

# Growth Strategies of Specialty Chemicals: Polyimide and Separation Membranes



Specialty products are key focuses for UBE. This category comprises finished products resulting from processing raw materials and raw materials for specialty offerings.

The polyimide products covered here are from raw materials made in-house, films, varnishes, hollow-fiber membrane modules, and other products stemming from processing expertise. They are showing higher growth than projected in our current medium-term management plan amid significantly fluctuating raw materials and fuel costs.

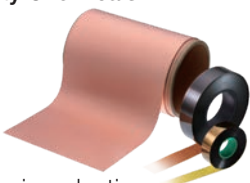
As well as polyimide, our inorganic materials-based offerings include high-purity silicon nitride. Group companies provide such functional products as lithium battery materials, with their product lineups centering on separators.

Under our medium-term management plan, we seek to increase revenues and earnings by setting main target markets of high heat-resistant polyimide and silicon nitride materials for electric vehicles (xEVs) and separation membranes for biofuels that contribute to carbon neutrality in addition to our traditional target markets of semiconductors and electronic components.

**Keiichi Nagata**  
Senior Managing Executive Officer  
General Manager,  
Specialty Products Div.



## Growth Strategies of Specialty Chemicals: Polyimide



### Product Characteristics

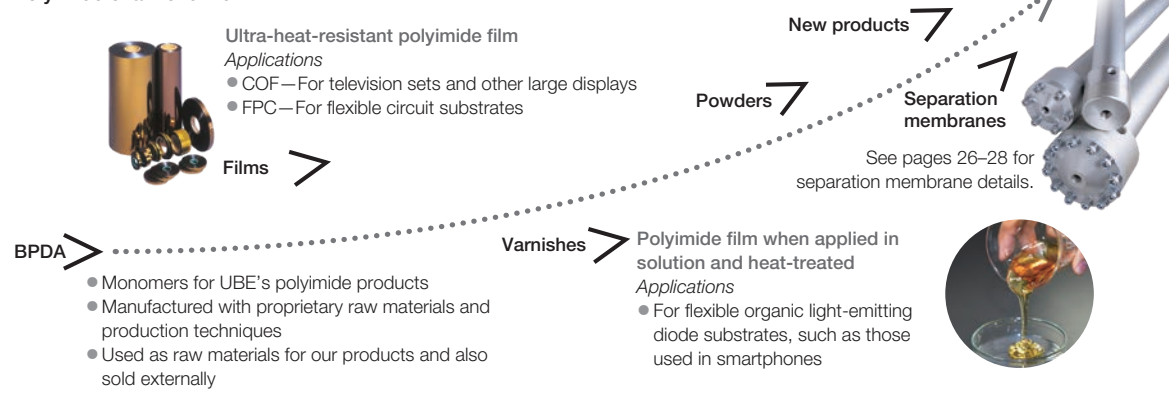
Polyimide is a super engineering plastic with outstanding strength and heat resistance. Its applications span from televisions, smartphones, and automobiles to aerospace.

UBE is the world's only manufacturer to have

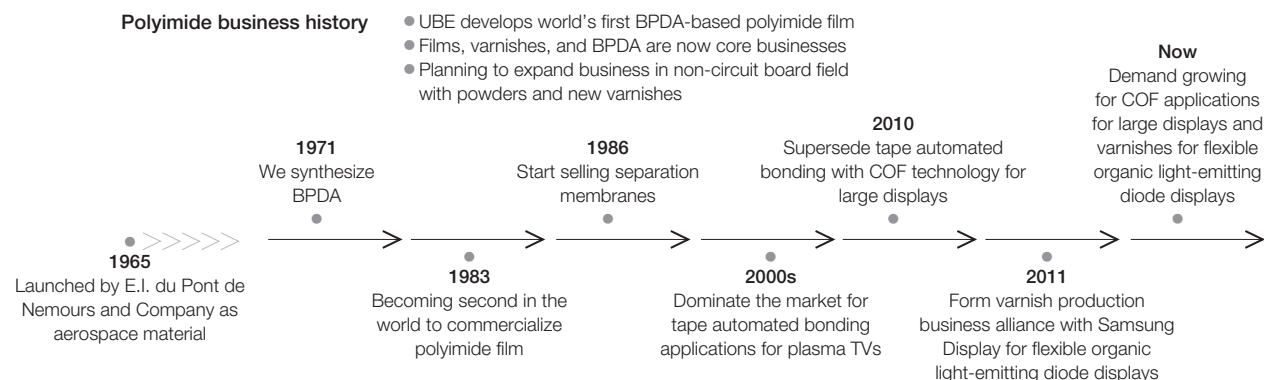
integrated production from biphenyl tetracarboxylic dianhydride (BPDA), a raw material, to varnish, film, and powder. Our raw materials and proprietary manufacturing techniques enable us to create products with features that competitively differentiate us. Our polyimide has a high market share in chip-on-film (COF) applications for large displays and flexible organic light-emitting diode substrates.

We also manufacture gas separation membranes incorporating polyimide hollow fibers (see pages 26–28 for details) and develop new products.

