Advance Innovation

As an Innovative Solution Provider aiming to solve societal issues with innovative technologies, we have designated "advance innovation" as one of the key management priorities. We have identified four priority areas: the related fields of environment, food, healthcare, and ICT. By leveraging Sumitomo Chemical's broad technological foundation, we strive to provide solutions (value) that address societal issues.

Research and Development

Amid increasing uncertainty in the business environment surrounding our company, the role played by the chemical industry in solving societal issues, such as climate change, food security, and infectious diseases is significant, and our business opportunities are expanding. Through extensive research activities over the years, we have acquired six core technologies: catalyst design, precision processing, organic and polymer material functional design, inorganic material functional design, device design, and biological mechanism analysis. We have cultivated research and development assets in the three areas of Green, Digital, and Bio. By fully leveraging these assets, we will continue to drive research and development and provide solutions to our customers and society.

Long-Term Vision: A Company that Solves Societal Issues with Innovative Technologies

Innovative Solution Provider

Food
Achieve regenerative

ICT
Innovate IT

Healthcare
Spread leading-edge medicine

Environment
Reduce environmental impact

Agro & Life Solutions	ICT & Mobility Solutions	Advanced Medical Solutions	Essential & Green Materials




Important value-generation assets

GX (Green Transformation)	DX (Digital Transformation)	BX (Bio Transformation)

Six core technologies

Assets Contributing to the Three Transformations (X)

BX (Bio Transformation)

Accumulation

Over **50** Years of Research Achievements (Since the 1970s)

Starting from the Takarazuka Research Institute (1971-1984), biotechnology has been accumulated through research in agrochemicals and pharmaceuticals.

Technological Expertise

Over **200** BX-related Patent Families

Analytical Techniques
- Analysis of Biological Mechanisms
- Comprehensive Omics Analysis
- Microbiome Analysis

Synthetic Techniques
- Development of Biocatalysts

Cellular Techniques
- Early Initiation of ES/iPS Cell Research
- Advanced Differentiation Induction Techniques

Open Innovation

Accelerating collaboration with leading startups (Conagen, Ginkgo Bioworks) to develop high-performance chemicals using synthetic biology.

Human Resource Strength

Over **280** Ph.D. in Biotechnology

Actively recruiting Ph.D.-level talent with advanced expertise.

GX (Green Transformation)

Promoting Carbon Neutrality

First comprehensive chemical manufacturer to receive SBT certification in 2018.

GHG Reduction Goal for 2030 **50**% reduction compared to FY2013 levels.

- Committed to carbon neutrality through both "Responsibility" and "Contribution."
- Achieved a 47% reduction by FY2023.

Human Resource Strength

Establishing Development Centers for technologies that reduce environmental impact (Innovation Center MEGURU)

Technological Expertise

Catalyst and Process Technology Licenses Approximately **70**

- Technologies enabling the production of low environmental impact chemicals (e.g., PO-only Process, Hydrogen Chloride Oxidation Process)
- Numerous awards, including the JCIA Technology Award "Grand Prize" (2022)

Open Innovation

GI Fund for Chemical Recycling Approximately **50** billion yen (project scale)

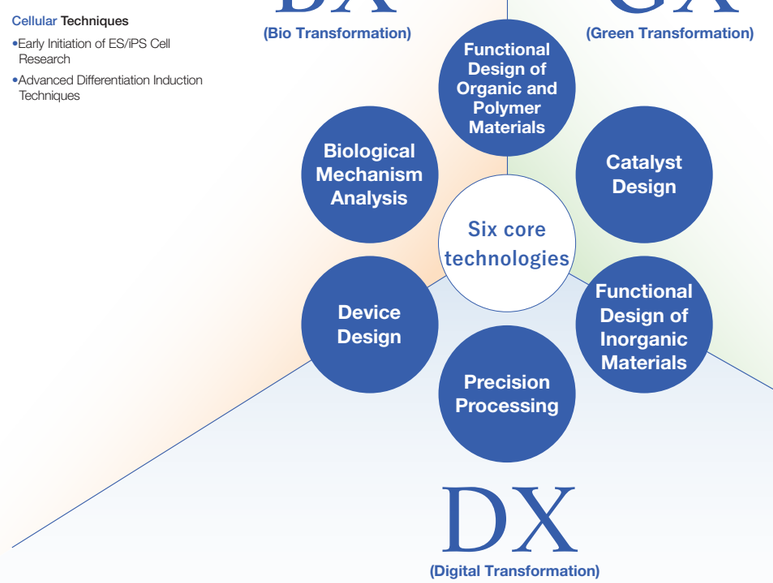
Development of innovative technologies through industry-academia collaboration (e.g., Ethanol to Propylene)

