

The 100th anniversary of the Nippon Kayaku Group's founding is on June 5, 2016.

It is without a doubt that we were able to make it this far owing to the many years of support we received from stakeholders both past and present. We would like to take this opportunity to once again thank you all for your tremendous support.

Since its founding, Nippon Kayaku has leveraged technologies in the four areas of explosives, dyes, pharmaceuticals, and resins. We have combined and transformed these technologies to develop products to meet market demand over the years.

Going forward, we aim to tackle new challenges by working as one and employing our global "sukima" ideas.

Our goal is to create a prosperous and more enjoyable future!

So expect Nippon Kayaku to continue to provide the best products and services going forward.



President Masandu Suzulo

#### **Corporate Vision**

The KAYAKU spirit represents Nippon Kayaku Group's corporate vision - the ultimate goal of all its corporate activities.
We fulfill our social responsibilities as part of our corporate efforts to realize the KAYAKU spirit. These efforts are based on the standards of conduct articulated in the Group Action Guidelines and in the Nippon Kayaku Group Charter of Conduct and Code of Conduct.

#### **KAYAKU** spirit

"Continuously providing society with the best products through ceaseless progress and the combined forces of our consciences." is the Nippon Kayaku Group's KAYAKU spirit.

#### **CSR Management**

For the Nippon Kayaku Group, CSR-based management means aiming to realize the KAYAKU spirit and being a "good and strong company" to fulfill our social, economic and environmental responsibility.

#### **Group ACTION Guidelines**

At Nippon Kayaku Group, we believe in doing more than just going through the motions of our work. When we act, our aim is to think about the value we each individually contribute.



# Supporting Everything from People's Lifestyles to Industries.

#### Functional Chemicals Business

We differentiate ourselves by offering sustainable solutions in energy conservation and the environmental fields. We will continue to deliver value by developing complex products that incorporate proprietary materials and technologies from our core resins, colorants, and catalysts technologies. These products are used in a wide range of applications, especially the field of electronics. In quick- changing markets, Nippon Kayaku uses technologies at which we excel to create businesses that demonstrate our strengths.





We specialize in cancer-related products, putting our many years of development and manufacturing know-how to work to handle products from new pharmaceuticals to generics and provide medical institutions with the reliable information they need about anti-cancer drugs. Moving forward, "Speciality, Biosimilar & Generic" will continue to be a key domain. We aim to contribute to society with innovations that are backed by our technological expertise and by consistently supplying high-quality pharmaceuticals to improve the level of treatments patients receive, and to achieve more efficient medical spending.

As we seek to be No. 1 globally in niche markets, Nippon Kayaku sees functional chemicals, pharmaceuticals and safety systems as growth industries and runs its business with "global 'sukima' ideas."

#### Safety Systems Business

Nippon Kayaku has a long history in the development and manufacturing of explosives and pyrotechnic devices, together with a wide range of technologies. By applying these technologies, we have developed original automobile airbag inflators, micro gas generators that tighten seatbelts in the event of a collision, and ignition devices called squibs that are a key component of these. We contribute to enhancing safety in automobile societies by providing such products to the global market.





### Agrochemicals Business and Other

Nippon Kayaku runs agrochemical and real estate businesses. Supporting agricultural development and production of high-quality food.Nippon Kayaku has been developing, manufacturing, and selling the agrochemicals chemicals (pesticides, herbicides, and soil fumigants) that are essential for maintaining a stable supply of food, the pesticides for killing insanitary insects, etc.

# **Functional Chemicals Business**

#### Supporting Society and Industry

Within our functional chemicals business we handle functional materials, color materials, and catalysts. Functional materials cover a variety of functions especially for the electronics field, including epoxy resins, UV-curing resins, and other resin materials. Color materials include textiles, paper, with high added-value, such as colorants for inkjet printer inks. Products from our catalyst business are used for the production of acrylic acid and methacrylic acid. With this blending of new and long-established technologies, we create products designed to help protect the environment and save energy.