### Polyimide chain overview



### Polyimide business history



### New Value Creation

#### Opportunities and risks

##### Opportunities

- Demand for high heat-resistant polyimide is growing amid the uptake of 5G communications for smartphones and automobile electrification
- New applications created for BPDA-based polyimide requiring high heat resistance

##### Risks

- Changes in prescribed properties and replacements with other technologies
- Greater emergences among new polyimide manufacturers, particularly in China

#### UBE's strengths

- Integrated production of films, varnishes, and powders with in-house raw materials
- Unmatched line of BPDA-based products and unique molding and processing technologies
- BPDA-based polyimide product development capabilities and intellectual property strategy
- Market intelligence gathering capabilities

#### New value creation

- Contribute to an advanced digital economy by continuing to deliver distinctive offerings that markets need and only we can offer (for better living)

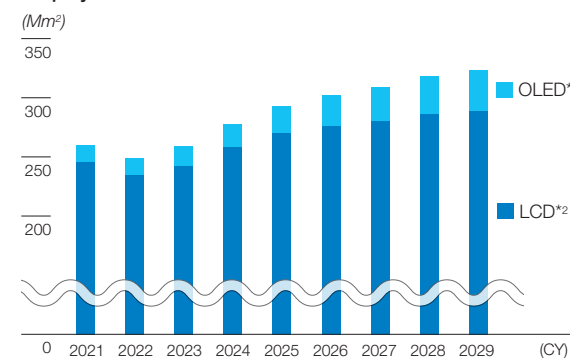
We are expanding target markets to contribute further to earnings growth through our polyimide chain.

### Social and Market Analysis

UBE enjoys a high share of the market for chip-on-film applications. We expect demand for large television sets employing this technology to expand at 3% to 4% annually. In the smartphone market, we expect that more products will incorporate flexible organic light-emitting diodes, for which our varnish is a strength. Also, we look for polyimide demand to increase in 5G-compatible flexible printed circuits, automotive, and other new applications.

We expect that materials requirements will diversify with technological innovations in displays. Demand for flexible solar cells and other environmentally friendly products should rise as environmental concerns grow.

### Display area trends



Source: UBE estimates based on a range of data  
\*1 Organic light-emitting diode  
\*2 Liquid crystal display

### Vision for 2030

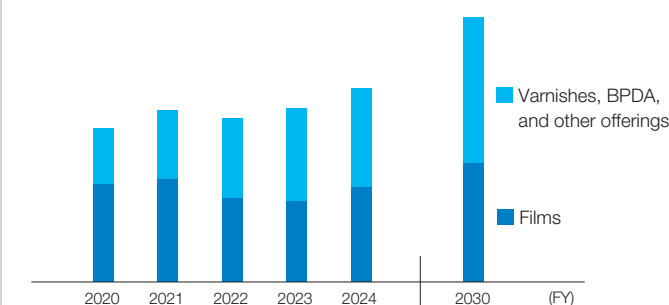
We will leverage our strengths in BPDA, films, and varnishes to secure high market shares in niche markets and remain very profitable to generate steady earnings growth in line with market expansion. By drawing on our edge in technology, product development, information gathering, and other areas, we will flexibly tackle changes in demand attributes and establish a structure that enables us to remain very competitive beyond 2030.

### Growth Strategies

#### Progress under the Medium-Term Management Plan

- Chip-on-film unit sales for large displays declined amid lower demand for TVs and other products in fiscal 2022. On the upside, varnishes for flexible organic light-emitting diodes remained robust on a higher ratio of products with panels incorporating these offerings despite sluggish smartphone demand.
- Sales of powders for semiconductor manufacturing and inspection equipment increased as planned.

### Sales trends







**Toward 2030**

For biphenyl tetracarboxylic dianhydride and films, we will decisively capture expanding demand by steadily launching new facilities.

While expanding sales of films for flexible solar cells, we will steadily develop binders for lithium-ion batteries and water-based varnishes and contribute to a growing range of environmentally friendly products.

**Growth Investments (expansion plans)**

(Production capacity increases)

BPDA	Operational start in second half of fiscal 2023	+60%
Films	Test Operation start in second half of fiscal 2024	+20%

**R&D and Intellectual Property**

We will develop advanced products in response to social needs. These could include better living

through digital technology and a growing awareness of the need to safeguard the environment.

We will provide products that leverage our strengths in BPDA-based polyimides, thus helping improve living standards and embedding environmentally friendly technologies in society.

**Digital Transformation**

- Strengthen marketing  
We cultivate new applications and customers through outbound marketing by digitally gathering customer information, analyzing markets, and strengthening customer touchpoints.
- Reinforce quality controls  
We are working to investigate the causes of defects by analyzing big data, monitor processes by using business intelligence tools, and visualize changes.
- Automation  
We are digitizing processes by deploying tablets and using robotic process automation to automatically collect data and streamline process management.

**R&D employee message**

I develop polyimide materials for advanced displays. I endeavor to attain properties that customers prescribe by employing organic synthesis techniques and evaluation methods that are comparable to actual processes while communicating closely with customers. I aim to help enhance UBE's brand position and technological prowess in the flexible display market.

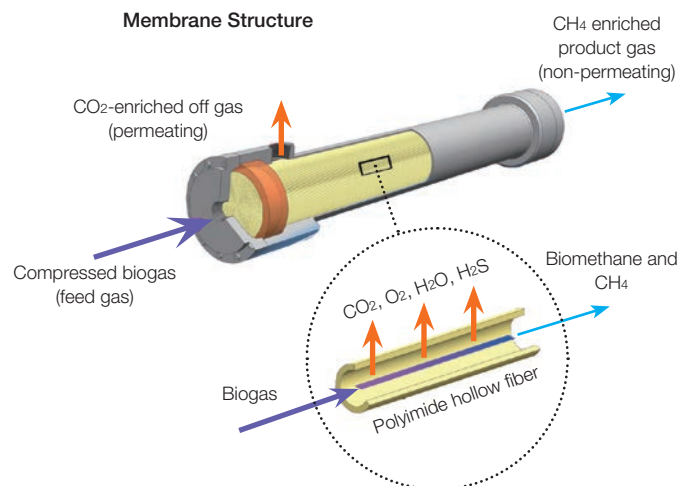
**Yuki Nemoto**

*Polyimide Group,  
Polyimide and Specialty Products R&D Dept.,  
Specialty Products Div.*



