

Chemicals Company Performance Chemicals Business Briefing

The logo for AGC, consisting of the letters 'AGC' in a bold, blue, sans-serif font. A small red square is positioned to the right of the letter 'G'.

AGC Inc.

Performance Chemicals General Division, Chemicals Company

December 5, 2023

Your Dreams, Our Challenge



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1. Positioning of the Performance Chemicals Business in the AGC Group

Overall Strategy

Leveraging the core businesses and the strategic businesses as two wheels, we will shift to an optimal business portfolio and continuously create economic and social value.

Core businesses

Establishing long-term, stable sources of earnings by increasing competitiveness of each business



Strategic businesses

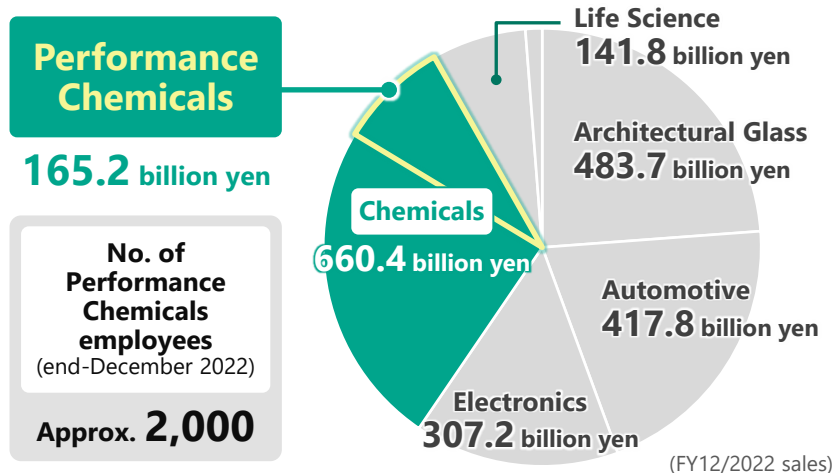
Create and expand highly profitable businesses that will become future pillars by using AGC's strengths in high-growth fields



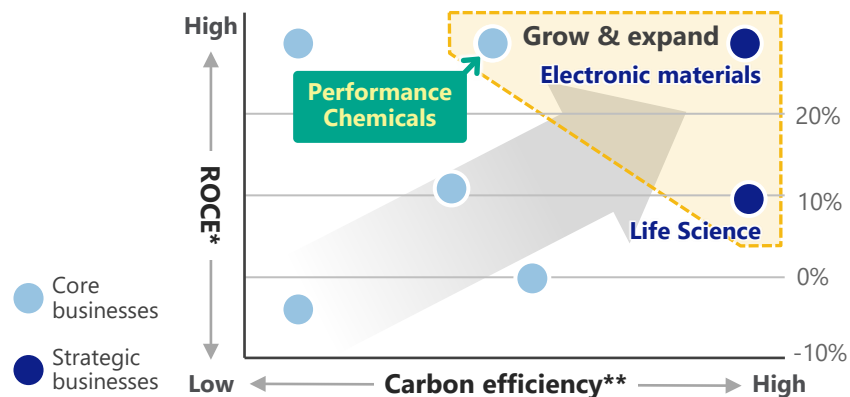
Positioning of the Performance Chemicals Business

- Part of the Chemicals segment and handles a wide variety of products consisting of functional chemicals and specialty chemicals
- Positioned as a growth business with high ROCE and carbon efficiency in the AGC Group's business portfolio

Business scale in the AGC Group



Positioning in the business portfolio



* Compiled based on 2022 ROCE

** Compiled based on 2021 emissions per 2022 sales

2. Overview of the Performance Chemicals Business

History of the Performance Chemicals Business

- The Performance Chemicals business started from making active use of chlorine
- We have established a unique presence in global markets

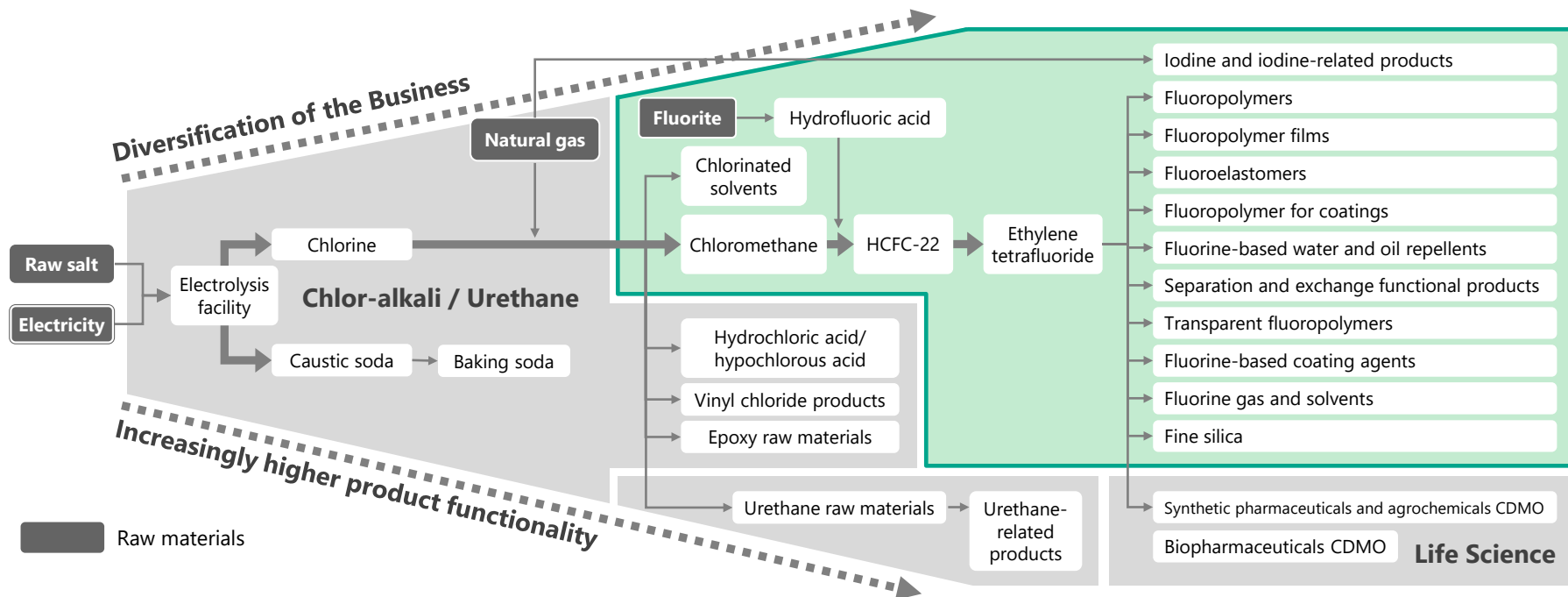
60's	1962	Starts research into fluoropolymers
	1964	Begins production and sales of CFC-12 for refrigerants and CFC-11 for foaming
	1965	Starts production of HCFC 22 as a raw material for fluoropolymers
	1968	Completes a pilot plant for Solvent CFC-113 and other products
70's	1971	Develops AsahiGuard water and oil repellent agents Introduces fluoropolymer production technology adopted from Allied Chemical (US)
	1972	Launches production and sales of ETFE fluoropolymer Starts production of sulfur hexafluoride (SF6)
	1973	Starts production of TFE monomer Starts sales of Fluoroelastomer AFLAS
	1976	Starts sales of fluoropolymer film AFLEX

