G20 2019 JAPAN

Plastics Smart

MARINE PLASTICS × INNOVATION

Public-Private Innovative Cooperative Framework on Marine Plastics

環境省
Ministry of the Environment

To G20 Karuizawa Ministerial Meeting participants,

We are now facing a critical global challenge. Our oceans are becoming more and more seriously polluted with plastic waste.

We have to take urgent action to solve this problem, and to do this, we need to induce revolutionary changes in public consciousness. Innovation is essential in this process.

Japan has been making great efforts over many years in the development of substitutes for plastics. We have a huge number of researchers, local governments, and companies that can offer support to other developing countries.

I would like to take this opportunity to introduce you to several cases of public-private innovation in Japan. You can see that they use outstanding techniques, systems and ideas. In fact, I myself have visited and seen them at first hand.

This brochure gives you an idea of the cooperative actions being taken and I hope that you find it useful when planning strategies in your respective countries to deal with the problem of plastics and ocean pollution.

原田義昭

Minister of the Environment, Japan　June, 2019　Yoshiaki Harada

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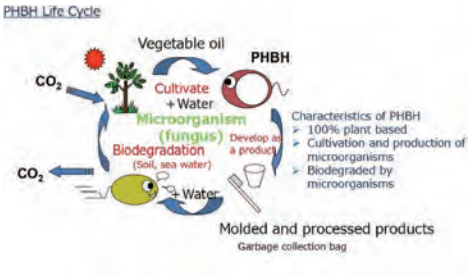
New Materials

CASE 01 Kaneka Biodegradable Polymer PHBH

KANEKA CORPORATION



Life Cycle of PHBH

Example of PHBH Applications

Kaneka Biodegradable Polymer PHBH is a 100% bio-based polymer produced using biomass, such as plant oils, as raw material through fermentation technology to accumulate polymers in microorganisms. It can be processed and molded to be used in various applications.

PHBH has excellent biodegradability. It decomposes into carbon dioxide (CO2) and water in natural environments such as in soil and in seawater. It has received the "OK Biodegradable MARINE" certification which has been given to only four types of polymers worldwide to certify that they can biodegrade in seawater.

Contact information

New Business Development Department
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CASE 02 Plant-derived biodegradable plastic, BioPBS™, contributing to the solution of environmental problems

Mitsubishi Chemical Corporation

Application example of BioPBS™

BioPBS™ cutlery

BioPBS™ is a plant-derived biodegradable plastic that can be broken down into water and carbon dioxide by naturally-occurring microbes, ensuring it exerts a low impact on the natural environment.

With this low-impact characteristic, the material is expected to contribute to the solution of environmental problems, such as plastic waste and global warming. The company continues to develop various applications of the material in food-related products, such as paper cups, plastic straws, coffee capsules, cutlery, as well as mulch films for agriculture, and others.

Contact information

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New Materials

CASE 03 Development of bio-polypropylene

Mitsui Chemicals, Inc.

Naphtha（conventional raw material of polypropylene）

Demonstration production of Bio-Polypropylene

Mitsui Chemicals is the first company in the world that will be successful in demonstrating an industrial-level verification test of bio-polypropylene (bPP) production using a unique production technique that uses fermentation as the key reaction. Polypropylene is the second-most widely produced plastic in the world, and bPP is a type of polypropylene that uses biomass instead of petroleum-based raw materials.

Mitsui Chemicals utilizes various sources of biomass, including food waste and non-edible materials, as raw materials, converting them into electricity to be used effectively, improving their recyclability by turning the processed substances into mono-materials, and processing plastic waste to become monomers. In this way, the company aims to achieve a sustainable circular economy by combining recycling technologies into its development efforts.

Contact information

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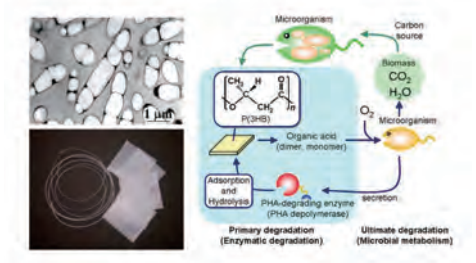
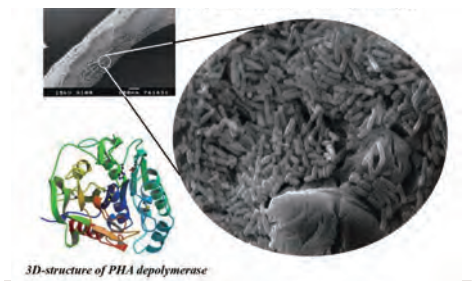
CASE 04 Development of a high-strength biodegradable material for fishing lines and other products

The University of Tokyo, Prof. Tadahisa Iwata



Biosynthesis and biodegradation of microbial polyesters



3S-structure of PHA depolymerase

Prof. Iwata's laboratory has succeeded in developing the world's strongest biodegradable fibers and films. Biopolyester materials synthesized using microorganisms from sugar and vegetable oil are biodegradable plastics that can be degraded completely into carbon dioxide and water, using enzymes secreted by other environmental microorganisms.