External Collaboration

Expansion of CFP-TOMO® Approximately **110** cases

(Recipient of the JCIA Responsible Care Award)

- Developed proprietary software for automatic bulk calculation of Carbon Footprint (CFP)
- Currently offering the software free of charge to domestic and international companies



DX (Digital Transformation)

Technological Expertise

Selected as a Clarivate Top 100 Global Innovator for **3** Consecutive Years

Deepening the Utilization of Informatics (BI, CI, MI) by the Data Scientist Team (Digital Innovation Department)

Human Resource Strength

DX Core Talent: Approximately **1,700** People

- Developed through proprietary educational programs
- Enhanced digital literacy across the company through corporate events (DX Repository)

Accumulation

Over **50** Years of Research Achievements (Since the 1970s)

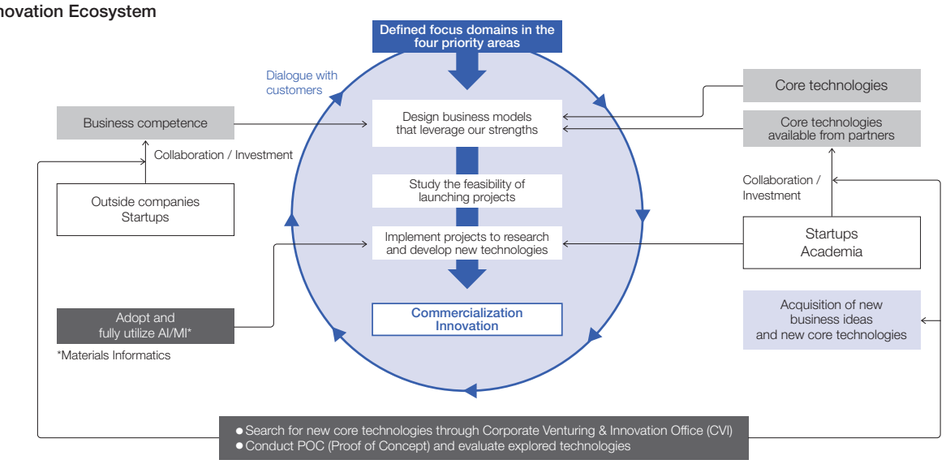
Developed a drug design system using computational science as early as the 1980s, laying the foundation for computer chemistry and contributing to the advancement of materials informatics (MI).

Sumitomo Chemical's Innovation Ecosystem Accelerates the Creation of Next-Generation Business

Sumitomo Chemical is building an innovation ecosystem (a system that continuously creates innovation) to steadily link R&D and business development to the creation of next-generation businesses.

In each of the four priority areas, we have defined focus domains for our efforts within four priority areas, have identified core technologies that we own and core technologies that we do not own, and we are acquiring non-owned technologies through collaboration with startups and academia. As for business competence, we are also supplementing the lacking areas with alliances and investments with outside companies and startups, considering designing a business model that leverages our strengths and thematizing. At each stage of promoting themes, we communicate closely with relevant internal departments, external partners, and customers, and appropriately reflect their feedback to promote research and development. In addition, we will incorporate new ideas and technologies that emerge in the course of theme promotion and dialogue with partners, and link this to the continuous creation of innovations.

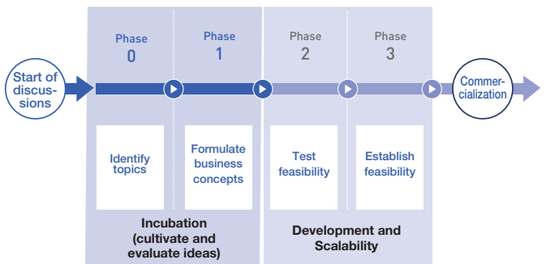
Innovation Ecosystem



Stage-gate Management System

In considering thematization, the Stage-Gate Management System for Corporate Research Themes was introduced in earnest in FY2019, and research themes are managed in four stages, from the idea stage to commercialization. We will proactively incorporate internally proposed themes in the idea stage while also clarifying the requirements for passing through the gate in each phase. We will determine whether or not to pass through the gate through deep discussions not only with the research division but also with the business divisions. This has enabled us to promptly create new themes and make decisions on discontinuation of projects, taking into account their future potential. In the past three years, about half of the research themes have been replaced due to the creation of new themes, interruptions, and transfers to business divisions.