80's	1981	Establishes Asahi ICI Fluoropolymers, a PTFE manufacturing company, with ICI (UK)
	1982	Launches Lumiflon, fluoropolymer for coatings
	1988	Develops CYTOP, transparent fluoropolymers
90's	1991	Starts production of CFC substitute, ASAHIKLIN AK-225
	1997	Establishes Asahi Allied Signal to specialize in the blended refrigerant business
	1999	Asahi ICI Fluoropolymers becomes a 100% subsidiary Acquires the UK-based ICI's fluoropolymer business and starts businesses in the U.K. and the U.S.
	2000	Develops a new production method "PERFECT" for fluorine compounds
00's	2006	Launches AsahiGuard E-SERIES, a new eco-friendly product
	2007	Starts overseas production of ETFE fluoropolymer in the U.K.

10's ~	2014	Develops next-generation refrigerant AMOLEA for air conditioners
	2014	Establishes new Technical Service Center in Shanghai, China
	2015	Completes production facility for next-generation automotive refrigerant HFO-1234yf at Chiba Plant
	2015	Opens new Technical Service Center in Amsterdam, Netherlands
	2016	Opens and starts operation at technical service center in Singapore, following those in Europe, the U.S., and China
	2017	Launches FORBLUE Family of separation and exchange functional products
	2018	Introduces Fluon+ series, which adds further functions to the characteristics of fluorine
	2022	AGC Si-Tech launches RESIFATM , an integrated brand of silica products

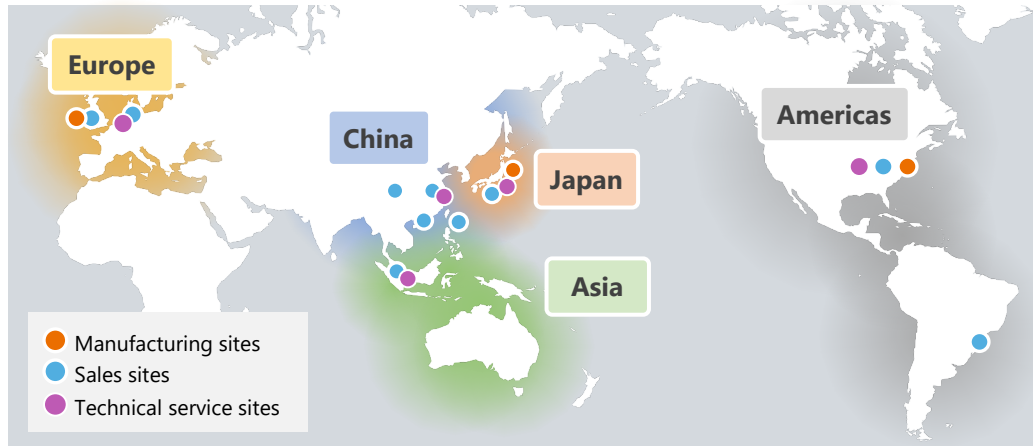
Product Flow in the Chemicals Business

- The Performance Chemicals Business is positioned in the downstream part of the chemical chain
- Wide range of product lineup to provide optimal solutions to meet customer requirements

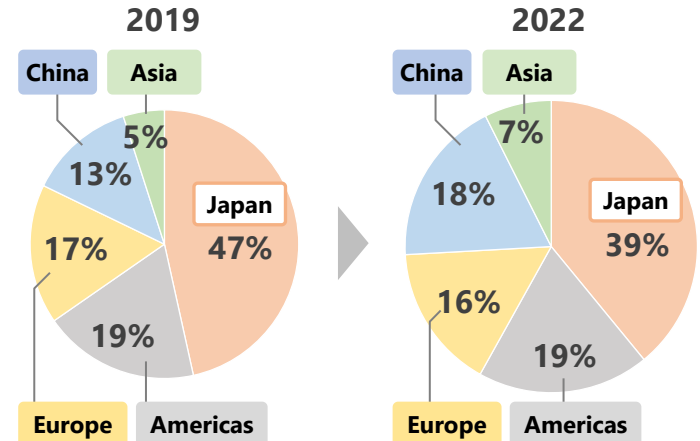


- Due to the wide variety of applications, the overseas sales ratio is about 60% and the consumption area is distributed globally in where each customer industry is located
- In addition to manufacturing sites in Japan, Europe, and the U.S., sales and technical service sites are located globally
- In recent years, demand has grown in China and Asia, home to many manufacturing sites in the semiconductor sector

Global distribution of performance chemicals business sites



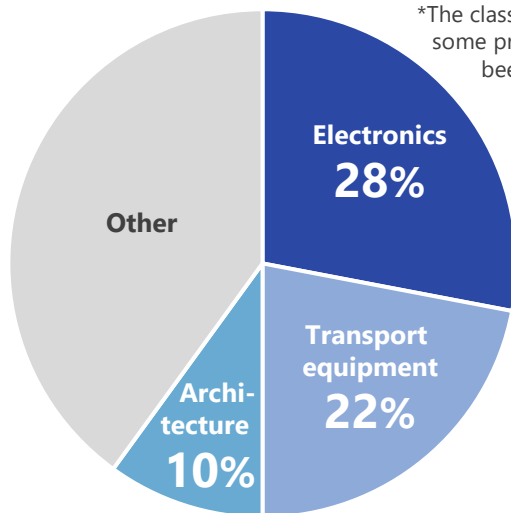
Sales breakdown by region



Main Demand Sectors

- About 60% of the demand is in the sectors of transportation equipment and architecture such as electronics, automobiles, aircraft, etc. which are the main applications
- The other remainder consists of diverse and specialized demand sectors

