Performance Materials

We will continue to expand the business by actively developing display, semiconductor, and inorganic materials, as well as new materials for new fields.

Display Materials

We continue to develop our display materials business, spearheaded by SUNEVER® polyimide-based LCD alignment coating materials and NHC® insulating hard coating materials, by catering to the growing needs of the display market, particularly in Asia.

Semiconductor Materials

We provide ARC® (bottom anti-reflective coating materials) necessary for semiconductor manufacturing process. We also work to expand our business by developing multilayer process materials and temporary bonding materials.

Inorganic Materials

We have continuously developed nano-colloids to a variety of industries for many years using “Ultrafine Particle Control technology”, one of our core technologies. We strive to supply our main product, SNOWTEX®, and other products.

New Products

Our development focuses on next generation products that identify the future needs of customers.

Features of Our Business

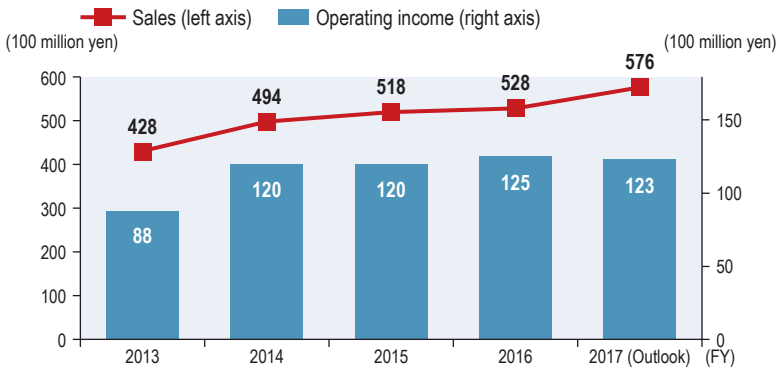
Electronic Materials

- Promoting R&D in an integrated manner with customers in Japan and overseas countries
- Bases established in Japan, Korea, Taiwan, and China that target the continuously growing field of electronic materials in the Asian market

Inorganic Materials

- Development of a wide range of applications that take advantage of the features of high performance colloid products
- Prompt response to customers through collaboration between sales, manufacturing, and research teams

Business Results and Outlook



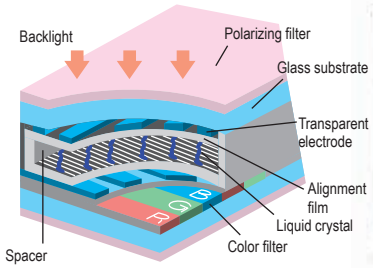
Comment

In Display Materials in FY2016, SUNEVER® sold well for small- and medium-sized devices such as smartphones. In terms of Semiconductor Materials, sales of multi layer process materials were affected by reduced operating rates from selected customers. In Inorganic Materials, we saw a decline in sales of SNOWTEX® for general purposes, and also in organo silica sol.

Main Products

SUNEVER®

SUNEVER® is a polyimide-based coating for LCD / flat panel displays. It is used to coat the surface of the outer glass panels, to align liquid crystal molecules in a certain direction. We offer various grades of this product for small- and medium-sized screens, such as LCD monitors, PCs, tablets and smartphones, in addition to those for the latest flat-panel LCD TVs.



▲ LCD panel

▲ LCD TV

ARC® (bottom anti-reflective coating)

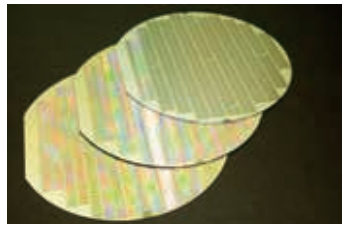
ARC® is an anti-reflective coating developed for semiconductor lithography. It is used to coat the part under the photoresist, to resolve a number of issues with lithographic exposure, such as reflection from varying substrate levels. This makes it possible to significantly reduce the device failure rate.

Effects of anti-reflective coatings

SNOWTEX® / Organo silica sol

SNOWTEX® is a colloid solution with nano-sized silica particles dispersed stably in water. Organo silica sol is the same product but dispersed in an organic solvent. Making the most of their diverse capabilities, these products are used across a wide range of different fields, including coating agents for optical films and printers, and polishing agents for electronic substrate materials and electronic recording media.

