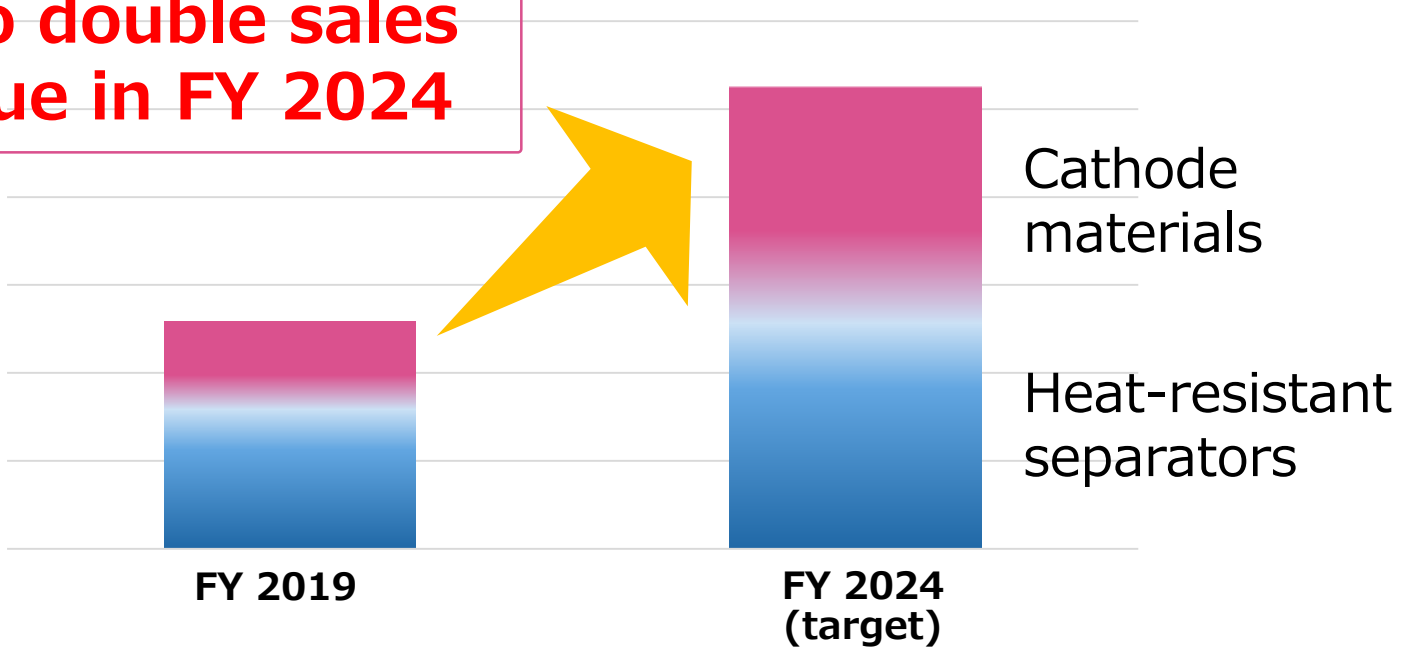
Expanding facilities

Phase 1	Expand main raw material melting facilities	Oct. 2018
Phase 2	+1,200t/month	Jul. 2019
Phase 3	+1,200t/month	Sep.2020

For Future Business Expansion
(Battery Materials Business)

Business target for battery materials

Aim to double sales revenue in FY 2024



Expand battery materials business with 2 components: heat-resistant separators and cathode materials

Ⅲ Energy & Functional Materials

Ⅲ-3

Toward the implementation of next-generation batteries for EVs (Solid-type batteries)

Ⅲ-3 Trends in Battery Components: Higher Capacity

Breaking through safety and productivity limits is a must for higher capacity batteries

	Current solution LIBs (up to 2025)	Improved solution LIBs (2020 to 2030)	Next-generation batteries (from 2025)
Energy density	100Wh/kg	250Wh/kg	500Wh/kg

	Current components	Example of technological development	Candidates for next-generation batteries
Cathode Materials	Middle Ni, Iron phosphate	High Ni, Cobalt-free, Nickel-free, Lithium-excess	① **Solid-type batteries**
Anode materials	Graphite (+silicone)	Silicone, aluminum, lithium	② **Other batteries** Lithium-oxygen batteries lithium-sulfur batteries
Separator	Aramid, Ceramic	Resistance to high voltage	
Electrolyte	LiPF6/EC	Ionic liquid, higher concentrations	

Development of Solid-type Battery Materials (Sumitomo Chemical)