**Growth Strategies of Specialty Chemicals:**

**Separation Membranes**



**Product Characteristics**

There has been extensive research into polyimide as a separation membrane material because it offers outstanding heat and chemical resistance, mechanical strength, and high gas and vapor permeability and separation. UBE's gas separation membranes employ fine straw-shaped hollow fibers (with an outer diameter of 0.2 mm to 0.5 mm and an inner diameter of 0.1 mm to 0.4 mm) made of BPDA-based polyimide. The membranes separate mixtures of gases and vapors (with a molecular size of 250–550 picometers) by harnessing the permeability differences of the polyimide layer, which is about 100 nanometers thick, on the exterior surfaces of the membranes.

We package BPDA-based polyimide membranes in containers and provide them to customers as separation membrane modules. Their diverse applications include nitrogen enrichment (air separation), dehumidification, organic

**New Value Creation**

**Opportunities and risks**

**Opportunities**

- Building on the environmental contribution lead of our European business to replicate that approach in North America and Asia

**Risks**

- National policy changes or revisions owing to international conflicts

**UBE's strengths**

- Growing awareness of its energy-saving, maintenance-free membrane separation method
- UBE separation membranes employing in-house raw materials to deliver high gas permeability, separability, and durability

**New value creation**

- Contributing to surging production of biomethane and other renewable energy sources
- Contribute to a better environment and cut GHG emissions

solvent dehydration (alcohol dehydration), and hydrogen and carbon dioxide separation.

**Social and Market Analysis**

The public and private sectors are diversifying their energy sources, chemical raw materials, and other resources to cut GHG emissions and stabilize procurement. This situation has increased demand for carbon dioxide separation membranes

for biomethane production, organic solvent dehydration membranes for alcohol purification, and hydrogen separation membranes for hydrocarbon production. This trend should continue. We anticipate surging demand in this area in view of accelerating efforts to produce biomethane by separating carbon dioxide from biogas derived from livestock manure and waste, especially in Europe and the United States.

**Application Examples**

**Environment and Safety**



**Nitrogen enrichment**

Removing oxygen from compressed air to obtain nitrogen



Including protection from explosions of oil, gas, coal, chemicals, or other materials, the On-Board Inert Gas Generation System for aircraft, analytical gases, and laser cutter gases



**Dehumidification**

Obtaining dry air by removing water vapor from compressed air



Including railroad and machine tools and other pneumatic equipment, medical devices, and analytical equipment

**Environment and Energy**



**Organic solvent dehydration**

Removing water from alcohol and other organic solvents



Refining bioethanol, industrial and pharmaceutical ethanol, isopropanol, ketones, and other substances

**Hydrogen separation**

Obtaining hydrogen and other useful gases from mixed gases



Hydrogen recovery for oil refineries, methanol, ammonia and renewable energy production, and adjusting concentration of syngas

**Carbon dioxide separation**

Removing carbon dioxide from carbon dioxide and methane mix to obtain pure methane

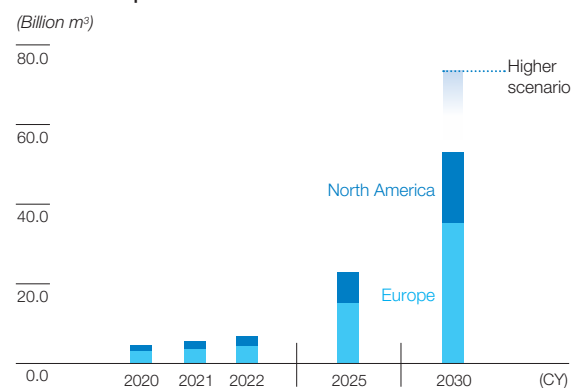


Biogas, landfill gas, natural gas, and other methane enrichment



# Growth Strategies of Specialty Chemicals: Fine Chemicals and Composites

## Biomethane production



Source: UBE estimates based on a range of data

### Vision for 2030

Demand is surging for carbon dioxide separation membranes for biomethane production. These offerings accounted for around 50% of membrane sales volume in fiscal 2022. We are a leading supplier of carbon dioxide separation membranes for biomethane production. We thus aim to capture fast growing demand and significantly enhance earnings growth by 2030. At the same time, we will strive to lift sales of environmentally friendly products, including hydrogen separation membranes and alcohol dehydration membranes, to 70% of sales and establish a business model delivering sustainable growth.

### Growth Strategies

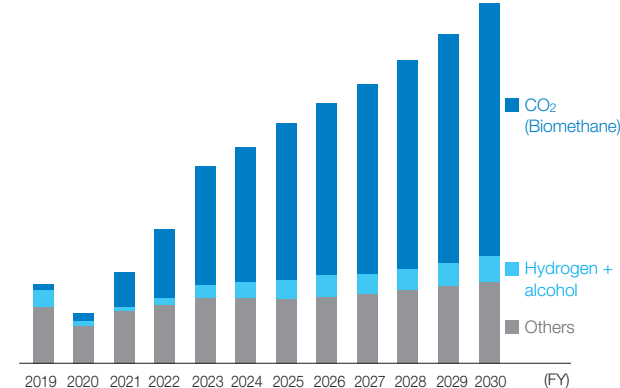
#### Progress under the Medium-Term Management Plan

- In view of surging demand for carbon dioxide separation membranes to produce biomethane, we decided to bring forward plans to upgrade our polyimide hollow fiber membrane production facilities for gas separation membranes at the Ube Chemical Factory and separation membrane module production facilities in the Sakai Factory. These new facilities should go on line in the first half of fiscal 2025.
- We will prepare for further demand growth by gathering intelligence and will explore additional investments at the right times and places.