Overall picture of the stage-gate management system



Standardization Initiatives

In order to promptly implement new technologies into society and promote their global adoption, it is crucial not only to develop technology-driven markets, but also to establish and deploy standards related to the technology both domestically and internationally. Sumitomo Chemical has established a cross-departmental structure to examine standardization strategies, aiming to leverage its technological strengths for the implementation of solutions to global challenges such as carbon neutrality in the international community. We are also actively engaged in various standardization efforts to establish product value and business foundations, such as participating in an ISO working group for standardization of chemical recycling.

Message from Researchers

*Affiliations and positions are as of August 2024

We have been generating innovations in a variety of fields. Here, our research specialists, who have been at the forefront of their fields for many years, introduce our R&D strengths and our efforts toward future innovation.

Contributing to Product Development by Pursuing Sophisticated Evaluation Methods within a Safety-Driven Culture

Environmental Health Science Laboratory, Fellow
Yoshihide Matoba

At the Environmental Health Science Laboratory, we assess the impact of chemical substances on "human health" and "the "environment" to ensure the safety of the products developed and sold by our company.

In 1990, when methods for evaluating the safety of household insecticides had not yet been established, the Tokyo Metropolitan Government measured the indoor concentration of household insecticides, and the results became a topic of discussion. Our company decided to further investigate this issue by verifying the safety of insecticides that remain indoors. I was in charge of constructing multiple model rooms within our research facility and measuring the indoor concentration using various insecticidal products. With the help of my seniors and colleagues, we clarified the residual behavior of the insecticides and devised a method to estimate the amount exposed to the human body. As a result, by comparing the estimated amounts with toxicity test results, we were able to "demonstrate safety with numbers." Additionally, we developed a simulation model based on the fugacity model that could predict airborne concentrations and floor residues without requiring significant resources. These findings gained significant attention at the time, leading to numerous lecture invitations from Europe and the United States and eventually contributed to the establishment of safety evaluation methods for household insecticides in various countries.

On the other hand, while the predictive model I developed could estimate the transfer and distribution between indoor air and surfaces such as floors, it had the limitation of being unable to predict the concentration distribution of insecticides within the indoor air or on the floor. To address this issue, I conceived the idea of incorporating a computational fluid dynamics (CFD) model into the fugacity model. As a result of my leading the team members in developing a new model that integrated both approaches, we were able to achieve a more accurate safety assessment that accounts for the concentration distribution within the indoor environment. Currently, the team members are using this model to predict the behavior of insecticides under various usage methods and indoor environmental conditions, working towards even more precise safety evaluations.

Through these experiences, I have come to realize that our company places the utmost importance on "safety" and has a culture that ensures this commitment is passed on to future generations. Although safety evaluations do not directly generate profits, I take pride in our company for dedicating resources to develop pioneering evaluation methods that lead the world, and for establishing a system that continues to build upon and advance these research achievements. As our company continues to promote the agrochemical business as a growth driver, I believe that the mechanisms ensuring the safety of pesticides will become increasingly important. I am committed to continuously refining our safety evaluation technologies so that our products not only contribute to society but can also be used with confidence.

Aiming to Deepen Organic Synthesis Technology that Supports Functional Material Development

Advanced Materials Development Laboratory
Takashi Kamikawa

In modern society, countless synthetic organic compounds created by humans are in use. To meet the demands for a higher quality of life (QOL), research and development in organic compounds has become increasingly active in recent years. Looking at the data, the number of publications and patents related to organic chemistry (search tool: STN-CAplus) published every ten years since 2000 has shown a continuous increase, with 37,000, 46,000, and 62,000 cases respectively. This trend underscores the critical importance of organic chemistry knowledge and the technology of organic synthesis, which allows the creation of new organic compounds from simple molecules.