Sales ratio by application (2022)*



*The classification of some products has been updated

Electronics



Transport equipment



Architecture



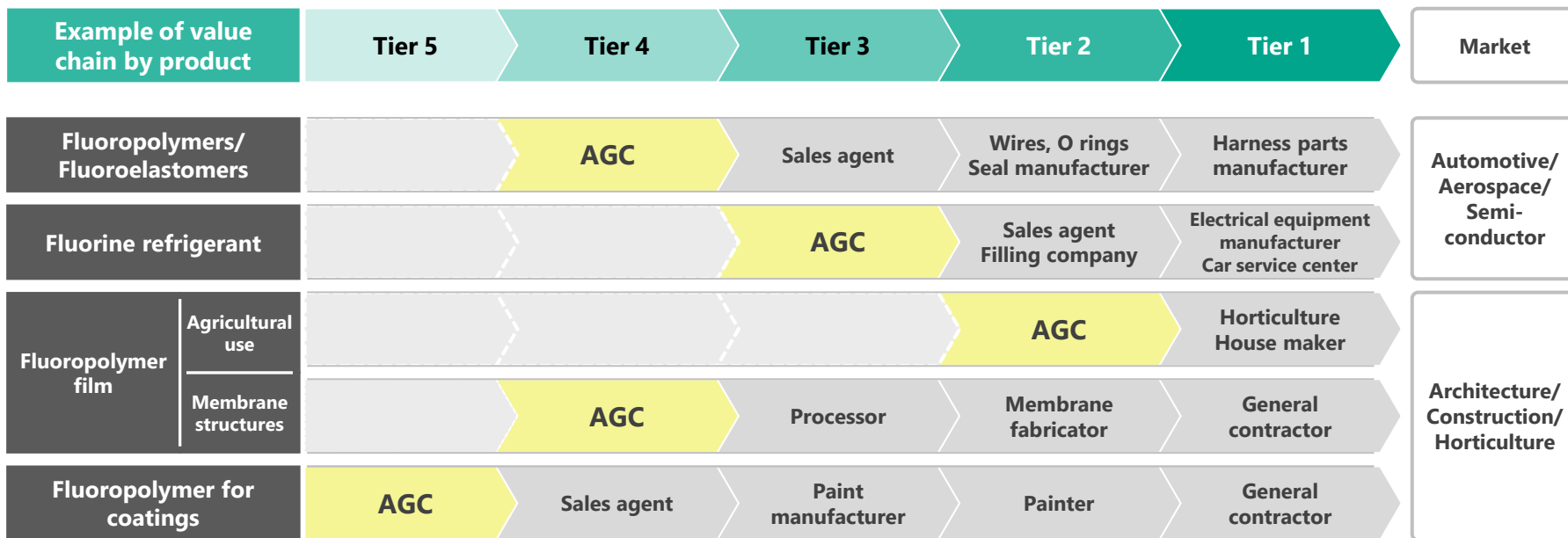
Excellent Characteristics of Fluorochemicals

- Our products with two or more superior characteristics differentiate them from rivals and are used in a wide range of industrial fields
- We continue to develop new markets with the technology to control characteristics

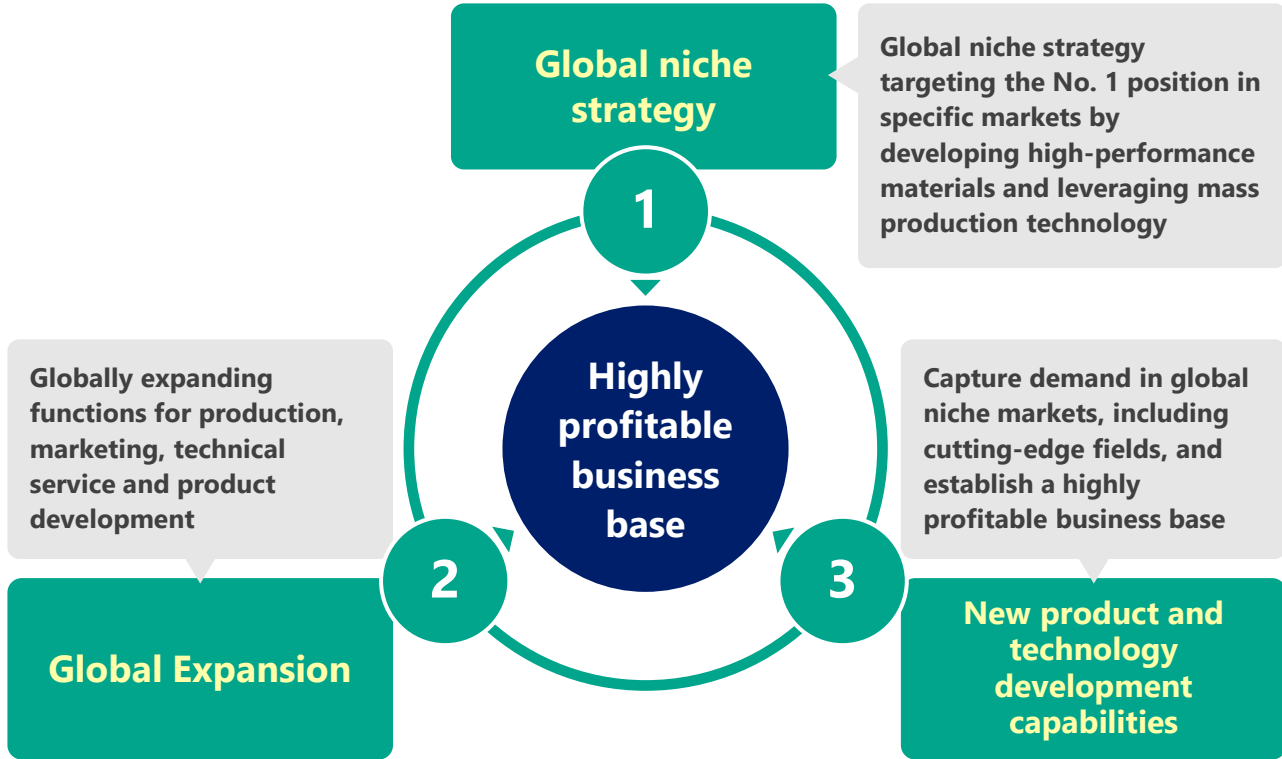
Major characteristics and sample applications for fluorochemicals		Heat resistance Resistance to cold	Chemical resistance	Weatherability Durability	Water and oil repellency Anti-stick properties	Mechanical characteristics	Electrical characteristics	Optical characteristics
Automobiles Transport equipment	Oil filters	●		●	●			
	Wire covering/fuel hoses	●		●		●	●	
	Oscillation components	●	●	●	●		●	
Electronics Tele-communications	O rings	●	●	●				
	Semiconductor packaging	●			●		●	
	Semiconductor manufacturing equipment components		●	●				
	Optical lenses				●			●
	Touch panels			●	●			
	Film for LED production processes				●			
	Printed circuit boards				●			
Architecture materials	Wire covering	●		●		●	●	
	OA equipment components	●			●			
	Coatings			●	●			
	Interior/exterior materials			●	●			
	Metal construction material coatings			●	●			
Energy	Roof/exterior wall/membrane structures			●	●			
	Solar cell materials			●			●	
	Power plant cables	●	●			●		
Infrastructure Plants	Bridge/steel tower coatings			●				
	Chimney/pipe sealing			●				
Industrial materials	Various sealants	●	●					
	Tubes/hoses	●	●					
Medical & lifestyle industries	Surgical gowns/medical masks				●			
	Food packages/containers				●			