#### Toward 2030

Renewable energy uptakes are accelerating. We

## Sales volume



will therefore cultivate technologies and solutions to materialize a green, hydrogen-based economy. Such an economy would feature such energy sources as biomethane, bio-alcohol, and sustainable aviation fuel, and use carbon dioxide effectively. We aim to expand our separation membrane business across diverse fields.

### R&D and Intellectual Property

Research and development into polyimide hollow fiber for gas separation membranes started in the 1970s. This work bore fruit in 1986 with hydrogen separation commercialization. We have since developed separation membranes offering high permeability, separation, and durability for a range of applications. In R&D for manufacturing and applying hollow fiber membranes, containers, and separation membrane modules, repeated molecular, materials, strength, process, and other design processes and verification are driving our technology forward. We will continue to bolster our product capabilities and keep undertaking R&D to resolve environmental issues.

### Digital Transformation

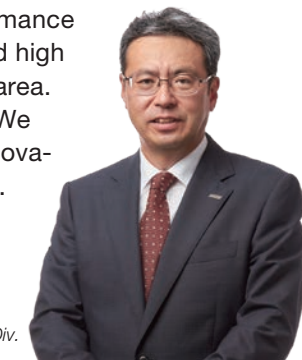
Our membrane module factory was an early adopter of a smart factory. It has enhanced productivity and quality, human resources development, and technology transfers. We will leverage big data from that factory to keep enhancing design and production technologies.



Dimethyl carbonate is a key C1 chemical product derived from our proprietary nitrite technology. We expect demand to grow for this product as a raw material for lithium-ion battery electrolytes and semiconductor photoresist developer solutions. High-performance coatings are downstream offerings in the C1 chemical chain. They have earned high regard for being eco-friendly. We will continue to expand our business in that area.

Composites are downstream from such businesses as lactams and nylon. We will expand composites beyond nylon, developing functions to meet market innovation needs as eco-friendly offerings, symbolized in the shift to electric vehicles.

We will lift production capacity overseas for C1 chemicals, high-performance coatings, and composites businesses and drive significant global growth for them.



Masayoshi Ota  
Managing Executive Officer  
General Manager,  
Performance Polymers & Chemicals Div.

## Growth Strategies of Specialty Chemicals:

### C1 Chemicals and High-Performance Coatings



#### Product Characteristics

Our C1 chemicals are chemical chains derived from our unique nitrite technology, which we developed using carbon monoxide as a raw material. They are pivotal to downstream high-performance coatings and other aspects of our specialty chemicals growth strategy.

Dimethyl carbonate is a key offering. Our nitrite process for this product differs from those of other companies, delivering high quality without by-products. It is thus increasingly important as a raw material for lithium-ion battery electrolytes and semiconductor photoresist developer solutions, which both require high quality. It is also an important basic raw material for our expanding range of downstream polycarbonate diols. Dimethyl

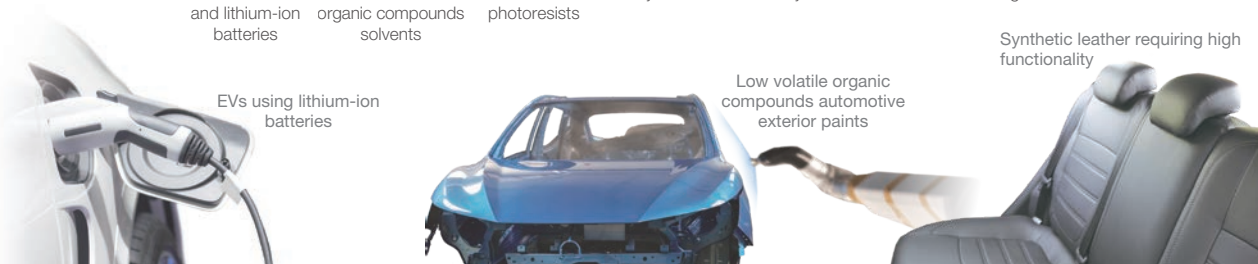
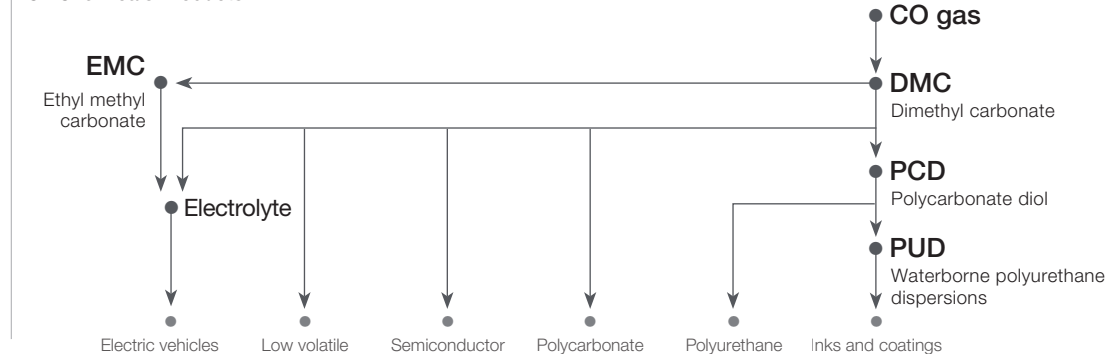
carbonate is a common eco-friendly solvent because it is not a volatile organic compound.