#### Rediscovering our roots: 1916

Since the launch of the first full-color inkjet printers in the early 1990s, many types of dyes and pigments have found use as ink colorants. With our lineup of numerous products and our colorant synthesizing technology (backed by over nine decades of history since Teikoku Senryo Seizo Co., Ltd. was founded in 1916), we have developed outstanding colorfast water-soluble dyestuff for inkjet photo printing and developed pigment slurry using new dispersion technology as we continue to advance inkjet technology.



#### Functional Materials Business

Epoxy resins and hardeners for – encapsulation of semiconductor device

UV-curing resin for 7 solder mask



In our Functional Materials Business, we are involved with materials that have a broad range of functions, including epoxy resins that serve as an insulating material for semiconductor encapsulation, UV-curable resins, and polyimide/polyamide resins that are noted for their high durability.

In addition, we are also developing high value added products for use in a wide range of fields, such as resin composites, including Sealants for LCD, Sealants for LED, Touch Panel Adhesives and microelectromechanical systems (MEMS), that combine our proprietary resin materials with our structuring technologies.



Epoxy resin



minin

Sealants for LCD panels

"Sukima" of tomorrow: UV adhesives for touch panels Designed to make touch panels look even more beautiful.

Clearer, thinner touch panels are realized by filling the gap between an LCD module and touch sensor. We are developing UV adhesives for touch panels as innovative materials that are both cost efficient and resource saving, because they can be reapplied during the manufacturing process.



#### Color Materials Business

Nippon Kayaku is pursuing the possibilities of dyes. As Japan's largest dye manufacturer, we are always at the forefront of the industry. To meet the needs of customers, which change with time, we develop characteristic and unique dyes, including those that are vivid in color, those that do not fade (colorfast) and those that are easy to handle. We deliver a wide range of products to market, including textiles, paper, resin coloring, and inkjet printers.

The company is committed to the creation of materials with features that can contribute to society in a variety of areas. This is done by utilizing Nippon Kayaku's printing and optical evaluation technologies, including resisting, dispersion, and synthesis technologies developed over many years in its colorant business. These consist of various functional coloring materials such as infrared absorbing agents, color resists for image sensors, pigment derivatives (synergists), Materials for thermal paper such as overcoat agents, and developer.



Dyes for papers



Colorants for inkjet printers



**Dyes for Textiles** 

#### Catalysts Business



Aquarium tank

Nippon Kayaku has been developing, manufacturing, and selling catalysts for the production of acrylic acid and methacrylic acid (by direct oxidation method). These products have been highly rated by our customers.

Acrylic acid finds use as raw material in the production of SAPs (super absorbent polymers) used in disposable diapers, etc., acrylic paints for automobiles, and adhesives.



Methacrylic acid is used in FPDs, light-guide plate and other optical applications, as well as in products such as transparent plastics used for giant aquarium tank, automotive parts, and artical marble.

#### Polatechno Co., Ltd. -

Nippon Kayaku's consolidated subsidiary Polatechno Co., Ltd. manufactures specialty polarizing films essential for LCD panel displays. These dye-type

polarizing films are ideal for niche markets that demand a great deal of durability, such as small and medium sized panels for automobiles and LCD projectors.



**Components for LCD projectors** 



Polarizing film

#### Nippon Kayaku in your life



When liquid crystals are injected between sheets of glass, sealants for LCD panels are used as adhesive holding the glass together.

Durable dyes are used to color the ink for color inkjet printers.

#### **Digital cameras**

Resist inks, which are UV-curing resins, are used in digital camera image sensors.

#### Projectors

ment.

Semiconductor encapsulator

epoxy resin is used to protect,

insulate and keep moisture

away from the semiconduc-

tors of PCs and other elec-

tronic and information equip-

Substances like iodine and dyestuffs are caused to adsorb and orient themselves in polyvinyl alcohol. The resulting polarizing film is used to allow light of only a certain direction to pass.

#### Stick-on notes

Catalysts are used to produce acrylic acid, a raw material of adhesives.

#### Curtains

Dyestuffs are used that make fibers, resins and other materials colorful.