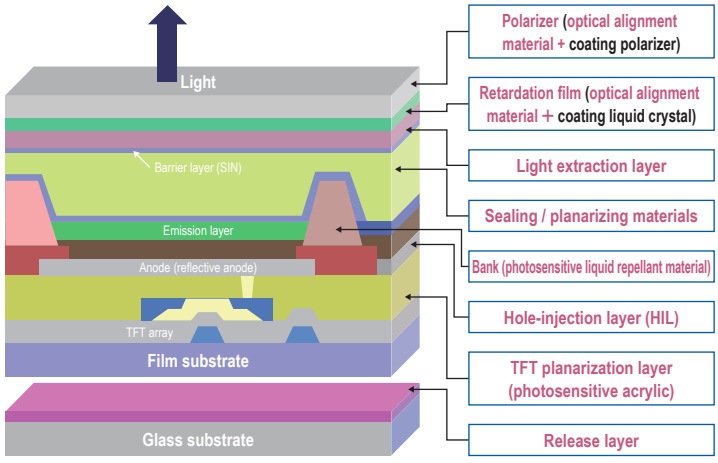
▲ Tablet device



▲ Silicon wafer

OLED materials

We are focusing developing markets for OLED, which is expected to grow in the future as a next-generation display. In addition to coating hole-injection layer materials and TFT planarizing film materials, we are currently moving forward with the development of distinctive peripheral materials, including bank materials that help ensure the uniformity of pixels during inkjet application, and optical alignment materials used for anti-reflective retardation films.



Agricultural Chemicals

Provide a stable supply of food to people around the world. Provide agrochemicals that are environmentally friendly. This is what we aim to do.

We seek out and develop new agents for mainstay crops around the world as well as those in Japan. We also develop agents in collaborative efforts, and actively acquire agents from other companies. We constantly work to expand our product lineup and sell our products in Japan and other countries.

Agrochemicals

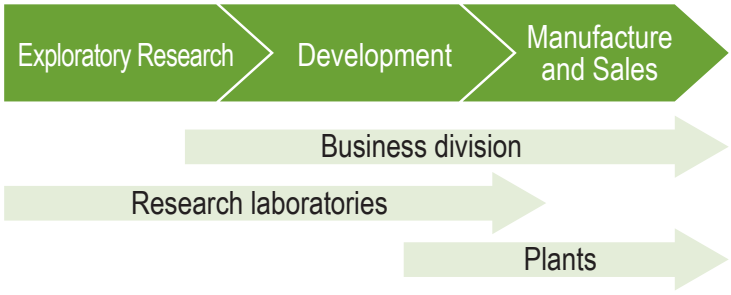
We develop, manufacture, and sell herbicides, insecticides, fungicides, and other products used for the management of agricultural land and green land.

Veterinary Pharmaceuticals

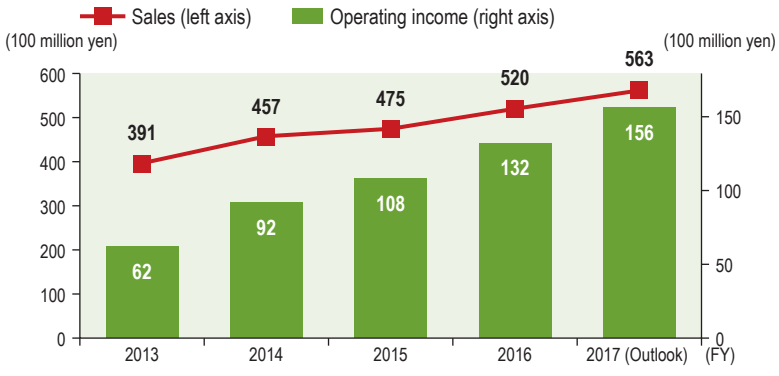
We develop and manufacture active pharmaceutical ingredients used in ectoparasiticides for companion animals.

Features of Our Business

Integrated System from Exploratory Research, Development to Manufacture and Sales



Business Results and Outlook



Comment

In FY2016, we recorded strong sales of ALTAIR® both domestically and overseas. Increased sales of ROUNDUP®, the launch of ROUNDUP® MAXLOAD AL Ⅱ for the household market, and the release of agricultural herbicide TREFANOCIDE® also contributed to an increase in revenue. BRAVECTO® chewable tablets for dogs are now on sale in 80 different countries, and we have also started selling spot on products for dogs and cats, as we continue to steadily increase shipments of Fluralaner.