Positioning in the Supply Chain

- These products are positioned upstream of the supply chain, which is difficult to recognize from the final consumer product side
- Market demand trends tend to appear late



3. AGC Group's Strengths



Strengths of the AGC Group: (1) Global niche strategy

- **Global Niche Strategy** through technological development using the exceptionally unique characteristics of fluorine compounds
- High entry barriers in manufacturing due to the **intermediates that are difficult to handle**

Products with the **No.1** global market share*



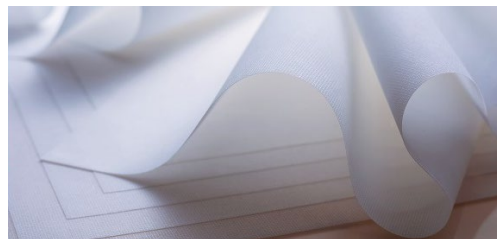
ETFE resin
(Fluoropolymer)



Fluorinated electrolyte polymer for **fuel cells**



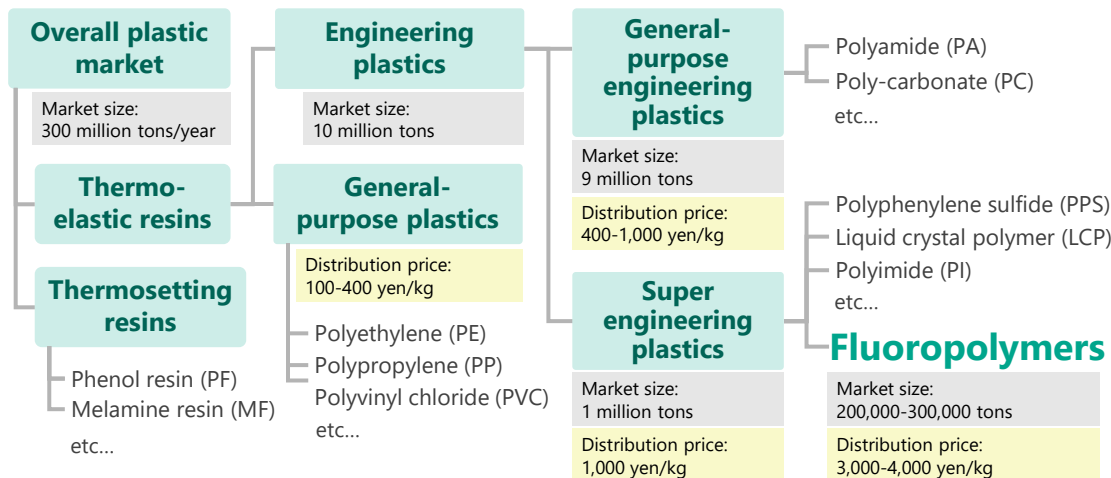
Fluoropolymers
for on-site coating



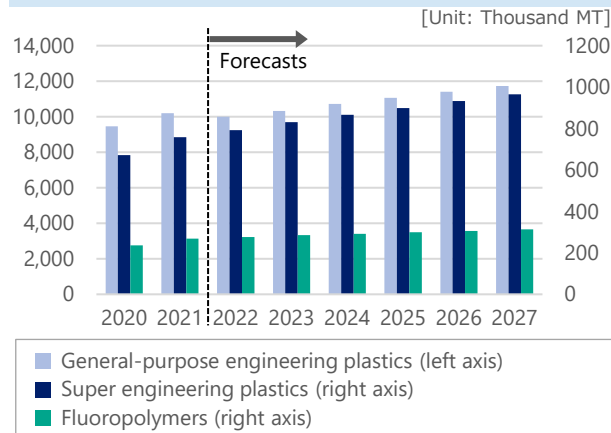
Ion-exchange membrane for chlor-alkali electrolysis

- Fluoropolymers, AGC's mainstay product, are used in applications with special physical properties and have a high sales price level
- Due to the increasingly sophisticated final products in growing markets such as automobiles and semiconductors, the required specifications for materials have become more sophisticated, and the market is expanding.