# Pharmaceuticals Business

#### Supporting modern medical care

Nippon Kayaku's history in the anti-cancer field started with the launch of BLEO<sup>™</sup> in 1969, and currently has many anti-cancer line-up. On the basis of Nippon Kayaku's network of cancer-specialist medical representatives, highly reliable information can be rapidly provided to physicians, pharmacists and nurses at clinical institutions. In recent years, we have been furthering our efforts into the areas of biosimilar products, generic anti-cancer drugs, as well as interventional radiology (IVR) so that we can continue to provide highly necessary pharmaceuticals and medical equipment for patients along with exceptionally reliable information to the medical institutions. Moving forward, "Speciality, Biosimilar & Generic" will continue to be a key domain. We aim to contribute to society with innovations that are backed by our technological expertise and by consistently supplying high-quality pharmaceuticals to improve the level of treatments patients receive, and to achieve more efficient medical spending.

#### Rediscovering our roots: 1931

Yamakawa Seiyaku Co., Ltd. was founded in 1931 for the purpose of aspirin manufacture, and became an important company. At that time, aspirin was imported, but the Japanese government urged domestic manufacture of a number of important drugs, among which demand was greatest for aspirin. In 1933, Yamakawa Seiyaku Co., Ltd., having overcome various difficulties, succeeded with domestic manufacture, and Yamakawa aspirin tablets were launched. In 1943, Yamakawa Seiyaku Co., Ltd. merged with Nippon Kayaku Seizo Co., Ltd. to form Nippon Kayaku Co., Ltd.



#### Principal pharmaceutical fields

#### Ethical drugs for Japanese use

Nippon Kayaku's efforts towards cancer treatment have provided numerous products since the launch of BLEO<sup>™</sup>. A large lineup of cancer-related products and accumulation of information as well as know-how are our strong points. In the cancer-related field, we are committed to promoting innovations by using our technological expertise. It is our goal to contribute to society by consistently supplying high-quality pharmaceuticals to improve patient outcomes, and to achieve more efficient medical spending. We do this by stationing cancer-specialist medical representatives throughout Japan, setting up Medical Information Service Centers, where we respond to inquiries from medical professionals and others, and preparing a framework that can deliver information to medical institutions about correct drug use for assisting in medical treatment.



#### Biosimilars

Nippon Kayaku aims to make further contributions to patients, their families, and healthcare professionals through the rapid commercialization of biosimilar pharmaceuticals, which are playing a major role in the treatment of cancer and Autoimmune disease. By providing a wide range of biosimilars, the company hopes to help realize a society where everyone has access to high quality medical care, at any place and time.



Principal pharmaceutical fields

#### Active Pharmaceutical Ingredients (API) and Export Business

We are conducting contracted manufacturing of pharmaceutical API and intermediates, using manufacturing techniques for high potency substances that were developed through fermentation technology and anti-cancer drugs as our API business. In addition, we are exporting anti-cancer drugs, including BLEO<sup>™</sup> to over 50 countries globally in regions such as Europe, Russia and CIS countries as well as Asia.

#### Diagnostic drugs

Nippon Kayaku provides diagnostics pertaining to tumor markers, which are useful for diagnosing cancer and judging the therapeutic effects and prognoses in the pharmaceuticals business.

Nippon Kayaku also produces and sells a product as a marker of blood sugar contrel (GlycoMark) used for diabetes. This product has been approved by the U.S. Food and Drug Administration (FDA) and are used in foreign countries. Thus, Nippon Kayaku has been deploying its business all over the world.

#### Food-related activities

At NIPPON KAYAKU FOOD TECHNO CO., LTD., our consolidated subsidiary, we are engaged in the manufacturing and sales of ethanol preparations that improve the shelf life of food products, preservatives for food quality, which curb the growth of mold and microbes, cleaning disinfectants that sanitize food manufacturing environments, and raw materials for health food products. Drawing on advanced technologies developed in pharmaceutical manufacturing, we are providing society with the best products that support a new era of food safety and food, health in an environment attentive to hygiene management.







#### "Sukima" of tomorrow: Polymeric micelle anti-cancer drugs

Polymeric micelle anti-cancer drugs have greater efficacy than other drugs, and progress is being made with their development for use in a novel nanomedicine drug-delivery system (DDS) in which anti-cancer drugs, which tend to have adverse effects, are selectively concentrated in cancer tissues, in order to achieve sufficient anti-cancer efficacy at the same time as reduced adverse effects.



