

# Energy & Functional Materials

## Businesses

### Advanced Polymers Business

Liquid crystal polymer (LCP), Polyether sulfone (PES)

### Specialty Chemical Business

Resorcinol, Plastic additives, Emulsions

### Inorganic Materials Business

High-purity alumina, Low soda alumina, Aluminum hydroxide, High-purity aluminum

### Battery Materials Business

Battery Separators, Cathode materials



## Strengths of the Energy & Functional Materials Sector

We believe that our strengths lie in our product lineup that meets diversifying customer needs, including separators for lithium-ion secondary batteries with the world's highest level of heat resistance, super engineering plastics used in various applications including electronic components, and products such as high-purity alumina and resorcinol that maintain the top global market share, as well as our R&D capabilities and evaluation, manufacturing and process technologies that create these product lines.

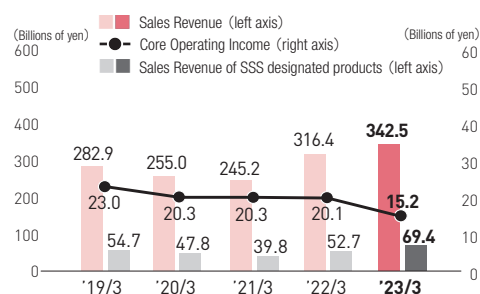
## Initiatives in FY2022

At the Ehime Works we started construction of a new facility for new high-performance grades of high-purity alumina. In addition, the Ehime Works is expanding its production capacity for LCP, for which demand is expected to grow against the backdrop of the spread of 5G and EVs. Both of these facilities are scheduled to start operation in FY2023. Moreover, we have successfully developed "soft solid-type batteries" in an industry-academia joint research program with Kyoto University and Tottori University and have made significant progress toward the early commercialization of safe solid-type batteries. On the other hand, due to the difficulty in securing stable earnings in the future, we have shut down its dyestuff manufacturing facilities at the Osaka Works and have withdrawn from this business. Furthermore, we have decided to withdraw from the S-SBR business in Singapore, and we have also terminated production of EPDM at our Chiba Works and plan to withdraw from this business in FY2023. We will allocate management resources to areas where we have a competitive edge and seek to upgrade our business portfolio.

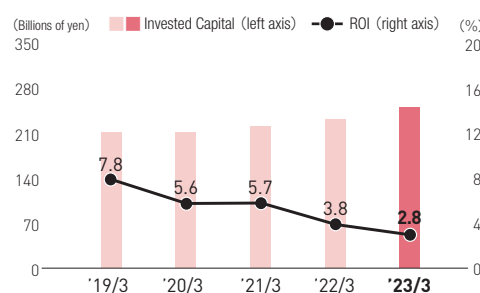
## Future Initiatives

We will concentrate our resources on growth businesses such as battery materials and super engineering plastics. In separators for lithium-ion secondary batteries we will respond to diversifying customer needs by leveraging our strengths in high safety and long life. In cathode materials, we aim to commercialize a highly productive calcination process. On the other hand, we will continue to assess the direction of low-profit businesses with a view to withdrawing from or downsizing them. As for next-generation businesses, we will develop new technologies for solid-type batteries, direct recycling of cathode materials, and separation membranes.

## Sales Revenues and Core Operating Income/ Sales Revenue of SSS designated products



## Invested Capital・ROI



## Transition to date

Core operating income had been stable at around 20 billion yen per year, but recently declined due to the global economic slowdown. Invested capital increased due to aggressive investments in super engineering plastics, battery components, and high-purity alumina, and ROI is trending downward. On the other hand, we are working to improve our business portfolio by making decisions to withdraw from the low-profit businesses of dyestuffs and synthetic rubber.

## Future Measures and Issues

In super engineering plastics, battery materials, and high-purity alumina, we will leverage our proprietary technologies to meet growing demand in the EV market and elsewhere, expand earnings, and ensure that our investments pay off.