Fluoropolymers in the resin market



Engineering plastics and fluoropolymer market trends



Source: Fuji Keizai, "2023 Engineering Plastic Market Outlook and Global Strategy" (Part 1 and 2)

- AGC's fluoropolymers have established the world's leading technology and production capacity, since the world's first successful mass production of ETFE about 50 years before.
- In addition to the high performance of our materials, Fluon® products are **highly evaluated by the market for our differentiated technologies**, such as excellent processability
Refining technical capabilities to meet customer needs and further improve characteristics



Fluon® product characteristics

- High heat resistance, high weather resistance, flame resistance
- High electrical insulation, high optical characteristics
- Chemical resistance, non-adhesiveness, water and oil repellency

Fluon® product application examples


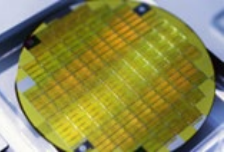

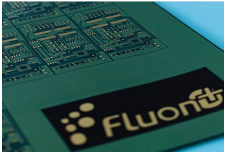
- Wire coating material
- Liquid transfer tubes
- Various linings and coatings
- Film (Membrane structure, green houses)
- Gaskets, packing
- Oil seals

Strengths of the AGC Group: (2) Global expansion

- Globally expanding functions for manufacturing, marketing, technical service and product development
- Considering building a strategic planning system in each area to focus on initiatives for medium- to long-term themes



- Increasingly market are requiring more sophisticated specifications for materials in growth markets such as hydrogen and semiconductors with increasingly higher product functionality
- Developing new products and technologies with fluorine technology cultivated over many years to meet needs

	Hydrogen business	Semiconductor business
Consumer goods	<ul style="list-style-type: none">■ Hydrogen power generation■ Alternative fuel feedstock■ Fuel-cell vehicle 	<ul style="list-style-type: none">■ High-speed and high-capacity communications■ Millimeter wave band utilization expansion 
Required technology	<ul style="list-style-type: none">■ Water electrolysis devices to produce hydrogen■ Fuel cells requiring hydrogen	<ul style="list-style-type: none">■ Achievement of low dielectric constant and low dissipation factor of dielectric materials, reduction of transmission loss
Necessary materials	<ul style="list-style-type: none">■ Electrolytic membrane for water electrolysis■ Electrolyte polymer solution for fuel cells 	<ul style="list-style-type: none">■ Silica products as inorganic filler and EA-2000 as printed circuit board material 

4. Future Growth Strategy

- Contributing to the sustainable society with the further deepening and developing fluorine technology for social issues such as environmental problems

SUSTAINABLE DEVELOPMENT GOALS

Performance Chemicals Business
Contributing to the Realization
of a Sustainable Society

Examples of fluorine technology cultivated by AGC

- Polymer synthesis and polymerization technology
- Molecular design technology
- Molding and compounding technology
- Film forming technology
- Mass production technology



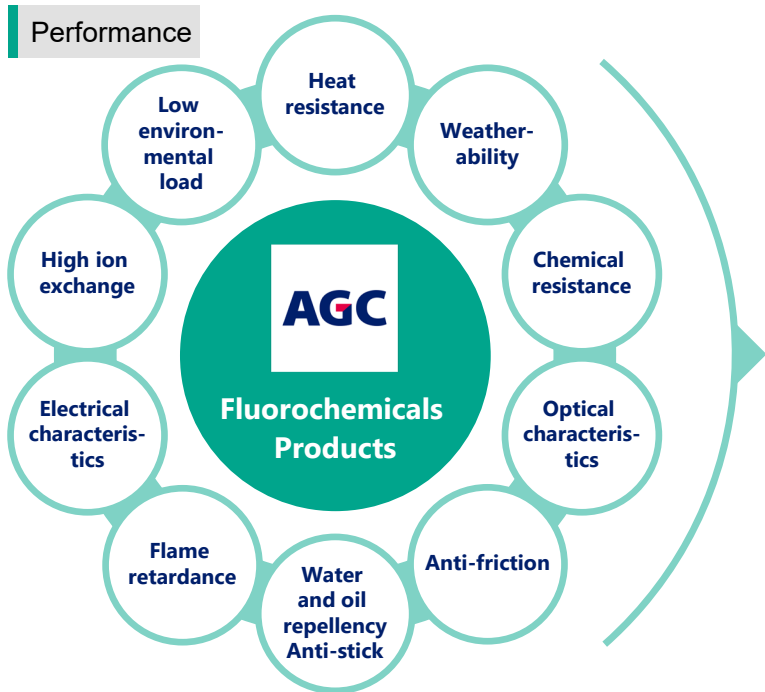
*1 VOC: Volatile Organic Compounds

*2 ODP: Ozone Depletion Potential

*3 GSC: Green Sustainable Chemistry Award











*4 FCDIC: Fuel Cell Development Information Center

- Establishing growth areas where AGC's fluorochemicals performance will contribute to solving sustainable management issues



1	<h2>Safe and secure society</h2> <p>Issues Solving food, water problems, realizing a healthy and long-lived society</p>	
2	<h2>Comfortable society</h2> <p>Issues Development of social infrastructure and smart society</p>	
3	<h2>Environmentally friendly society</h2> <p>Issues Development of a hydrogen society, addressing environmental protection</p>	

Initiatives in Growth Areas

	Main products									
	Fluoropolymers	Fluoropolymer films	Fluoroelastomers	Fluoropolymer for coatings	Water and oil repellents	Separation and exchange functional products	Transparent fluoropolymers	Coatings	Gas/solvents	Fine silica
	Fluon Fluon+	AFLEX F-Clean	AFLAS	Lumiflon	Asahi Guard	FORBLUE	CYTOP	SURECO	AMOLEA	RESIFA
										
Food/water solutions		●				●				
Realization of a healthy and long-lived society	●				●	●	●			●
Development of social infrastructure		●		●		●				
Building a smart society	●	●	●				●	●		
Building a hydrogen society						●				
Addressing environmental conservation						●			●	●

Products Expected to Grow in the Future:

(1) Fluorinated electrolyte polymers for fuel cells



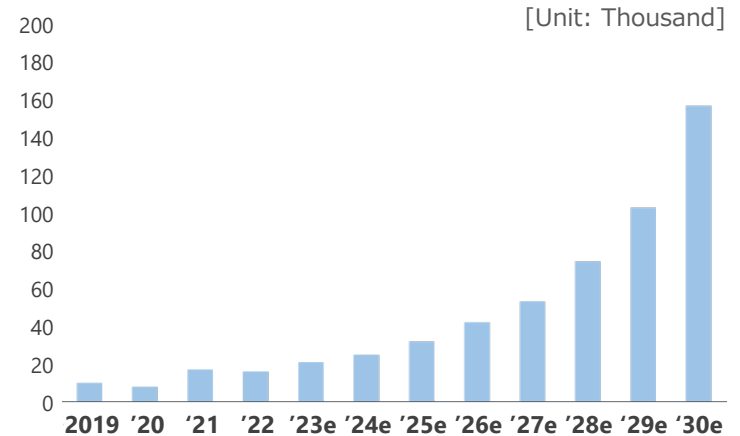
- Demand growth is accelerating due to the diffusion of fuel cell vehicles and technological development toward the realization of a hydrogen society.
- AGC supplies **fluorinated electrolyte polymers for fuel cells**, which are indispensable for fuel cells
- High quality that combines high power generation performance and durability achieved by differentiated technological capabilities to establish an **overwhelming No. 1 position**



AGC Group's Strengths

Issues with conventional products	AGC Group's Strengths
Battery cooling required due to insufficient thermal resistance of electrolytes	Developed electrolyte with excellent heat resistance
Electrolyte degradation during power generation	Durability is also dramatically improved by AGC's original technology (NPC*1 technology)
Increased cost due to the use of platinum as a catalyst	Molecular design technology that significantly reduces platinum usage

Fuel cell vehicle production volume*2

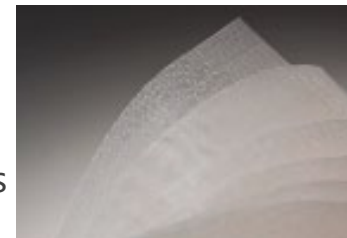


*1 New Polymer Composite *2 Compiled from S&P Global data

Products Expected to Grow in the Future: (2) Fluorinated sulfonate ion-exchange membranes



- Growing demand for electricity derived from renewable energy accelerating introduction of water electrolysis devices for hydrogen production
- AGC has integrated its electrolyte technologies for fuel cells and ion-exchange membrane technologies for chloroform electrolysis to supply electrolyte membranes for water electrolysis with the **world's highest efficiency and safety performance**



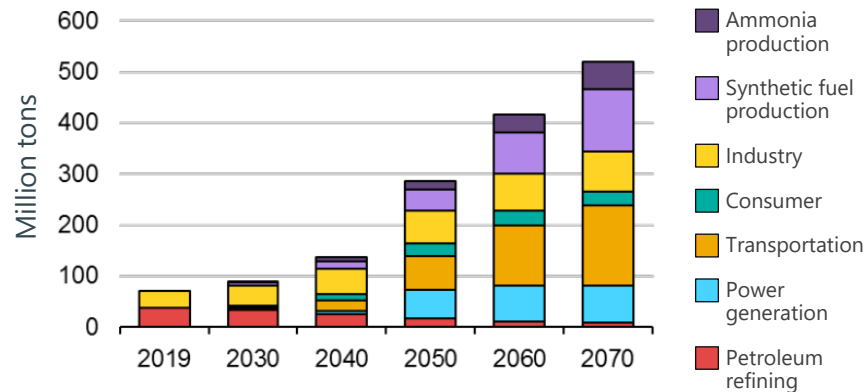
AGC Group's Strengths

Minimal electrical resistance, which improves efficiency of water electrolysis

Low hydrogen leakage, suitable for safe operation of water electrolysis

Excellent handling and dimensional stability due to reinforced body

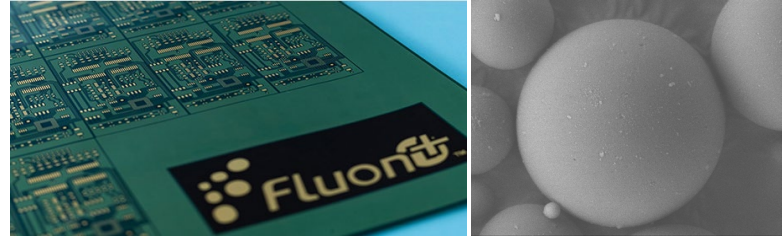
Trends in hydrogen demand*



* Hydrogen-related: Including synthetic fuels through ammonia, methanation, etc.

Products Expected to Grow in the Future: (3) Fluon+™ EA-2000 / Silica for inorganic fillers

- As communication speeds and capacities increase, there is a need for substrate materials with low dielectric constant, low dielectric dissipation factor, and reduced transmission loss



AGC Group's Strengths

Fluon+™ EA-2000

Unique characteristics of low-dielectricity fluoropolymer with adhesive properties, enabling printed circuit boards with composite low-transmission-loss materials

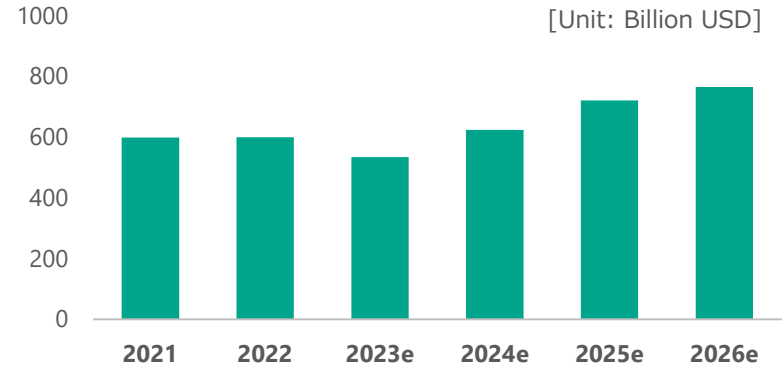
Available in various forms such as powders, films, and dispersions according to customer needs

Silica for inorganic fillers

Lowest dielectric constant and dissipation factor in the industry with AGC's proprietary silica technology

Available in a wide range of applications, including printed circuit boards and semiconductor sealants

Semiconductor market size*



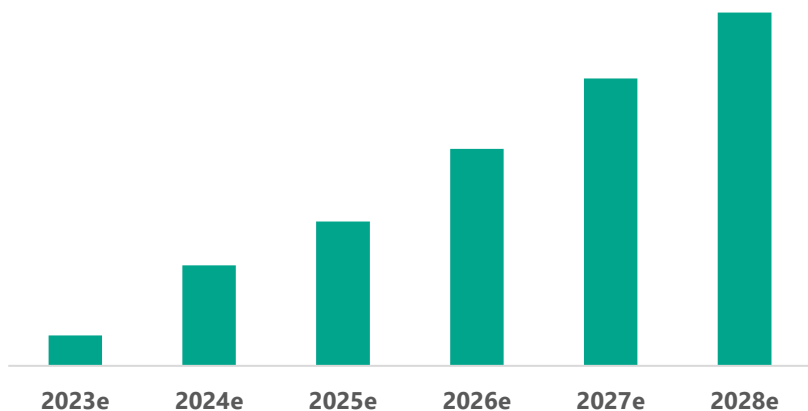
* Chart created by AGC based on Gartner data. Gartner®, Semiconductors and Electronics Forecast Database, Worldwide, 3Q23 Update, Rajeev Rajput et al., 4 October 2023, Semiconductor Revenue by Electronic Equipment basis.