#### Q: What are polymeric micelle anti-cancer drugs?

A: Polymeric micelle anti-cancer drugs are nanoparticles 20 to 100 nm in diameter, in which a low-molecular-weight anti-cancer drug is entirely enclosed and separated from the external environment by string-like large polymers. Each large polymer is constructed with a hydrophilic moiety, polyethylene glycol, at the external end, and a hydrophobic moiety at the internal end. Each "string" has a molecular weight of tens of thousand units, and their aggregation results in weights of millions of units.

## Safety Systems Business

#### Supporting Driver's Safety

Our modern automobile society sometimes has to balance safety with other concerns. For example, the amount of traffic is increasing, and automobiles are being made lighter to enhance fuel efficiency. These make it all the more important to ensure and improve automobile user's safety. Our Safety Systems Business helps advance user's safety and evolution of the automobile society by developing, manufacturing and selling airbag inflators and micro gas generators, which are essential components of airbags and seatbelt pretensioners that support passenger's safety.

#### Rediscovering our roots: 1916

Nippon Kayaku has a long history of developing, manufacturing and selling dynamite and electric detonators since our start as the first Japanese industrial explosives manufacturer in 1916. We have made full use of our technologies and know-how in a unique blending of mechanics and chemistry (especially explosives) to design, develop and manufacture airbag inflators and other automotive safety devices.



#### Main products

Airbag inflators



An inflator is a gas generator that inflates the air bag. Nippon Kayaku started with inflators for driver's seat and passenger seat applications, and later expanded our scope to add inflators for side air bags, curtain air bags, and knee

air bags to our portfolio. We continue to develop new products, to enhance the safety of vehicles.

#### Squibs

A squib is an ignition part embedded in inflators and micro gas generators. When the sensor detects a collision, an electric current is sent to the squib, and then the heat that is generated ignites the agent inside the squib, leading to its activation. Upon activation, the ignition and heat from the squib is transferred to the gas generating agent of the inflator or micro gas generator which generates the gas used to propel the device.



A micro gas generator is a device that acts to retract the seatbelt (seatbelt pretensioner) in the event of a collision. The retraction of the seatbelt fixes the body to the ideal position in relation to the inflated airbag. This increases the effectiveness of the airbag, maximizing the safety for the passenger. As a safety device during an accident, its additional usages are being put in place, such as the shifting of the headrests or seats, or a system where the front hood is popped up to protect pedestrians.



- 1 The Collision sensor is a device embedded in the front portion of the vehicle, which detects collisions.
- 2 The Diagnostic device determines whether a collision is caused by an accident or not.
- 3 When determined as an accident, an electrical signal is relayed to the squib.
- 4 The squib's explosive agent is ignited by the relayed electrical signal.
- 5 Gas generating agent is ignited, and gas is generated.
- 6 When the "airbag" is inflated, the "seatbelt pretensioner" retracts the seatbelt, absorbing the shock received by the passenger. \*This process from 1 to 6 is completed in about 0.05 seconds.



# Agrochemicals Business

#### Supporting Food and Agriculture

Without food, there would be no life. The farm is where food is produced. The world's population is rising rapidly and demand for food is growing globally. Thus our world needs a safe and stable supply of food we can count on into the future. This requires agrochemicals that are good for the environment and suited for today's agricultural patterns, which include older farmers and people working side jobs. Using our fine chemicals expertise, we develop, manufacture and sell insecticides, fungicides, herbicides, soil fumigants and insecticides for public health, among others. By supplying chemicals that meet the needs of the times, we support people's lifestyles.

#### Rediscovering our roots: 1934

The roots of our Agrochemicals Business go back to 1934, when we started manufacturing the fumigant chloropicrin. In 1956, we formed a technical tie-up with the Swiss firm J.R. Geigy Ltd. (now Syngenta AG) and began domestic production of the insecticide diazinon at our Oji Pharmaceutical Plant. It was reported that a line of trucks formed around the plant to get the product. These two chemicals were the basis for a variety of products designed for different uses and are still used on farms today.