The Advanced Materials Development Laboratory, where I belong, aims to create and provide materials with new functionalities. New functional materials are developed by designing, synthesizing, and combining various foundational technologies. However, even if a material possesses excellent properties, there are often cases where it cannot reach commercial production due to low productivity (yield) or high waste during mass production. Therefore, another critical role of our department is to develop new manufacturing methods to produce these materials on an industrial scale. In recent years, we have been actively working on developing polymerization methods for printed electronics materials, which are promising as next-generation materials. This involves applying organic synthesis technology known as cross-coupling to polymerize polymers with continuous aromatic rings. Until now, it has been extremely challenging to obtain stable-quality polymers due to the difficulty of precisely controlling impurities and molecular alignment. To address this, we collaborated with the analysis and computational departments to conduct polymerization mechanism analysis, designed and synthesized new catalysts that drive reactions along the desired pathways, and succeeded in achieving mass production for the first time in the world. Additionally, this success has led to the accumulation of knowledge on cross-coupling polymerization, resulting in significant advancements in subsequent research and development.

We are currently working on the development of next-generation synthetic technologies to reduce greenhouse gas emissions. The term "Green Chemistry" began to be used in 1993, signaling that the chemical industry has been aware of and addressing environmental issues for the past 30 years. Today, reducing environmental impact has become an urgent societal issue in the quest for a sustainable society. To solve this significant problem, it is essential to refine the synthetic technologies, design capabilities, and analytical skills possessed by our research institute, as well as to ensure the close integration of our company's various foundational technologies and to leverage open innovation. We will harness the strengths of the wide range of technologies that chemistry offers and take on the challenge of solving this pressing societal issue.

Intellectual Property

We will promote intellectual property activities that serve as the foundation of business competitiveness and drive our growth strategy.

Our Vision

Sumitomo Chemical has traditionally engaged in “defensive” intellectual property activities aimed at protecting its business and securing freedom of operation based on its business strategy. While continuing to value this “defensive” aspect, we are now also advancing “offensive” intellectual property activities, focusing on building a strong patent portfolio that creates competitive advantages and entry barriers against competitors.

On the other hand, addressing societal issues such as reducing environmental impact and preserving biodiversity requires “co-creation and collaboration” among various players, each leveraging their strengths to the fullest. Within this framework, our company is tackling new challenges from the intellectual property perspective, focusing on how to protect and utilize the new value generated through transformation and connect it to sustainable growth.

By actively promoting intellectual property activities that encompass “offense,” “defense,” and “co-creation and collaboration,” we will lay the foundation for our company’s business competitiveness and drive business growth and the enhancement of corporate value.

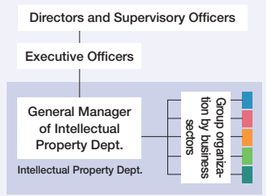
Basic Policy

We promote intellectual property activities under the following basic policy.

1. Promote activities in line with our business strategies
2. Create global business value
3. Strive to utilize all technological development accomplishments
4. Respect rights and comply with the law

Implementation Structure Closer to the Business

The Intellectual Property Department, under the direction and supervision of the responsible Directors and Supervisory Officers, is located within the headquarters section and operates from bases in Tokyo, Osaka, and Ehime. To conduct intellectual property activities closely aligned with our business operations, the department is organized into groups corresponding to each business sector. Each group is responsible for formulating intellectual property strategies, managing patent portfolios, handling patent applications and rights acquisition, and conducting research and analysis. These activities are carried out in collaboration with the intellectual property teams within the business divisions and laboratories.



Building a Patent Portfolio that Supports Business Competitiveness

The value and role of intellectual property vary significantly depending on the business environment and the country or region. In our growth areas, such as the agrochemical and ICT sectors, we formulate intellectual property strategies for each business segment, utilizing visualization data related to intellectual property as needed, and build patent portfolios accordingly.

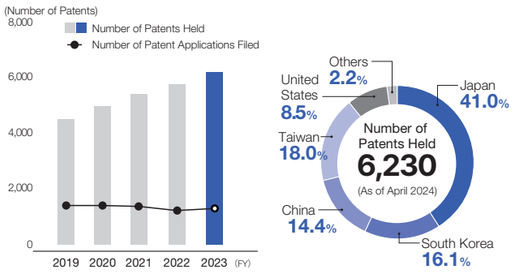
Number of Patents Held in the Agrochemical Sector

(As of April 2024)

- Covering the global agricultural market with a focus on the United States, South America, Asia, and Europe
- Securely obtaining substance patents for active ingredients in pesticides
- Strategically patenting surrounding technologies such as formulations, manufacturing processes, and applications to establish strong barriers of entry
- Utilizing patent term extension systems to maintain and expand market share and profit margins, thereby contributing to the maximization of business value