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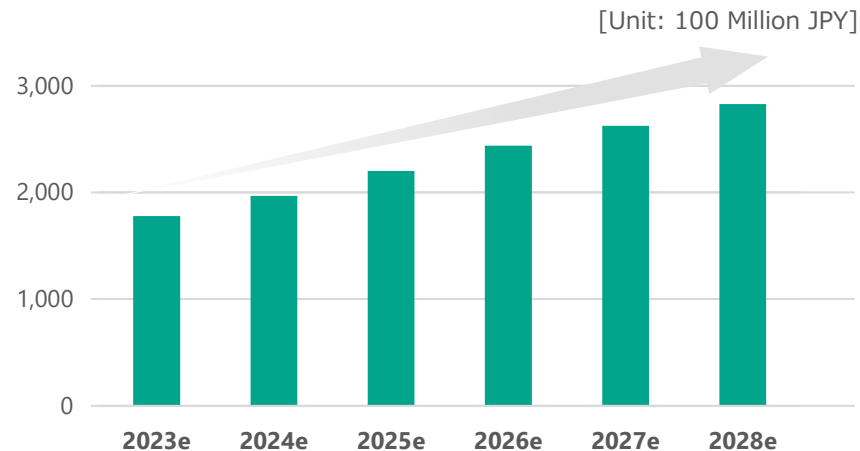
Medium- to Long-term Earnings Targets

- Decided in March 2023 to invest 35 billion yen to increase fluorine product capacity (scheduled to start operation in 2Q 2025)
- In addition to existing applications, we aim to capture cutting-edge needs and achieve sales of 200 billion yen or more by 2025 and 300 billion yen by 2030

Performance Chemicals Business: Conceptual image of Cumulative Investment



Performance Chemicals Business: Sales Trends



5. PFAS Regulatory Trends

PFAS : generic name for fluorine compounds, and there are about 12,000 kinds

- AGC has no history of manufacturing PFOS, which is currently regulated. Furthermore, we terminated the manufacturing and sales of PFOA by 2015, prior to the regulation*.
- To fulfill its corporate social responsibility, AGC Group is working to minimize the environmental impact of our business activities and reduce the environmental impact of our products based on scientific evidence

Regulated substances

PFOS

Aqueous Film-Forming Foam



Surface treatment agents



AGC has no experience in manufacturing or selling PFOS

PFOA

Water repellents (old generation)



Emulsifier



AGC abolished manufacturing and selling PFOA ahead of regulation completely

AGC products

Ion-exchange membranes



Fluorinated resins



Meeting the OECD's criteria for Low concern Polymers i.e. low environmental, human health impacts and hazards

Pharmaceuticals



Agrochemicals



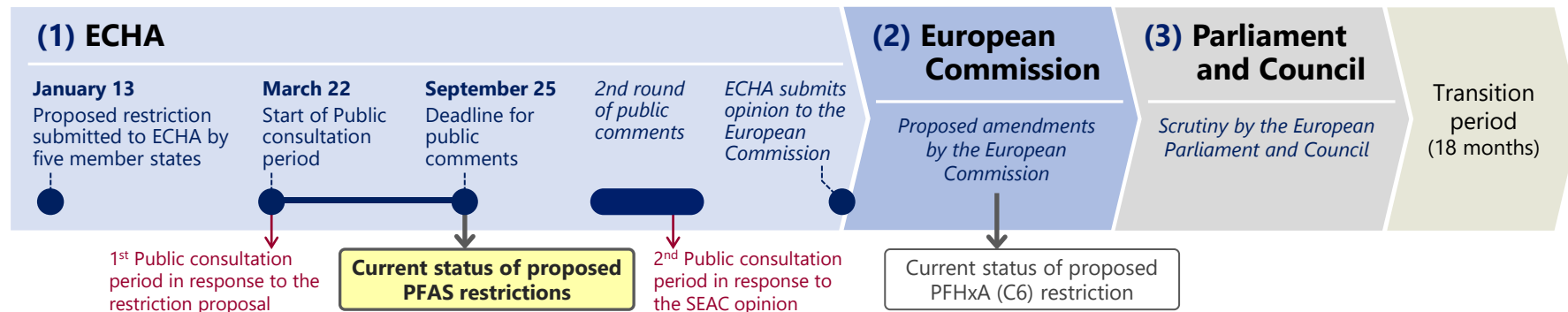
Strictly controlled by related law

*Regulations in this page refer to substances designated as Class I Specified Chemical Substances under the Act on the Regulation of Manufacture and Evaluation of Chemical Substances (Chemical Substances Control Law) in Japan.


- The expert committee of the European Chemicals Agency (ECHA) is currently reviewing the proposal of the universal PFAS restriction.
- The draft regulation may be adopted in 2025, and substances without a derogation period may be regulated no earlier than 2027. However, the ECHA's review process is taking time due to the significant number of public comments received, and the time frame for the regulatory process is currently unclear.
- AGC Group has submitted our public comments.