**Concentrate investments and expand business in growth areas**

**Battery materials**

**Separators: Development, increase in production capacity and sales expansion in accordance with advances in battery capacity**

Demand for lithium-ion secondary batteries is expected to continue to grow, especially for automotive applications. We will respond to the rapidly expanding EV society with our accumulated technologies and promote further expansion of our separator business by increasing our production capacity to meet customer demand.

**Our Initiatives**

- Increase production capacity to meet the increasing demand for automotive, expand sales to new customers and pursue cost rationalization.
- Focus on expanding sales for consumer use like home appliances, electrically assisted bicycles.

**Cathodes: Expand sales of precursors, establish calcination technology and commercialize**

By establishing our proprietary high-productivity calcination process, we aim to enter the market for high nickel-content cathodes, which is expected to grow in the future.

**Our Initiatives**

- Launch validation equipment on schedule and acquire customer certification.
- Develop cobalt-free cathodes to help achieve a sustainable society.

**Super engineering plastics (LCP)**

**Expand business with increased production capacity. Expand sales into automotive and 5G high-speed telecommunications connectors**

With the shift to EVs, engine parts are decreasing while onboard connectors and EV motor peripheral parts are increasing. In addition, as 5G goes into full swing, demand for LCPs that matches the required characteristics is expected to increase. We will develop a production regime to meet such robust demand and focus on expanding sales in growth fields

**New facility to be operational in FY2023**

Approx. 9,000 tons **→ 30% expansion**

**Our Initiatives**

- Considering further increase in production capacity
- Respond to automotive demand and expand sales of 5G high-speed telecommunication connectors

**Decide direction for low-profit business**

While giving maximum consideration to the impact on stakeholders, we will downsize or withdraw from businesses that we judge to be unprofitable in the future due to changes in the business environment and other factors, in an effort to improve the business portfolio.

**Our Initiatives**

- FY2021 Decided to withdraw from the EPDM business
- FY2022 Decided to withdraw from the dyestuffs business; decided to withdraw from the S-SBR business in Singapore

**Develop next generation business**

**Develop new technologies such as solid-type batteries and direct recycling of cathode materials**

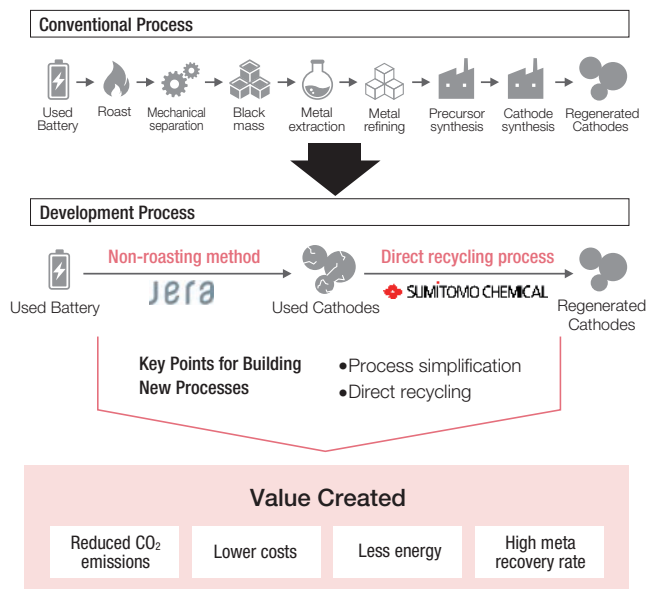
**Solid-type batteries**

Compared to current lithium-ion secondary batteries, solid-type batteries are safer and are expected to become the next generation of batteries. In an industry-academia joint research program we have succeeded in developing a soft-solid electrolyte, which had been a challenge. We will continue our development efforts for early commercialization.

**Direct recycling of cathode materials**

We are developing a technology to recycle recovered lithium-ion secondary battery cathode materials as cathode materials again without returning them to metal. JERA Co., Inc. and we were selected for NEDO's "Green Innovation Fund Project: Development of Next-Generation Storage Batteries and Next-Generation Motors". Both companies will promote development of the recycling technology and social implementation.