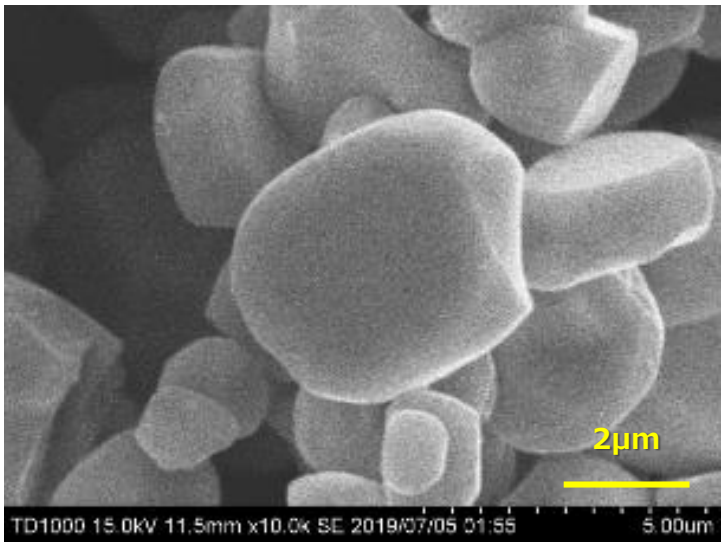
Development-I: Cobalt-free Cathode Materials

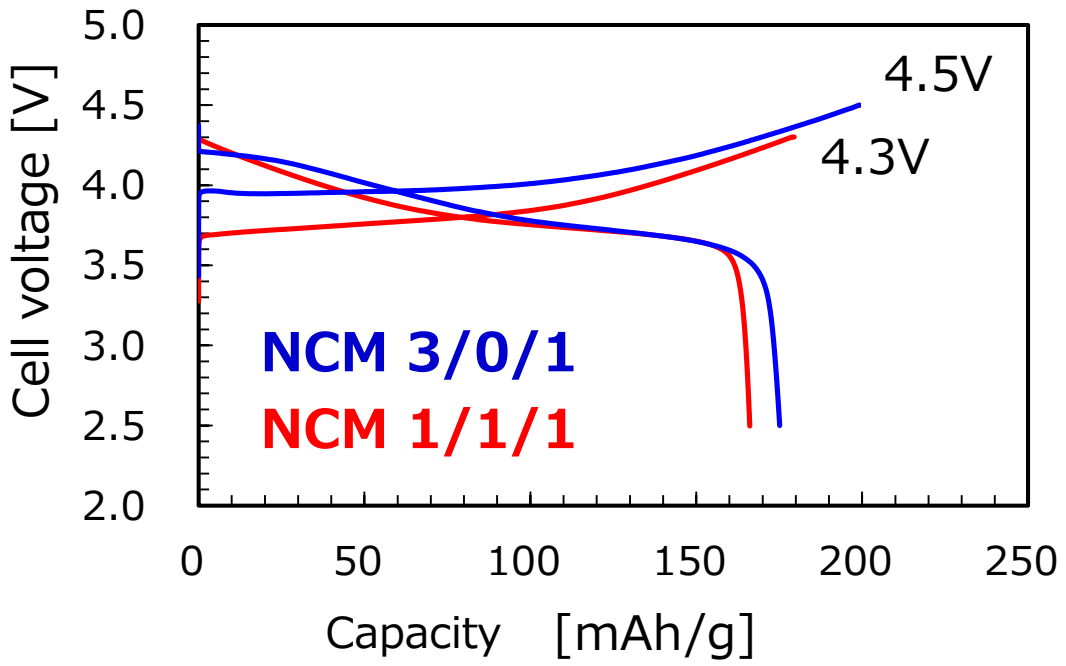
Designing high capacity and high output materials based on the findings accumulated with **Enervio®**

Composition: **NCM 3/0/1**

Particle size: D50 = 5 μm

Change in crystal axis length is small up to high-voltage region. Even with a 4.5V charge, the materials show high cycle characteristics.