* TREFANOCIDE® is a registered trademark of Gowan Crop Protection Limited.

Main Products

Herbicide

ALTAIR®

ALTAIR®, an active ingredient in herbicides for paddy rice, is a wide-spectrum herbicide with that is highly effective in eliminating bulrush and cyperaceous perennial weeds. It is also effective for weeds that are resistant to conventional sulfonylurea-based herbicides. We market this product in Japan, Korea, and China.

▲ ALTAIR®

ROUNDUP® MAXLOAD, ROUNDUP® MAXLOAD AL, ROUNDUP® MAXLOAD ALII

In 2002, we acquired the exclusive marketing rights to this product in Japan from Monsanto. While this herbicide kills most weeds, it has low toxicity to humans and animals and does not remain in the soil or in the environment. Because of these benefits, this herbicide is popular all over the world. From 2011, we added ROUNDUP® MAXLOAD AL to the product line-up. Created for general households, this product features a container with a shower head and can be used without needing to be diluted.

▲ ROUNDUP® MAXLOAD ALII

▲ ROUNDUP® MAXLOAD AL

SIRIUS®

To meet the needs of farmers, we develop and sell a large number of one-shot herbicides for paddy rice. The main component of these herbicides is SIRIUS®, our proprietary active ingredient. We have been marketing these products in more than 20 countries for over 20 years.

TARGA®

This herbicide controls gramineous weeds that affect broadleaf crops such as soy beans, rapeseed, beets, cotton, and sunflowers. It is used in more than 40 countries, including India and countries in the United States and Europe.

PERMIT®

Taking advantage of the fact that it is extremely effective against cyperaceous weeds, we market this product in Japan under the trade names of HICUT®, which is a herbicide for paddy rice in the mid to late term that is highly effective against the pesky weed Eleocharis kuroguwai, and INPOOL®, for lawns. We also market it as PERMIT® in more than 20 overseas countries as an herbicide for paddy rice, corn fields, sugar cane fields, and lawns.

Insecticide

STARMITE®

This acaricide prevents and eliminates spider mites from fruits, tea, and vegetables. It is extremely safe for the natural enemies of spider mites and useful insects such as honey bees. It is also popular in overseas countries. In Korea it is used for fruits and vegetables, and in South America it is used for flowers.

▲ STARMITE®

▲ LEIMAY®

SANMITE®

This insecticide / acaricide is effective against spider mites and rust mites in fruit trees, as well as spider mites and whiteflies in vegetables. We also market this product in about 30 overseas countries.

Fungicide

LEIMAY®, ORACLE®

These fungicides have specific activity for diseases caused by oomycetes and myxomycetes. We sell LEIMAY®, which is used as an atomizing agent for potatoes, grapes, and vegetables, and ORACLE®, which is used for preventing and eliminating the root-knot disease of cruciferous vegetables and soil-borne diseases of potatoes, rice, vegetables, and lawns. BESGREEN® meanwhile is designed to prevent diseases in lawns, and is sold in more than 20 countries, including South Korea, China and parts of Europe.

GREATAM®, PULSOR®

These products contain a fungicide that we acquired from Dow AgroSciences in 2010. We market GREATAM® for the sheath blight disease that affects paddy rice and IKARUGA® for large patch disease of lawn. We export and sell this product in overseas markets including China, Korea, India, and Brazil under the trade name of PULSOR®.

Active Ingredients for Veterinary Pharmaceutical

Fluralaner

A compound that we invented in-house, Fluralaner is one of the ingredients contained in BRAVECTO® (veterinary pharmaceuticals), developed by MSD Animal Health. We manufacture Fluralaner and then supply it to MSD Animal Health for use in as active ingredients for veterinary pharmaceuticals.

▲ BRAVECTO®

Pharmaceuticals

We strive to develop better pharmaceuticals by making use of our accumulated technology. Our products help preserve precious lives and deliver smiles to people around the world.