**Key Points of New Process Construction and Value Creation**



## Status of Global Expansion

### Expanding our Business to Quickly Meet Customer Needs

In the Energy & Functional Materials Sector, Sumitomo Chemical has marketing functions in local group companies such as Sumika Electronic Materials (Shanghai) Corporation and Sumitomo Chemical Europe S.A./N.V., for efficient sales activities with a technical suggestion in order to promptly respond to the needs of overseas customers. For example, one of the sector's core businesses is super engineering plastics, for which over half of shipments are to China and other overseas customers. Using our molecular design technology and design support technology which leverages the characteristic of materials, we propose solutions that meet customer needs. In the future, we are considering further strengthening such overseas sales organization, including through alliances with other companies.



Super engineering plastics

## Q&A

### Q : What kind of future developments are you thinking about for the separator business?

**A:** Because of the impact of stricter environmental regulations in countries, the scale of the market for environmentally friendly vehicles is projected to expand to sales of over 40 million vehicles in 2030, and demand for separators will expand accordingly.

There are two main issues to address for environmentally friendly vehicles to become widespread. The first is cruising distance, and lithium-ion secondary batteries are continuing to evolve, primarily with expanded capacity. Under such situations, the requested characteristics of separators are being further raised, and there is an increasingly broad scope for leveraging the superiority of aramid coatings. The other major issue is cost, and there is a need to



Separators

#### Strategy and Areas of Focus for Global Expansion

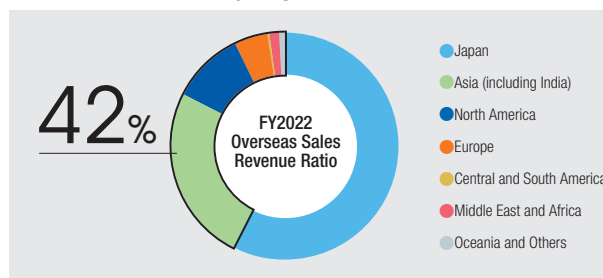
##### LCP

- Develop a value chain in Europe and the US
- Maintain and expand our share of the connector market, primarily in China

##### PES

- Expand share in artificial dialysis membrane applications, primarily in Asia and the US
- Expand use in high-performance membrane applications, such as for pharmaceutical companies

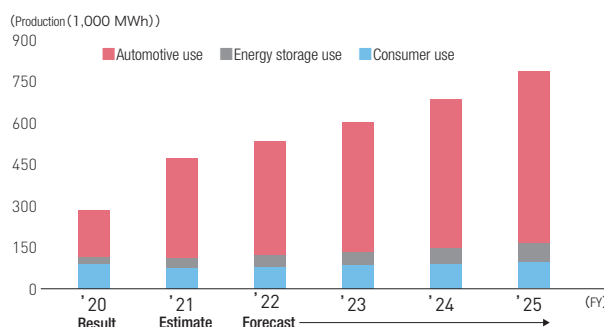
#### Sales Revenue Ratio by Region



significantly reduce the price of lithium-ion secondary batteries, which account for over half of a vehicle's cost. There is also a strong demand to reduce the cost of separators, and competition is becoming more severe with the emergence of Chinese manufacturers. Accordingly, we are rethinking the materials used and the manufacturing process in order to significantly reduce costs.