Patent Portfolio in the ICT Sector

(Left: Number of Patents Over Time, Right: Patent Holdings by Country Ratio)



- Acquired numerous high-quality patents with significant influence over rival companies in key manufacturing and sales countries, including Japan, South Korea, China, Taiwan, and the United States
- Leveraged early examination systems to swiftly build a patent portfolio in line with the development speed

Intellectual Property Activities Contributing to GX/DX/BX

Transformation technologies, which serve as the foundation for value creation, are widely utilized across the supply and value chains. Therefore, we aim for strategic and comprehensive patent acquisition with a focus on co-creation and collaboration. In particular, in BX-related technologies, including regenerative medicine, we have already acquired around 200 patents, establishing a solid foundation for growth. Additionally, in the area of SDGs-related patents, we hold a top-tier patent portfolio among domestic diversified chemical companies.

Maximizing Business Value through the Integration of Technology and Branding

By combining our “technological capabilities”—which enable us to create high-performance products and technical services that meet customer needs—with the “trust” we have built over many years, we are continuously enhancing the sustainable value of our business.

Brand (Trademark): **Meguri®**

Chemical/Mechanical Recycling Technology

Brand (Trademark): **Natural Products**

Biorational (Microbial Cultivation Technology)
Botanical (Plant Extract Research and Development Technology)

Brand (Trademark): **Biondo®**

Advanced Analytical Technology
Extensive Natural Resources Data

Case Study **Intellectual Property Activities in “Meguri with Chemical Recycling”**

While the plastics business is a mature field, plastics made from recycled materials are a critical growth area from the perspective of carbon neutrality, requiring development with new values and concepts. For example, in the PMMA chemical recycling business, various companies are involved, from resin recovery to the regeneration of resin raw material monomers, re-resinization, and sales. The first step taken by researchers and intellectual property personnel was to take a bird’s-eye view of the supply chain, organizing and visualizing the players and technical challenges at each layer. By comprehensively considering not only competitors but also all aspects from upstream (resin recovery) to downstream (use of recycled resin), about 20 patents were obtained, covering a wide range of the supply chain while nurturing the mindset of those involved. Based on these technologies and patents, the “Meguri” branding is also being advanced, leading to applications such as Koizumi Lighting Technology Corporation’s use of recycled acrylic materials in lighting fixtures, Star Jewelry Co., Ltd.’s first-ever use of recycled acrylic materials in jewelry in Japan, and collaboration with Lumus Technology on a licensing business.

→ Contribute to Recycling Resources

Strengthening IP Intelligence

The Intellectual Property Department, in collaboration with business divisions and research institutes, is promoting activities (IP landscape) that integrate and visualize intellectual property and market analysis to support management and business strategies. Typically, this approach is utilized for assessing the feasibility of new market entries, formulating new development themes, and evaluating the intellectual property of potential M&A partners. Notably, in our area of strength— inorganic membrane separation technology—we have begun to see successful cases where we identified and proposed potential joint research partners and customers by analyzing the supply chain from a patent perspective. This analysis led to the selection of candidate companies and discussions on collaboration within the business divisions. We will continue to actively strengthen these activities moving forward.

IP Landscape Collaboration Structure and Application Examples

Application Examples

Analysis of our company, competitors and market
Understanding IP and market position
Understanding of technology and patent trends
Search for new applications and themes
Search for potential customers and business partners
Research for M&A and investment targets

In-House Intellectual Property Training: Human Resource Development and System Building

At our company, we conduct intellectual property training tailored to different job roles and positions. The aim is not only to acquire basic knowledge and skills related to intellectual property but also to develop personnel and systems capable of strategically utilizing information, including IP landscape analysis.

Training Overview

For early-career researchers

Participants	Young researchers with a few years of experience: Basic Research; approximately 100 per year Applied Research; approximately 80 per year
Main Content	Overview of the intellectual property system, importance of intellectual property in invention discovery, investigation, and application examination response activities.

For the mid-career level

Participants	Approximately 50 team leaders every other year.
Main Content	Planning and execution of intellectual property strategies that contribute to the business, contracts, disputes, and information utilization (IP landscape).

TOPICS

Clarivate Top 100 Global Innovators 2024
Selected as one of the Top 100 Global Innovators for three consecutive years

This recognition is a testament to our strong research and development capabilities, as well as our intellectual property activities. We will continue to further advance these efforts.