Drug Discovery

We first entered the pharmaceutical business in 1982. Since then, we have continued to deal with challenges in the R&D of innovative new drugs, making full use of our strategically developed chemical compound library, our cutting-edge evaluation functions, and our fine organic synthesis technologies.

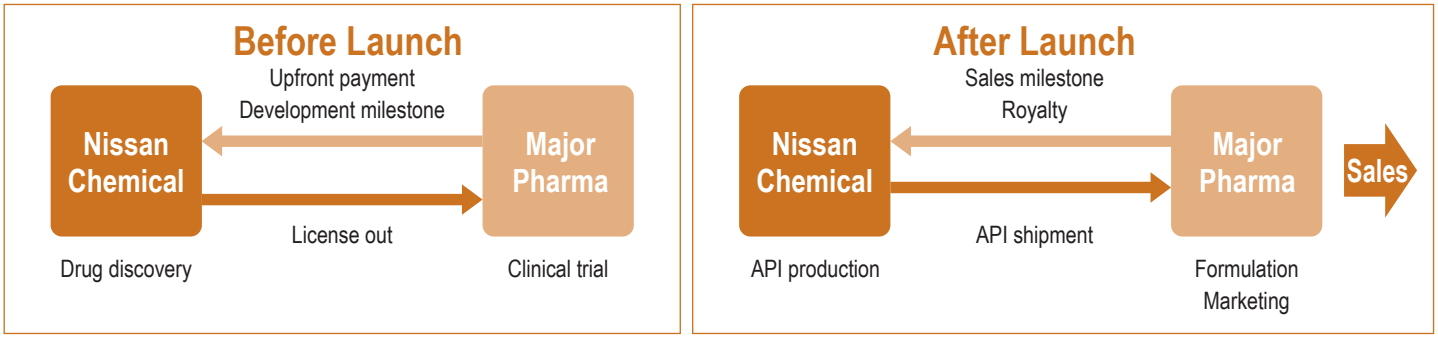
Finetech®

This business provides total support to customers for their R&D of active pharmaceutical ingredients (API). Specifically, we engage in the contracted development of manufacturing process in each one of the stages from pre-clinical to commercial production, as well as the contracted manufacture of API and intermediates in compliance with GMP.

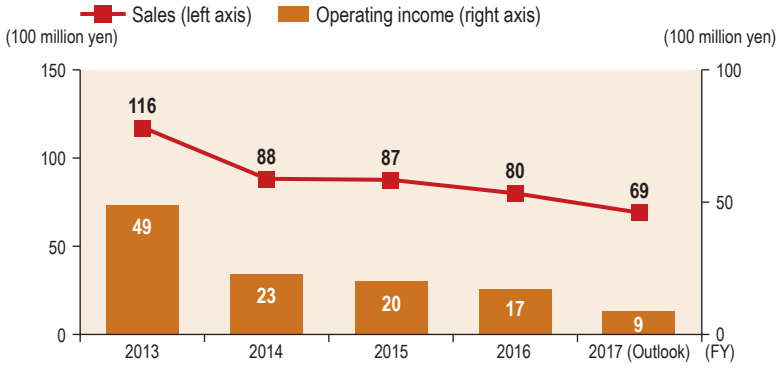
Features of Our Business

A Unique Business Model That Specializes in New Drug Discovery and the Manufacture of API without a Sales Force

Business Model



Business Results and Outlook



Comment

While sales of LIVALO® continued to grow on the overseas market in FY2016, figures were down in the domestic market due to the increasing availability of generic products. Sales of Finetech® were strong. We also brought in revenue from a lump-sum payment resulting from a joint research agreement with Mitsubishi Tanabe Pharma Corporation, relating to the development of new drugs for autoimmune diseases.

Main Products

Pitavastatin calcium (LIVALO®)

This is a statin agent that greatly reduces LDL cholesterol and causes fewer drug-interactions, offering the advantage of safety. This agent is recognized as one of the “strong statins” in clinical practice, and it is distributed by Kowa Pharmaceutical Co. Ltd. in Japan. It has also been released in the United States, as well as Latin American, European, and Asian countries. There are plans to release it in other countries and territories in the future.