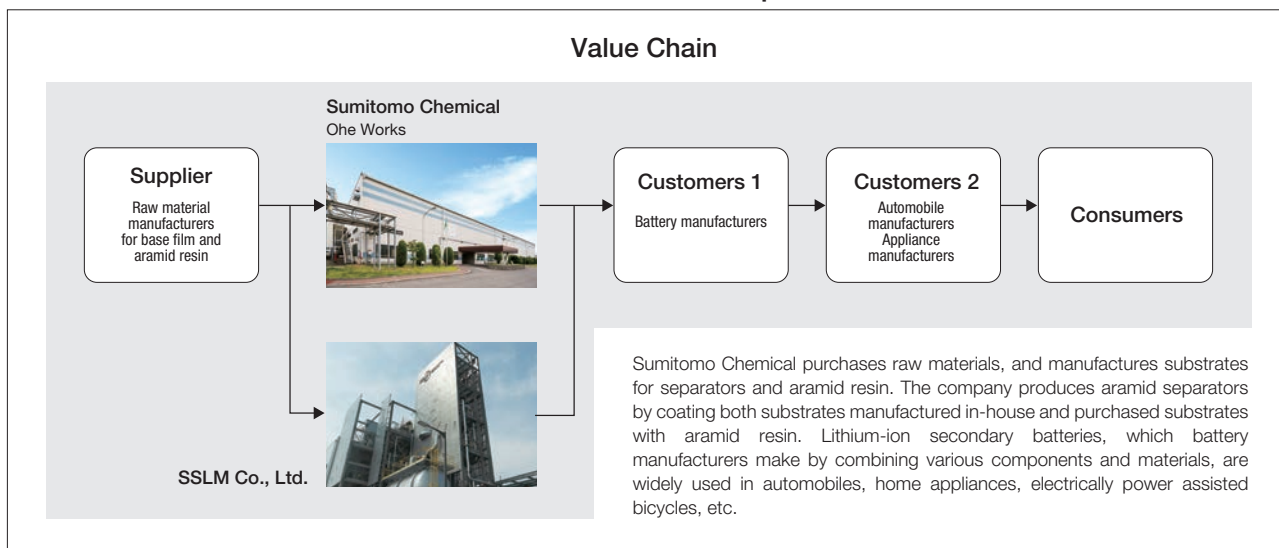
In addition to these initiatives, in order to meet a dramatic expansion in future customer demand, we are quickly expanding our production capacity and promoting an expansion of our separator business.

#### Market Forecast for Lithium-ion Secondary Batteries



(Note) Automotive use: EV/HEV/PHEV applications; Energy storage use: Uninterruptible power supplies and base transfer stations; Consumer use: Small-scale consumer applications  
(Source) Fuji Keizai Co., "General Survey of Battery-related Market Conditions – Battery Cells Market," 2022 edition

## Value Creation Model: Separators



## System for Providing Added Value

### Sumitomo Chemical's Competitive Advantages

The use of coated separators has become mainstream for lithium-ion secondary batteries. Among separator coatings, there are mainly ceramic coatings and aramid coatings, and almost all producers of separators are making ceramic coating separators. Compared to other companies' products, our aramid coating separators were used earlier in automobiles, and they have a track record for many years as high-quality and high-performance separators. Besides, they have superior safety (heat resistance), and they have been made lighter, weighing just kilograms for each electric vehicle, delivering customers added value that is different from other companies. In order to further strengthen the superiority of our aramid separator, we are conducting research to enhance the strength of the separators and reduce their thickness.

### Major Processes Generating Competitive Advantages

We are not only conducting research and development of separators but also working on improving productivity. We are capable of applying a uniform aramid coating with industry-leading speed, while maintaining high quality. Productivity at the plant of SSLM in South Korea has tripled since 2015 due to factors such as more advanced techniques, accumulated experience, and improvements in coating equipment. We expect further productivity improvement in the future.

### Providing Customer Value

Customers and consumers need EVs and other environmentally friendly vehicles with a long cruising range, and for that type of environmentally friendly vehicle, it is essential to implement high-quality, high-performance batteries. Our direct customers, the battery manufacturers, seek to manufacture batteries that provide that performance at the lowest possible cost. For that reason, we provide high-safety (heat resistant) separators, and we are working to improve productivity to be able to provide products with superior cost competitiveness. We also periodically communicate with customers to hear what new needs they have, and then work to develop products that can meet those needs.



## Added Value Provided to Society

### Contributing to Realize a Sustainable Society through the Separator Business

With more rigorous environmental regulations being put in place all over the world, the shift to environmentally friendly vehicles like EV is accelerating. Environmentally friendly vehicles loaded with lithium-ion secondary batteries can reduce CO<sub>2</sub> emission while driving as compared with gasoline cars. Separators are essential components in creating highly safe lithium-ion secondary batteries, and are indispensable for environmentally friendly vehicles to gain ground. Sumitomo Chemical contributes to realizing a sustainable society through its separator business.