UBE dominates the global polycarbonate diol market. We develop diverse grades to match the properties that customers prescribe. Our structure for supplying this product from Japan, Spain, and Thailand allows us to match our sales and development setups to specific market needs.

Polycarbonate diol is the main ingredient (polyol) in such high-performance polyurethane resins, notably for synthetic leather and coating materials. It can improve the heat, weather, hydrolysis, and oil resistance of polyurethane products. It enjoys high regard as an environmentally friendly product.

Waterborne polyurethane dispersions made from polycarbonate diol feature nano- through micron-level polyurethane particles dispersed in water. Common applications are as key constituents of automotive exterior paints and textile printing inks for clothing because these dispersions are free of volatile organic compounds and are environmentally friendly.

## C1 Chemicals Products



## Sales employee message

I engage in gas separation membrane sales at UBE Europe GmbH (Germany). The European Union seeks to shift away from the fossil resources that it procures from Russia. It has embarked on plans to increase biomethane production around 10-fold as a natural gas alternative by 2030. Because of their outstanding durability and gas separation performance, UBE's gas separation membranes have earned the trust of customers and continue rapid growth for this application. Refining biogas can produce bio-derived CO<sub>2</sub> together with biomethane, therefore its value in use is increasing. Our separation membranes are helping to decarbonize the economy.

Kentaro Wakamura  
UBE Europe GmbH





**New Value Creation**

**Opportunities and risks**

**Opportunities**

- Growing demand for lithium-ion battery electrolyte in expanding market for battery electric vehicles
- Rising demand for eco-friendly, high-performance resin products

**Risks**

- New manufacturer entries intensifying cost competition
  - ➔ Better performance and lower costs from technological development
- New powerplants replacing lithium-ion batteries
  - ➔ Development of diverse applications

**UBE's strengths**

- We offer carbon monoxide-based dimethyl carbonate that gives more choices of plant locations and with higher quality than from other companies, which use ethylene as a raw material
- Global development and supply structure and diverse product range for polycarbonate diol
- Automotive paints and textile printing inks employ polyurethane dispersions, taking advantage of the swelling and abrasion resistance of their polycarbonate diol raw materials and eco-friendliness

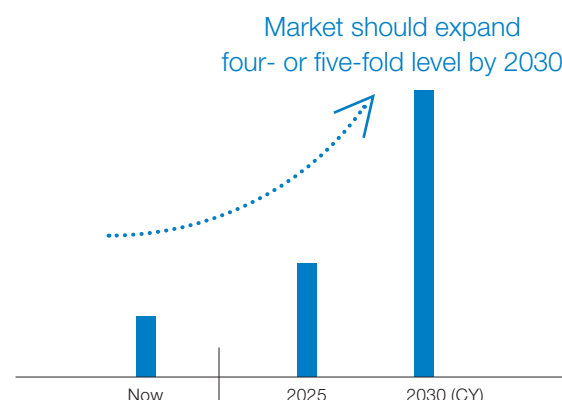
**New value creation**

- Supplying environmentally-friendly products and high-performance materials for better living
- Bolstering overseas sites to cater to local production and consumption needs and building supply structure encompassing multiple sites as part of business continuity planning

**Social and Market Analysis**

- A semiconductor shortage that reduced battery electric vehicle growth adversely affected the lithium-ion battery market in 2022. We nonetheless look for the market to expand four- or five-fold by 2030. Demand for dimethyl and ethyl methyl carbonate serving as the principal electrolyte components in various lithium-ion types should also soar.
- Demand for high-performance polyurethanes should climb 5% or so annually through 2030.
- The market for solvent-free coatings should expand 5% to 10% annually amid tighter environmental regulations.

**Global lithium-ion battery market forecast**



Source: UBE estimates based on a range of data

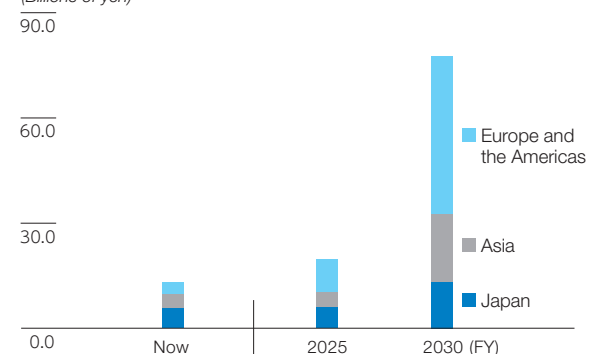
**Vision for 2030**

We will broaden local production and consumption by securing overseas plants for dimethyl and

ethyl methyl carbonate as battery electric vehicle markets expand. We will also transition faster to environmentally friendly products and increase our business in global markets, including through mergers and acquisitions and other inorganic growth strategies. By 2030, we target annual sales totaling ¥60 billion to ¥80 billion, with operating margins of 20% to 25%, from such C1 chemicals as dimethyl carbonate, polycarbonate diol, and polyurethane dispersion.

**C1 chemical chain product sales**

(Billions of yen)



**Growth Strategies**

**Progress under the Medium-Term Management Plan**

Sales of dimethyl carbonate for lithium-ion battery electrolyte are basically expanding on target. Polycarbonate diol sales are recovering despite a temporary dip owing to an economic slowdown in China. In Thailand, we look to expand sales as third facilities of polycarbonate diol becomes operational in fiscal 2023. In polyurethane dispersion,

the Ube Chemical Factory has inaugurated solvent-free grade facilities. We plan to fully begin producing base coat grades for automotive exteriors in fiscal 2023, a new application for us.