Efonidipine hydrochloride (LANDEL®, FINTE®)

This is a dual type Ca antagonist that blocks not only L-type calcium channels, but also T-type channels. This agent has shown to have a positive effect on hypertension and angina pectoris. In addition, the agent is expected to provide a renal-protective and cardio-protective benefits. LANDEL® is distributed by Zeria Pharmaceutical Co., Ltd. and Shionogi & Co., Ltd. in Japan, and FINTE® is distributed by Green Cross Co. in South Korea.

▲ LIVALO®

Novel Agent under Development

NIP-022 (thrombocytopenia treatment agent)

This activates the thrombopoietin receptor, which is a hematopoietic factor. This is orally administrable drug and enables to accelerate platelet production. It has the potential to be a drug for treating every kind of thrombocytopenia.

NT-702 (asthma care, arteriosclerosis obliterans treatment agent)

This orally administrable drug exhibits both a phosphodiesterase inhibitory effect and a thromboxane A2 synthetase inhibitory effect. It is expected to be used as a novel agent for asthma and intermittent claudication associated with peripheral arterial disease.

NTC-801 (anti-arrhythmic agent)

This is a new orally administrable antiarrhythmic agent that inhibits the acetylcholine-activated potassium channel current (IKACh). NTC-801 is expected to be used as an atrial selective agent for the treatment of atrial fibrillation because IKACh channels are apparent in the atrium but not in the ventricle.

▲ Compound library at Biological Research Laboratories

Finetech® Business

Manufacturing API and intermediates (from pre-clinical to commercial production stages, including manufacturing in compliance with GMP)

We manufacture API and intermediates by establishing manufacturing methods that can be scaled up.

Process research (route scouting, optimization and scale-up)

We establish production processes that can be scaled-up through quantitative reaction analysis and confirming the stability data of every process. We suggest cost-competitive synthesis routes by only disclosing the structural formula.

Supplying API of generics

We develop and sell API capable of high levels of activity in small amounts, such as the prostaglandin (PG) class of ingredients and vitamin D_3 (VD_3), by making use of our accumulated technologies for handling high active API and our column equipment capable of high levels of refinement.

▲ Finetech® development plant

Chemicals

The development of products focused on high-level customer needs is another important mission.

Basic Chemicals

We provide products to meet a wide range of demands, focusing on melamine, sulfuric acid, nitric acid, ammonia and other industrial chemicals. We also provide high purity chemicals for washing semiconductors.

Fine Chemicals

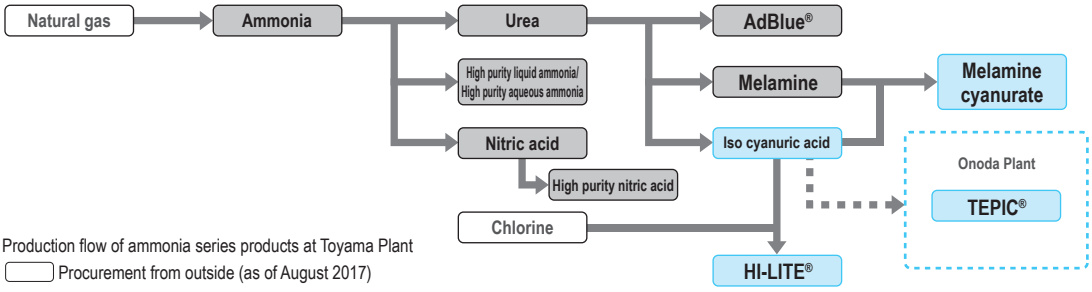
This business focuses on environmental chemicals such as TEPIC® (a special epoxy compound for sealants), melamine cyanurate and PHOSMEL® (non-halogen flame retardants), phenylphosphonic acid (a surface modifier), and HI-LITE® (sterilizing agent and disinfectant).

New Products

To better meet customer needs, we are working to fully enhance our product lineup, which focuses on new grade TEPIC®.