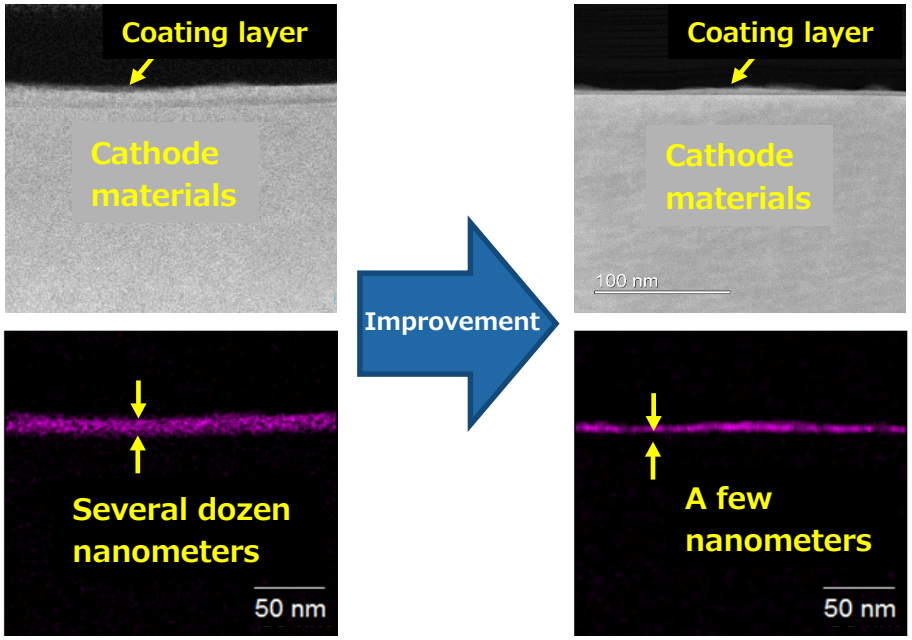


Development of Solid-type Battery Materials (Sumitomo Chemical)

Development-Ⅱ: Cathode material surface-coating technology

✓ Role of coating: It does not inhibit the movement of Li^+ but suppresses reactions between cathode materials and the electrolyte.

Ideal coating:
thinly and uniformly covers all surfaces of cathode materials.



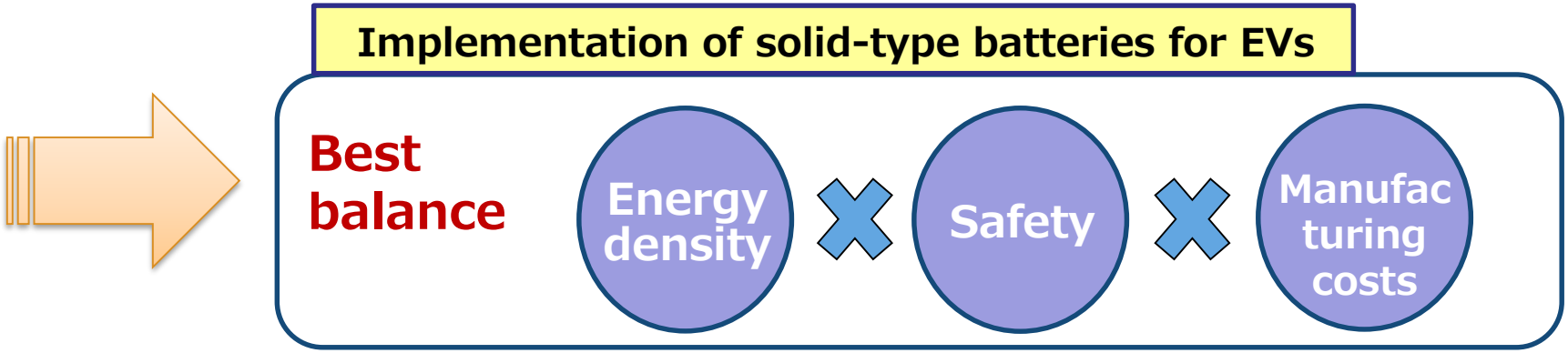
Achieved a uniform coating layer with the thickness of a few nanometers.

Ⅲ-3 Development of Solid-type Battery Materials (Joint development)

The course on joint research between industry and academia at Kyoto University

Opened in April 2020 for joint development of materials for solid-type batteries (cathode materials, solid electrolytes, etc.) and optimal designs for solid-type batteries

- ✓ Expand ideas through the deepening of discussions with professors at Kyoto University
- ✓ Validate utility with sample synthesis and the evaluation of actual battery performance
- ✓ **Aim to complete development of materials for solid-type batteries in 2023**



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The important factors that could cause actual results to differ materially from those discussed in the forward-looking statements include, but are not limited to, general economic conditions in Sumitomo Chemical's markets; demand for, and competitive pricing pressure on, Sumitomo Chemical's products in the marketplace; Sumitomo Chemical's ability to continue to win acceptance for its products in these highly competitive markets; and movements of currency exchange rates.