**Toward 2030**

- We will leverage our proprietary manufacturing process, which is free of by-products that could detract from earnings and ensures high quality to expand sites in North America and Europe to attain local production and local consumption worldwide of dimethyl and ethyl methyl carbonate and satisfy rising demand for lithium-ion battery electrolyte. In China, we will keep to licensing our technology to generate solid earnings.
- We will increase downstream polycarbonate diol and polyurethane dispersion production capacity, principally in Thailand and North America, to capture rising demand and expand our business.

**Growth Investments**

Planning to build new dimethyl and ethyl methyl carbonate plants in North America and Europe

Boost downstream polycarbonate diol and polyurethane dispersion production capacity in Thailand and North America (through third polycarbonate diol facilities in Thailand that should become operational in fiscal 2023)

**R&D and Intellectual Property**

The environment is a prime focus of research and development in this business area. In dimethyl and ethyl methyl carbonate, our ongoing efforts to develop manufacturing processes with low environmental footprints are steadily yielding results.

We design polyurethane dispersion to dry fast at low temperatures, thereby cutting carbon dioxide emissions during coating. We also make this offering durable, extending end-product lives. We satisfy customer performance requirements through an internal assessment program that we set up to correlate performance requirements and basic physical properties, providing materials for

**Employee message**

We endeavor to provide customer solutions at a laboratory in China by reinforcing our paint formulation technology. For customers urgently needing to develop water-based paints, we offer proposals for compatible compounding materials matching applications to maximize fast drying, durability, and other performance attributes of our products. We will keep helping to shrink environmental footprints by collaborating with customers to develop water-based paints.

relevant applications.

We have embarked on such new R&D focuses as using carbon dioxide, recycling, biodegradability, and tapping biomaterials to push toward carbon neutrality and a circular economy.

We established a laboratory in Shanghai in 2022 to serve the market in China, which is tightening its environmental regulations. We set up a program in China to propose ways to use polyurethane dispersion in line with local customer needs.

On the intellectual property strategy front, we aim to formulate a technology roadmap in view of our long-term vision and build a patent map that enables us to secure exclusive licensing rights and sharpen our competitive edge.



Osaka Research & Development Center



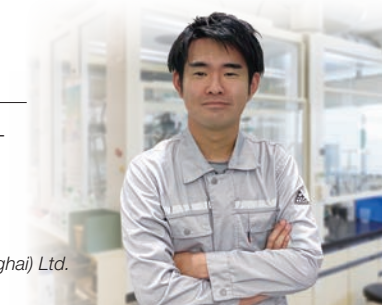
Laboratory in China Center

**Digital Transformation**

Developing diverse grades is important for polyurethane dispersion. For that business, we are standardizing and upgrading manufacturing and sales planning and better visualizing production, sales, and inventory. We are more closely linking customer and supplier information to integrate and optimize supply chain management overall for demand, production, and raw materials in terms of sales, plants, and procurement.

**Highlights**

- Set up a laboratory in China, bringing it on line in September 2022 to reinforce polyurethane dispersion marketing structure system across Asia and accelerate sales in the Chinese market
- Responded to growing market demand for fully water-based, solvent-free grades in line with tighter environmental regulations by installing polyurethane dispersion solvent-free grade facilities at the Ube Chemical Factory to cater to customer demand for such offerings



Yoshinori Sugimura  
General Manager,  
Development Office, UBE (Shanghai) Ltd.



## Growth Strategies of Specialty Chemicals: Composites



### Product Characteristics

Composites combine multiple materials to perform functions that are beyond the scope of single materials. UBE's composites are the engineering plastics whose design encompasses not only resin materials design and blending processes but also molding and processing at customer sites and end-product usage.

Diverse applications for our composites include automobiles, electrical and electronic components, industrial machinery, and construction parts. They have found particular favor for automotive parts as metal substitutes that can help reduce vehicle weights.

*Application:* Corrugated tubes for automotive wire assemblies

*Resin type:* Nylon 6

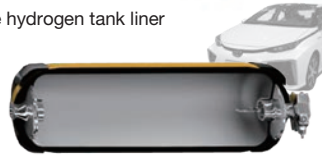
*Prescribed properties:* Extrudability, flame retardance, and voltage resistance



*Application:* Fuel cell vehicle hydrogen tank liner

*Resin type:* Nylon 6

*Prescribed properties:* Moldability, compressive strength, hydrogen barrier properties



*Application:* Battery electric vehicle charger cases

*Resin type:* PBT

*Prescribed properties:* Flame retardance, high strength, and dimensional stability



### Social and Market Analysis

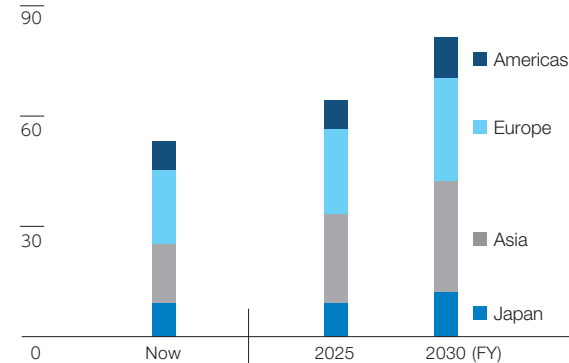
The prime application for engineering plastics is the automotive components market. We expect global vehicle production to reach 140 million units annually by 2050. Demand should accordingly grow for these plastics. At the same time, the transformation of powertrains is increasing the number of internal combustion engine-free automobiles, battery electric and fuel cell vehicles among them. This situation should diversify the composition and prescribed properties of automotive components. The UBE Group's composite products already serve in battery electric, fuel cell, and other renewable energy vehicles as well as in the engine parts of conventional gasoline models. We will expand our business by adapting to such market changes associated with decarbonization.