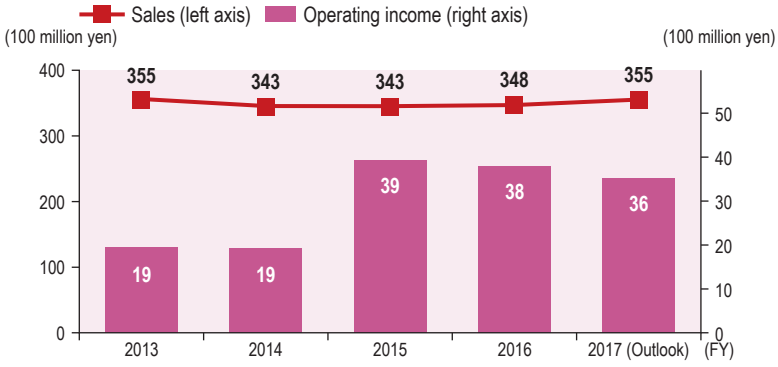
Features of Our Business

Supplying Derivatives that Use Ammonia as Main Raw Material



Production flow of ammonia series products at Toyama Plant
Procurement from outside (as of August 2017)

Business Results and Outlook



Comment

Despite maintaining healthy export sales of melamine, fixed costs for basic chemicals increased in FY2016 due to capital expenditure on initiatives such as switching feedstocks for ammonia. In terms of fine chemicals meanwhile, we saw an increase in revenue from HI-LITE® and TEPIC®.

Main Products

Melamine

This is widely used as an adhesive agent for plywood, laminated sheets, molded products, resin finish for fabric, paper and paint. It is highly aesthetic and offers a substantial level of quality.

High purity chemicals

Our products used for semiconductors / LED require an extremely high level of purity. We provide sulfuric acid, nitric acid, and ammonia to customers, who hold our products in high regard.

AdBlue® (High-grade urea solution)

This is a solution of urea in demineralized water used as an operating fluid in diesel-powered freight trucks to purify emissions. We have established and expanded our original supply system addressing customer needs.

FINEOXOCOL®

This is our unique, highly branched, saturated fatty alcohols and acids product with a long chain alkyl group consisting of carbon 16 to 20. It has been used for various esters, lubricants, cosmetics, and ink modifiers.

TEPIC®

This tris (2, 3-Epoxy propyl) isocyanurate is a special tri-functional epoxy compound consisting of a triazine ring and three glycidyl groups. The triazine ring provides excellent outdoor durability due to its low UV absorption, while the glycidyl groups provide outstanding heat resistance by densely cross-linking with resins.

Melamine cyanurate (MC)

This is a compound of melamine and isocyanuric acid. We provide a high quality product by integrating production from raw materials. MC is highly nitrogen containing compound, which offers superb thermal stability up to 300°C. It is used as a flame retardant or an auxiliary flame retardant for various engineering plastics such as nylon resins. It also exhibits outstanding flame retardation when used with flame retardants such as phosphorus systems or metal hydroxide, and has been added to various plastics.

HI-LITE®

Chlorinated isocyanulate is the main ingredient in this product, which is used for sterilization and disinfection of swimming pools and water purification tanks, and thus contributing to public hygiene.

Nissan Reishi

Nissan Reishi is a safe Japanese-made health food created through the domestic processing of Reishi mushrooms grown in Japan.

▲ Plywood

▲ LED

▲ AdBlue® trucks

▲ HI-LITE® in use

▲ Reishi

Advanced Materials & Planning

Tackling challenges in new fields with an “undaunted spirit”

Our mission is to create new materials and businesses that will be our pillars for future growth of Performance Materials and Life Sciences business. We work on developing new materials that meet market needs by making full use of our core technologies, “Fine Organic Synthesis”, “Functional Polymer Design”, “Ultrafine Particle Control” and “Biological Evaluation”. We also promote collaboration between industry, government, and academia, such as alliances with distinguished companies and joint research with universities, to generate actual demand at an early stage.

Main and New Products

Life Sciences Materials

Cell culture material

We offer the FCeM® series and SphereMax® as base materials for three-dimensional cell cultures. Used to culture cells in a three-dimensional state, these products can adjust cells efficiently while mimicking the in vivo environment.

The FCeM® series has been adapted for the evaluation of anticancer drugs because it is capable of culturing large amounts of iPS / ES cells as well as cancer cells. Just like the FCeM® series, SphereMax® allows for the low adhesion culture of cancer cells. Evenly dispersed spheres sink to the bottom, making it easy to collect the cultured cells. This makes the SphereMax® useful for sphere formation assay and 3D imaging analysis.