#### Agrochemical Business products

#### • Agricultural chemicals

We offer agricultural chemicals that bring together our production technology and know-how and meet the needs of the times.

#### Insecticide DIAZINON CS "DIAZINON SL SOL"

Japan's first microencapsulated agricultural chemical. It has long-lasting effectiveness and is highly safe.

#### Soil fumigant CHLOROPICRIN EC "CHLOPIC FLOW"

This improved new chemical mixes chloropicrin, which is hard to handle by itself, with water, resulting in a product that is easy to process with less irritation when processing but has stable effectiveness.

In addition, we have developed innovative preparations, such as CYCLO PACK granules, a labor-saving insecticide that spreads by itself, "WIDE COAT", a new type of spreading agent that combines the two functions of spreadability and sticking power, and "FUHMON", a spiracle-sealing insecticide that has food additives as active ingredients.

#### Insecticides for public health

We offer chemicals to protect from hygiene pests like cockroaches, bed bugs and ticks.

#### Insecticide PROPETAMPHOS CS "SAFROTIN MC"

Safrotin, which has long been used to protect form hygiene pests, now comes in microcapsule form. It has long-lasting effectiveness and is highly safe. It is particularly effective against cockroaches, since the capsules break down the special structure of their digestive tracts.

#### Other chemicals

#### Animal repellent R-731

This animal repellent contains microcapsules of capsaicin, the sharp-tasting component of chili peppers. Kneaded into cables and other goods, it prevents rats from chewing and harming those goods.

#### "Sukima" of t<u>omorrow: microcapsule</u> chemical technology

Our microcapsule chemical technology is a first for agricultural chemicals in Japan. Controlling the capsule size and strength and the rate at which chemicals leach out makes it possible to tailor agents to targeted pests.



**DIAZINON SL SOL** 











# Our vast accumulation of technologies holds our current business.

At Nippon Kayaku's core are technologies of fine chemicals, which we have built up in the fields of explosives, dyes and pharmaceuticals (all of which derived from our original products) along with resins (a field we entered later), among others. With these core technologies, and new technologies created through their fusions, we have been conceiving new products and businesses. We will continue to strengthen, expand and fuse our core technologies to create new products that meet the needs of the times.



#### **OExplosives technology**

Using technologies learned from years of explosives and detonator manufacturing, we are undertaking the challenge of developing new technologies. Based on those technologies, we have developed automotive safety devices that require timing control at the millisecond level.



#### OPharmaceutical technology

By fusing our low-molecular synthesis technology developed in the pharmaceutical field with our high polymer technology established through the development of resins, we have created new "Polymeric micelle anti-cancer drugs," which are currently undergoing clinical trials.

#### OResin technology

as and other products.

**Operation Dyestuff** technology

Our accumulated technology, which has

changed based on needs of the times,

has evolved to a high level and is now

used in colorants for inkjet printer inks,

and for the color filters of digital camer-

By combining our Dye technology with technology built up through the development of various resins, we have created a number of new products such as polarizing films and optical functional films.





# There is no "sukima," between our research centers.

Each division of R&D will work together as one with the business groups and divisions to strengthen the vertical threads of our system of product development so that it captures market needs accurately. As the group in charge of strengthening company-wide R&D that crosses organizational boundaries, the Research and Development Group is responsible for integration of intellectual property and management of corporate research, and is working to strengthen the horizontal threads that will contribute to R&D overall.

We will work to create the best products through the fusion of knowledge and technologies based on this strong organization, woven together by these vertical and horizontal threads.



Open innovation with external partners

#### **OFunctional Chemicals R&D Laboratories**

As the research and development department of the Functional Chemicals Group, the Functional Chemicals R&D Laboratories are involved in a variety of research and development areas, including resins, colorants, films, catalysts and new materials that derive from these.



#### OSafety Systems Development Laboratories

The Safety Systems Development Laboratories develop automotive safety devices such as airbag inflators that instantly inflate airbags and micro gas generators that create force to retract seatbelts automatically.