### Vision for 2030

We aim to become a solutions provider with a global presence as a manufacturer of engineering plastic composites, including resins other than nylon, with sales of more than ¥60 billion in 2030. We aim to lift our production capacity from 53,000 metric tonnes annually, to 61,000 metric tonnes by the end of our current medium-term management plan. We would thereafter boost capacity to 80,000 metric tonnes by 2030.

#### Production through sites in the Americas, Europe, Asia, and Japan

(k-tonnes/year)



### Growth Strategies

#### Progress under the Medium-Term Management Plan

Unit sales expanded more slowly than expected in fiscal 2022 because shortages of semiconductors and other materials caused automobile production cutbacks. We anticipate automotive applications to recover somewhat in fiscal 2023. In Thailand, we have acted as planned to boost capacity at existing facilities and build new production facilities for nonreinforced products, which is one of our strengths.

#### Toward 2030

We will develop unreinforced value-added products more swiftly. These include hydrogen tanks and gasoline tank valves for fuel cell vehicles and flame retardant corrugate products for battery electric vehicles.

We plan to boost capacity in Europe and the United States after similar moves in Thailand to cater to diversifying demand for automotive components in coming years. We will also explore expanding our business laterally and downstream, including by considering more acquisitions and alliances.

We will also focus firmly on developing eco-friendly products that incorporate recycled materials. They include biomass raw materials and nylon 6, for which we expect demand to grow. The goal here is to deliver new added value to customers.

### New Value Creation

#### Opportunities and risks

##### Opportunities

- Automobile production continuing to grow and globalization (local procurement) accelerating at customer production sites
- Extensively using resins to lighten automobiles
- Creating new parts in line with powertrain changes
- Increasing focuses on lowering environmental impact in addition to enhancing conventional features

##### Risks

- A shrinking domestic automobile market → Expanding overseas sites
- Products becoming generalized from textiles manufacturers in emerging nations entering engineering plastics market → Cultivating product specialization
- Nylon substitutes emerging → Range of resin products other than nylon expanding

#### UBE's strengths

- Supply structure across Japan, elsewhere in Asia, Europe, and North America
- Basic technologies and intellectual property for bonding, joining, and laminating dissimilar materials
- A superb customer base, including with Japanese original equipment manufacturers and Tier 1 parts companies, and a long track record of doing business with them
- Materials design and development capabilities in keeping with customer needs

#### New value creation

- Locally providing high-quality products through our global supply structure that meet regional needs
- Delivering solutions by drawing on excellent customer relationships, processing technologies, materials design, and development capabilities
- Developing products with low environmental footprints to match growing customer needs

### Growth Investments

**As well as boosting capacity in Thailand, we are constructing a new production line for unreinforced value-added products, with operations scheduled to begin in early 2024.**

### R&D and Intellectual Property

In the engineering plastics business, we have concentrated development, primarily in composites, in Sakai. This is closer to our market, empowering us to swiftly identify customer and market needs and develop applications with customers.

As well as expanding our tank applications and existing value-added application businesses, we are cultivating environmental conservation areas. They include cellulose nanofiber composites and recycled nylon composites. We are constantly developing products to underpin our composites business by 2030.

### Employee message

We are developing composite materials employing the biomass-based cellulose nanofiber as a reinforcing material in developing eco-friendly products. The low density and strength of this nanofiber can make automotive and other components thinner, lighter, and more fuel-efficient. We expect the market for this nanofiber to expand in coming years because repeated molding and crushing does not weaken it, making it highly recyclable. We will keep helping to materialize a circular economy by leveraging proprietary technology to swiftly develop and market cellulose nanofiber composites.

**Emi Sugata**

Composite Materials Development Group,  
Engineering Plastics Development Dept.,  
Performance Polymers & Chemicals Div.





# Growth Strategies of Specialty Chemicals: Pharmaceuticals



UBE plans for the Pharmaceuticals Division to become a core Group business in life sciences. In drug discovery research, the division has accordingly embraced the challenge of developing small molecule drugs and creating such high-value-added offerings as antibody-drug conjugates. The objective of the contract development and manufacturing organization (CDMO) business is to establish a highly profitable structure by bolstering the existing small molecule drug field while expanding contract manufacturing for low-dose, high-potency pharmaceuticals and obtaining production technologies for nucleic acid drugs and other new modalities. These considerations prompted UBE to strategically purchase all shares in 2022 of CDMO player API Corporation from Mitsubishi Chemical Group company Life Science Institute, Inc. We will keep expanding our business, including through more acquisitions in existing business areas, while exploring ways to enter new life science business areas to reach our goals as a growth strategy business.

**Yoichi Funayama**  
 Managing Executive Officer  
 General Manager,  
 Pharmaceutical Div.



## Business Overview and Features

The Pharmaceuticals Division engages in drug discovery research and CDMO operations. While operating independently of each other, they maintain business models unique to a chemical manufacturer in that we can draw on their dual capabilities to generate synergies as we need.

The drug discovery research business creates candidate compounds for active pharmaceutical ingredients (APIs) that we license to pharmaceutical manufacturers at preclinical stages. It also undertakes joint research and development to bring new drugs to market.

The CDMO business creates APIs, intermediates, and investigational drugs based on the contract with pharmaceutical manufacturers. It maintains stable supplies of high-quality offerings and provides development solution services, including to create manufacturing processes and optimize existing ones.