▲ Cells suspended in culture media

NANOFIBERGEL®

This gelator comprises palmitic acid and dipeptide, and is friendly to people and the environment. It changes from a gel (solid) to sol (liquid) in response to stress. It can be prepared in different forms, such as a spray, cream, and stick. Adding active ingredients such as hyaluronic acid to the gel has the effect that ingredients penetrate into the skin more slowly. We are continuing to develop products for cosmetics, quasi-drugs and pharmaceuticals.

▲ Spray

▲ Cream

▲ Stick

prevelex® (Material for Preventing the Adhesion of Biomolecules)

Applicable from experiments and research to regenerative medicine, it is an ultra-thin film material with nanometer-level thickness which allows the easy coating of objects of various shapes. It can be coated on PP, COP, PDMS and other base materials that had been difficult to coat. We are seeking new customers in the medical equipment field with characteristics such as prevention of the adhesion of DNA and other biomolecules as well as cell adhesion and protein adsorption.

▲ Consumables for pharmaceutical research

Environmental Harmony Materials

ECOPROMOTE® (crystal nucleating agent for polylactate)

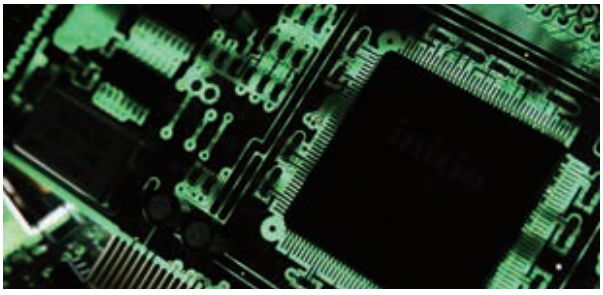
It forms a stable crystal nucleus during the polylactate molding process to significantly increase the speed of crystallization. It produces fine, even crystals, helping to improve the molding cycle and enhance the heat resistance and transparency of molded products.

▲ Bioplastic products (illustration purposes only)

Optical Materials

SUNCONNECT®

Liquid organic-inorganic hybrid resin materials that exhibit high thermal stability and near-infrared transparency. Suitable for imprinting methods, photo lithography, and other processes. It is used for optical interconnects for purposes such as optical waveguides and lenses for optical connectors.

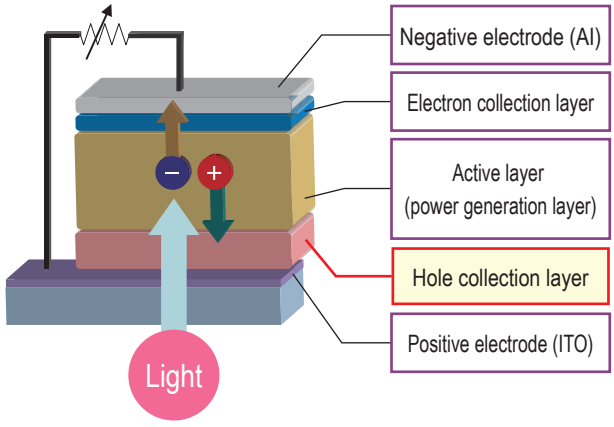


▲ Optical printed circuit board (illustration purposes only)

Battery Materials

Organic Thin-film Solar Cell Material

We are developing the hole collection layer of organic thin-film solar cells. The hole collection layer collects holes from excitons generated in the active layer, and then transports them to the cathode. At the same time, it blocks the inflow of electrons. It plays an important role in improving power generation efficiency. We will accelerate market development by taking advantage of the features of our materials, such as the capability of forming highly flat thin films, preparation at the HOMO level, and compatibility with various printing methods.



▲ Example for Organic Thin-film Solar Cell

Secondary Battery Materials

We are working to develop undercoat materials for use in lithium ion batteries. Applying coating materials to current collectors improves the flow of electricity, which in turn makes it possible to develop low resistance, high output batteries. This is chiefly targeted at vehicle batteries, which require higher levels of output, capacity and safety.

▲ Electric vehicle

Research and Development

We strive to further refine the core technology we have cultivated throughout our long history, and develop new products, technologies, and businesses.

Chemical Research Laboratories

Chemical Research Laboratories is Nissan Chemical's core R&D site, and is responsible for our corporate research. It researches and develops agricultural chemicals and pharmaceuticals that utilize the fine organic synthesis technology we have cultivated over the years, research on company-wide processes, and material analysis research.