#### OPharmaceuticals Research Laboratories

The Pharmaceuticals Research Laboratories specialize in research and development of anti-cancer drugs as well as in peripheral areas, such as polymeric micelle anti-cancer drugs using nanotechnology, biosimilar and development of generic anti-cancer drugs.



#### **OAgrochemicals Laboratories**

In order to contribute to an abundant and safe food supply we can rely on, the Agrochemicals Laboratories conduct R&D on environmentally friendly chemical pesticides and new functional agrochemical preparations.



History

## Kayaku Supports.

Nippon Kayaku is a chemicals manufacturer with a long history. Founded in 1916 as Japan's first joint-stock corporation manufacturing industrial explosives, it has since launched various technologies and diverse products. The technologies we bring out may change in form, but they continue to support convenience, comfort, confidence and safety for people's lives. At their root is the ideal of "serving society with products that enhance human happiness." Moving into the future, Nippon Kayaku continues to embrace this ideal.







1932 Yamakawa Aspirin Changed company name to Nippon Kayaku Co., Ltd. 1945 Acquired Teikoku Senryo Seizo Co., Ltd. and Yamakawa Seiyaku Co., Ltd.  $\cap$ Established Yamakawa Seiyaku Co., Ltd. and began marketing Aspirin the following year: Pharmaceutical technology. 1916 Founded Nippon Kayaku Seizo Co., Ltd. 1943 1931 Established Teikoku Senryo Seizo Co., Ltd.: Dyestuff technology Began as Nippon Kayaku Seizo Co., Ltd., the first industrial explosives manufacturer in Japan: Explosives technology 1916



1963 Awarded Deming Application Prize

1969 Launched sales of an anti-cancer drug, BLEO™

The Nippon Kayaku Group around the World

#### **Corporate Profile**

Business Name Representative Foundation Capital Head Office Address

- Nippon Kayaku Co., Ltd.
- Masanobu Suzuki, President
- June 5, 1916
- 14,932 million yen
- Meiji Yasuda Seimei Building 19th and 20th Floors, 1-1, Marunouchi 2-chome, Chiyoda-ku, Tokyo 100-0005, Japan
- Web site
- https://www.nipponkayaku.co.jp/english/



**Functional Chemicals Business** 



Fukuyama Plant

MicroChem Corp.



Asa Plant



KAYAKU CHEMICAL (WUXI) CO., LTD.



Pharmaceuticals Business

Takasaki Plant



NIPPON KAYAKU FOOD TECHNO CO., LTD.





Wuxi Advanced Kayaku Chemical Co., Ltd.

#### Safety Systems Business



Himeji Plant



POLATECHNO CO., LTD.





Kayaku Safety Systems Europe a.s.

**Agrochemicals Business** 



Kashima Plant

Kayaku Safety Systems (Huzhou) Co., Ltd.



Kayaku Safety Systems de Mexico, S.A. de C.V.







Malaysia Sdn. Bhd.

MicroChem Corp.

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Moxtek, Inc.
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NIPPON KAYAKU AMERICA, INC.

Kayaku Safety Systems de Mexico, S.A. de C.V.



Head Office

"Hishou" (training center)

Nagoya Pharmaceutical Office



Sapporo Pharmaceutical Office

Functional Chemicals Business
Pharmaceuticals Business
Safety Systems Business
Agrochemicals Business
Others
Group companies

#### Organization (as of October 1, 2018)



Global "sukima" ideas

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#### From "Sukima" to the World and the Future

Our technologies, born from "global 'Sukima' ideas," may not always get a lot of attention. However, these technologies support today's lifestyles and various industries and are laying a path to the future. Count on the Nippon Kayaku Group to continue bringing forth supporting technologies from "sukima" to contribute to the world and the future.

#### Global "sukima" ideas

"Global 'sukima' ideas" is Nippon Kayaku's Corporate Slogan. The term "sukima" is Japanese for "niche," meaning a place whose value is still undiscovered and unexploited. At Nippon Kayaku, our aim is to be No. 1 globally in niche markets, not by virtue of scale, but by using our original technology to provide high added-value products that the world needs.





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