Review process of the proposal of the universal PFAS regulation in Europe

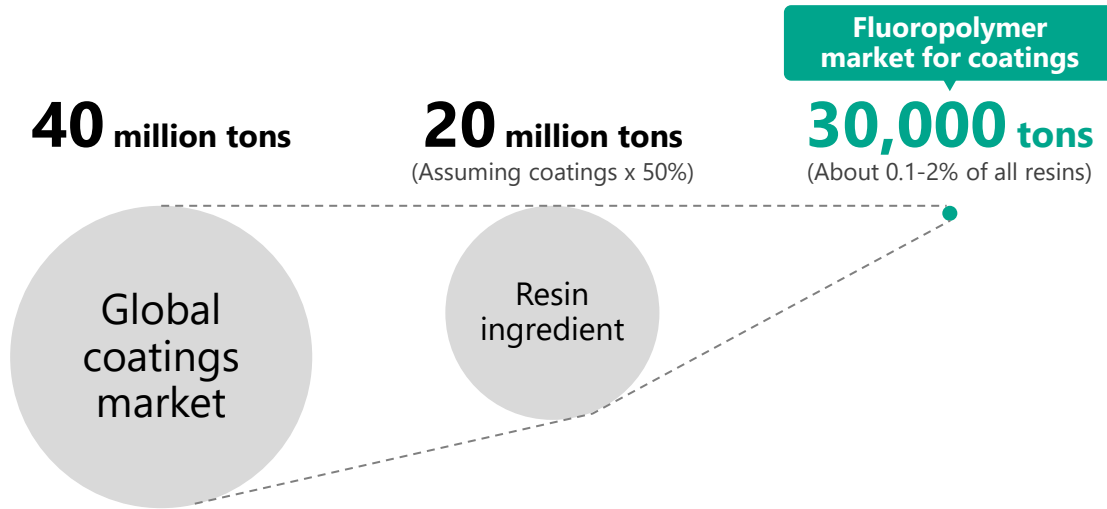
- (1) After two rounds of public consultation by ECHA, the expert committee submits their final opinion
- (2) The European Commission prepares a draft regulation referring the final opinion submitted, and the REACH Committee, consisting of member states, deliberates on and adopts the draft.
- (3) The adopted legislation enters into force after being scrutinized by the European Parliament and Council



APPENDIX

Business segment	Main products	Main areas of demand
<p>1</p> <p>Performance Chemicals</p> 	<p>(1) Fluoropolymers</p> <p>(2) Fluoropolymer films</p> <p>(3) Fluoroelastomers</p> <p>(4) Fluoropolymer for coatings</p> <p>(5) Fluorinated water and oil repellents</p> <p>(6) Separation and exchange functional products</p> <p>(7) Transparent fluoropolymers</p> <p>(8) Fluorine-based coating agents</p> <p>(9) Fluorinated gases and solvents</p> <p>(10) Fine silica products</p>	<ul style="list-style-type: none"> ■ Transportation equipment ■ Electronics ■ Architecture ■ Energy ■ Aerospace ■ Textiles/Paper ■ Agriculture ■ Cosmetics
<p>2</p> <p>Specialty</p>	<p>(11) Iodine and iodine-related products</p>	<ul style="list-style-type: none"> ■ Medical/ Pharmaceutical ■ Precision/Electrical equipment ■ Chemical industry ■ Food/Feedstuffs

- Positioning of fluoropolymer for coatings in the coatings market has very small but essential.








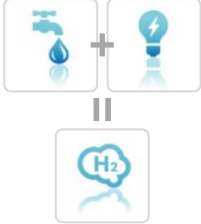




The market for fluoropolymer for coatings is extremely niche, accounting for about **0.1%** of the total resin market. It offers far superior weather resistance than other resins.



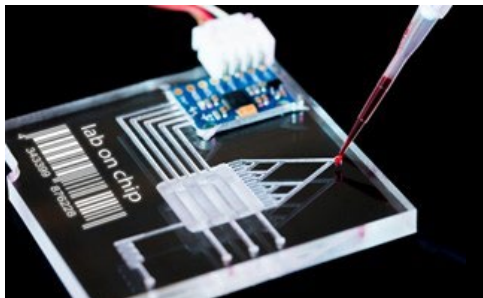
Coating name	Useable life until recoating
Acrylic resin-based coatings	4-7 years
Polyurethane resin-based coatings	10-12 years
Acrylic silicone coatings	10-15 years
Fluoropolymer coatings	25-50 years

Separation and Exchange Functional Products FORBLUE™

<p>Brand</p>					
<p>Products</p>	<p>Fluorinated electrolyte polymer</p>	<p>Fluorinated-ion exchange membrane</p>	<p>General-purpose fluorinated ion-exchange membranes</p>	<p>Electrodialysis tank</p>	<p>Humidity control module</p>
<p>Examples of applications</p>	<p>Fuel cell materials, etc.</p>	<p>Chlor-alkali electrolysis, etc.</p>	<p>Water electrolysis, storage batteries, etc.</p>	<p>Food processing, wastewater treatment</p>	<p>Humidification and dehumidification equipment</p>
<p>Image</p>					

- CYTOP™ has an amorphous structure, making it extremely transparent and soluble in proprietary fluorinated solvents and allowing for use as a thin film coating.
- It simultaneously achieves “light resistance,” “low refractive index,” “electrical insulation,” “water and oil repellency,” “chemical resistance,” etc.

Conventional uses



Biochip detection section

CYTOP® absorbs less water than silicone and has high water and oil repellency. It is widely used in the biochip field for its low-adhesion with biological materials.



Deep-UV LED encapsulants

CYTOP® is attracting attention for its transparency and light resistance. It has transparency equivalent to quartz in the UV-C region and can be processed more easily than quartz.



“Pellicle” dust-proof film for photomasks

Pellicles are used in environments where deep UV irradiated. CYTOP® has transparency and resistance in the deep UV region, making it ideal for pellicle materials.

Business Confidence by Demand Sector

- Due to the impact of COVID-19, recovery to 2019 levels, especially for aircraft applications, is expected to take time.
- Meanwhile, we aim to further increase earnings by expanding demand and new applications in the electronics, transportation equipment, architecture, energy-related and other fields, especially in emerging countries.

Demand sector		Current status	Future demand outlook
Electronics	Semi-conductor	The semiconductor cycle resulted in slack demand, especially for process applications	Continued growth due to strong demand for 5G-related products and data centers.
Architecture		Slumping demand due to high interest rates, soaring material prices, real estate market conditions in China, etc.	Demand to remain firm over the long term due to growing environmental awareness
Transportation equipment	Automobile	Recovery to 2019 level and demand expansion due to the shift toward EVs	Recovery to 2019 level
	Aircraft	Recovering from the impact of COVID-19	Recovery to 2019 levels in 2024

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