Major research contents

- Discovery of agrochemicals and pharmaceuticals, and the development of agrochemical formulations and active pharmaceutical ingredients
- Development of new organic materials and polymer materials
- Process development of new products and candidates
- Material analysis and computational science that support research

▲ Funabashi, Chiba

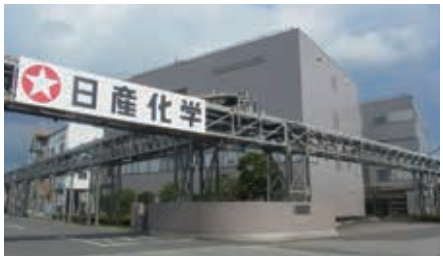
Materials Research Laboratories

Materials Research Laboratories create highly unique new materials, allowing us to respond quickly to increasingly sophisticated and diverse market needs. At the same time, the laboratories focus their efforts on researching next-generation materials in an effort to create new markets.

Major research contents

- Material development based on technologies for the design, synthesis, and evaluation of functional polymers and composite materials
- Development of new materials intended for new display technologies and semiconductor process technologies
- Manufacturing research and the application development of materials such as inorganic particulates

▲ Funabashi, Chiba



▲ Sodegaura, Chiba

▲ Toyama, Toyama

Biological Research Laboratories

Biological Research Laboratories serve as a place for life science research, such as evaluation research related to the usefulness and safety of agricultural chemicals, pharmaceuticals, and medical materials.

Major research contents

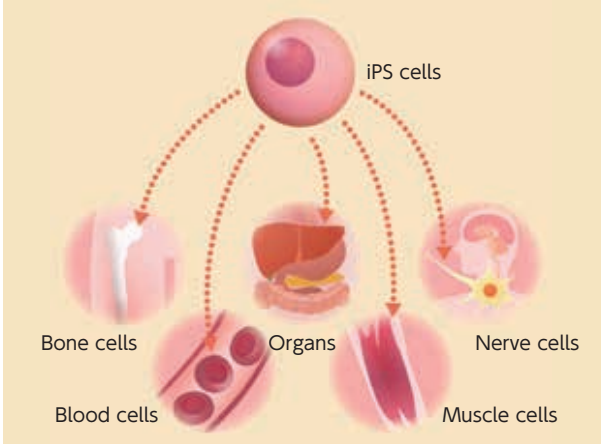
- Efficacy tests, safety tests, and residue tests of agrochemicals in greenhouses and on farmland
- Pharmacological tests, safety tests and pharmacokinetics tests of pharmaceuticals, ranging from those on the gene level to those based on pathological models
- Development of medical materials such as cell culture media, stem cell amplifiers, and coating materials for medical equipment

▲ Shiraoka, Saitama

Promotion of Industry-Government-Academia Collaborations

While we deepen our proprietary technologies, we also promote the creation of new materials and introduction of new technologies through industry-government-academia collaborations. As part of these activities, we are participating in a project of the Japan Agency for Medical Research and Development (AMED), which was founded in April 2015, and are working on the development of a cell manufacturing and processing system for the industrialization of regenerative medicine. We are conducting joint development with Kyoto University, and have discovered a technology that leads to the low-cost manufacturing of iPS cells. We will continue contributing to the development of regenerative medicine while also proceeding with state-of-the-art research.

In the area of collaboration between industry and academia, we have been involved in research through comprehensive collaboration with Kyushu University since April 2006. This collaboration aims to create new materials through functionalization and application research, which is conducted by combining the seeds (materials) owned by us with advanced technologies owned by the university. In addition to the previously described efforts, we engage in R&D activities around the world. We collaborate with overseas universities and participate in an international consortium.



▲ Regenerative medicine (illustration purposes only)

▲ Fukuoka Industry-Academia Symphonicity

R&D Expenses

We consider R&D is the source of growth, and have intensively invested our management resources in R&D.

Over the last five years, R&D expenses have totaled 74.8 billion yen. The percentage of our expenses in Performance Materials and Life Sciences (Agricultural Chemicals and Pharmaceuticals) is accounting for 47% and 41% respectively.