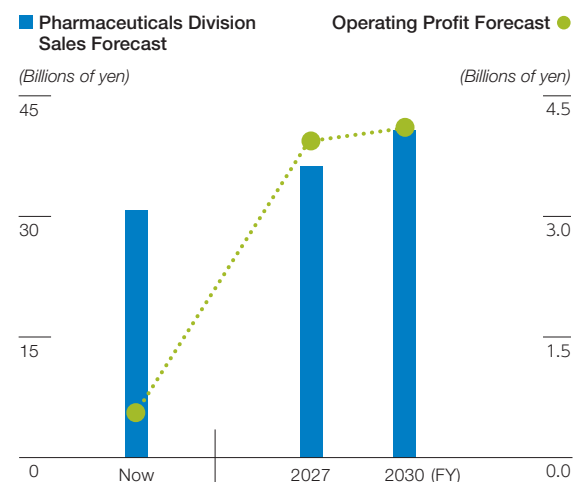
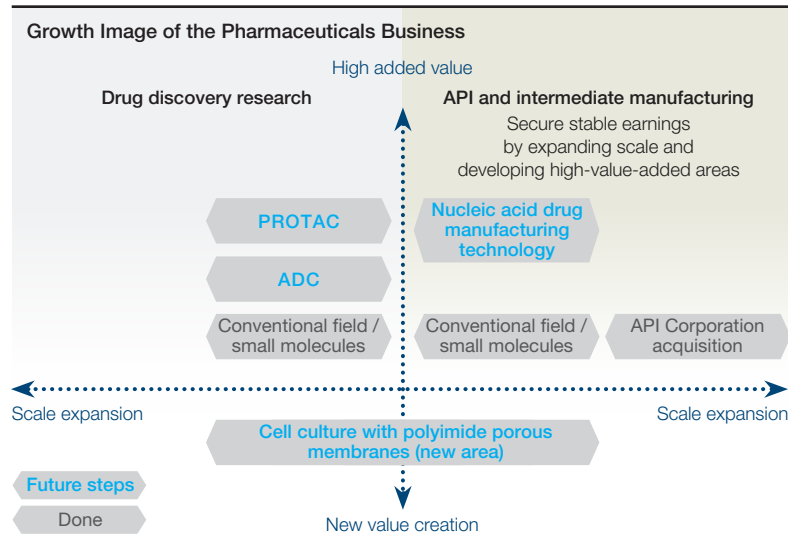
## Social and Market Analysis

Despite declining populations in Japan and some other developed nations, demand for advanced medical care is expected to grow with society aging. On the contrary, in developing countries, fast population growth and rising economic standards should boost demand for pharmaceuticals.

Demand for drugs to treat cancers and rare diseases is expanding more than for lifestyle illness treatments. Nucleic acid medicines, biopharmaceuticals, gene therapy, and other new modalities are emerging to meet such needs.

## Vision for 2030

We aim to generate stable royalty income from several drugs that we have developed. We also look to become highly profitable by doing more business in high-value-added fields, such as contract manufacturing for nucleic acid drugs, while entering new business areas in the life science field.



## New Value Creation

### Opportunities and risks

#### Opportunities

- Increasing demand for advanced medical care
- Growing need for stable supplies of top-shelf pharmaceuticals in developing countries

#### Risks

- Paucity of target molecules and increasing difficulty of first-in-class development in small molecule drug field
  - Standardize development priorities, strengthen open innovation, and leverage ecosystems to streamline drug discovery research

### UBE's strengths

- Joint development with pharmaceutical manufacturers and proven record in drug discovery based on organic synthesis technologies cultivated over many years as a chemical manufacturer
- High-quality API manufacturing capabilities based on a variety of facilities, equipment, and advanced quality control systems that match setups in Japan, the United States, and Europe
- Solution services for manufacturing and developing APIs and intermediates, which have earned accumulated results

### New value creation

- Help develop and manufacture new medicines and provide means to safeguard human health and lives from diseases

## Growth Strategies

### Drug Discovery Research Business

We will expand drug discovery targets by according top priority to clinical needs, developing such new modalities as antibody-drug conjugates and proteolysis-targeting chimera\* and conventional small molecules to bolster our pipeline and swiftly launch products.

\* A molecule with two active domains and a linker that can remove specific unwanted proteins

### CDMO Business

The UBE Group will establish a highly profitable structure through action in several respects. First, we will leverage our production capacity, which is one of the biggest in Japan, to expand contract manufacturing of small molecule drugs. Second, we will maximize earnings from our fifth pharmaceutical plant, which manufactures low-dose, high-potency pharmaceuticals, and do more of our business in such high-value-added fields as nucleic acid drugs.

### New Business Creation

We aim to enter new business areas in life sciences, focusing on cell culture systems using polyimide porous membranes.

### R&D and Intellectual Property

Our CDMO business develops APIs for nucleic acid drugs. We are striving to streamline nucleic acid drug development. To that end, we are lever-

aging an investment in Luxna Biotech Co., Ltd., a venture company developing nucleic acid drugs based on a modified nucleic acid group that Osaka University developed. We are also joining RNA-targeted drug discovery technology development carried out by the Japan Agency for Medical Research and Development. While there are issues in developing and manufacturing bulk nucleic acid drugs, such as impurity control associated with increasing scale, we are striving to resolve these issues by collaborating more with equipment manufacturers to innovate.

### Digital Transformation

We are accelerating drug discovery research by deploying chemo-informatics, optimizing existing processes with process informatics, improving efficiency by adopting automated operations, and exploring digital plants that provide data assurance.

### Highlight

- Protecting biodiversity is the 15th of the United Nations' Sustainable Development Goals (SDGs). For this reason, in January 2023 Pharmaceutical Research Laboratory obtained Japan Pharmaceutical Information Center certification for maintaining appropriate animal welfare systems for animal testing. We will continue to properly supervise and manage all animal testing.