Such fibers and films are completely biodegradable in nature, such as in soil, rivers, and oceans. The materials can also be used to produce fishing lines and surgical sutures. Currently, the laboratory is working towards the commercialization of these materials.

Contact information

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Alternative

CASE 05 Environmentally-friendly paper-based barrier material "SILBIO BARRIER"

Oji Holdings Corporation

Packaging samples of SILBIO BARRIER

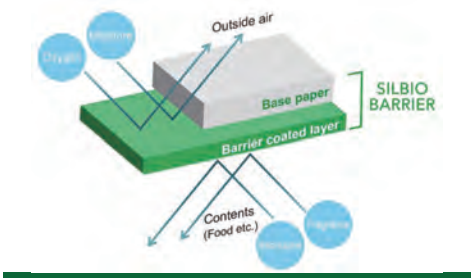

Illustration of barrier function

Oji Holdings has developed "SILBIO BARRIER" an environmentally-friendly paper-based barrier material to contribute to the reduction of plastic waste. Although this is a paper-based material, it can stop oxygen and water vapor from permeating through from the outside, thereby helping to prevent the deterioration of contents, and preserving the aroma and moisture content.

In addition, the carefully-selected raw materials can be used in a wide range of packaging applications, including food and daily necessities, such as detergents and other materials. Notably, the company is preparing products that only use materials that are approved by the US Food and Drug Administration (FDA) to be used in products that come into contact with food.

Contact information

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CASE 06 "SHIELDPLUS®" , a material of the future developed from paper

Nippon Paper Industries, Co., Ltd.

Paper packaging using "SHIELDPLUS®"

"SHIELDPLUS®" application example (Nagaraen Co., Ltd. "Motto Yasashii (kinder) Ukai Senbei Packaging")

Generally, only aluminum and plastic are available to be used in the production of soft packaging materials with a barrier function to maintain the freshness of the contents. The development of "SHIELDPLUS®" has opened new possibilities for paper-based packaging. The product makes use of water-based coating technology that can confer a high barrier function to paper as biomass material.

As a specific application, it is now commercially used in cereal containers and snacks packaging.

Contact information

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Alternative

CASE 07 Cellulose beads

Rengo. Co., Ltd.

Cellulose beads (2 mm, 0.3 mm)

Cellulose beads (100μm)

Cellulose beads are biodegradable materials in the form of spherical particles that are made of 100% cellulose, in the same way as paper. This material has a high affinity to water and excellent chemical and heat resistance properties, making it useful in many different applications, such as for detergents, cosmetic raw materials, abrasives, carriers, fillers, and others.

Particularly, it can be used to replace plastic particles in the packaging of scrub agents used in face wash, body wash, and toothpaste products, as well as raw materials for foundations and other cosmetic products, because the beads will not disrupt the environment even if they are spilled into the ocean.

Contact information

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CASE 08 Sustainable Cellulose Film Packaging

Futamura Chemical Co., Ltd.

Circular Economy in NatureFlexTM

Decomposition state in the household compost of NatureFlexTM

Futamura Chemical develops and manufactures cellulose films (NatureFlexTM), a material that can be used as a plastic substitute. The film is made using from pulp, which is produced from wood as a renewable resource. This film possesses heat sealing, non-conductive, and high-barrier properties, and is often used as food product packaging, such as stand-up pouches, pillow pouch packaging, twist wrap, and others.

Also, NatureFlexTM is a compostable material that has obtained certification from European (EN13432) and United States (ASRMD6400) industrial composting standards, as well as the OK Compost home (Australia/TÜV) home composting standard. Thus it contributes to the creation of a recycling society.

Contact information

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Alternative

CASE 09 The world's first wooden straws "AQURAS"

Aqura Home Co., Ltd.

Wooden straws and materials

Usage image of wooden straw

Aqura Wooden Straws are made from wood which originates from Japan's domestic wood including timber mainly from forest thinning, by slicing wood shavings about 0.15 mm thick, and winding them in a spiral to form a cylinder . The development and mass production of straws using this method is the first attempt of this kind in the world.

This project to produce wooden straws has been taken up by the media not only in Japan but also in other Asian countries such as China. Going forward, the project will make preparations for mass production of the straws by promoting mechanization of the process.

Contact information

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Reduce

CASE 10 "People-Friendly and Earth-Friendly" Label-less Mineral Water

ASAHI Soft Drinks Co., Ltd.

Refreshing mineral water Label-less bottle ①

Refreshing mineral water Label-less bottle ②

The "Label-less Bottle" series released by Asahi Soft Drinks Co., Ltd. helps to reduce the use of roll labels attached to PET bottles. This product is made exclusively for online sale by the carton and is marketed as "people-friendly and earth-friendly" mineral water that eliminates the need to remove plastic labels when recycling.

Product details (such as constituent ingredients, which are usually shown on the roll label) are shown on the exterior cardboard carton, while adhesive labels are used to display mandatory product information such as the recycling logo on individual products. This initiative reduces plastic consumption for labels by 90%. About 500,000 cartons were sold in the one year after release and sales are going well.

Contact information

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Reduce

CASE 11 "ECO i-Shirt" shirts using 100%-recycled fiber after use of plastic materials for packaging is discontinued

Haruyama Holdings Inc.

Before

ECO i-Shirt (After)

Shirts are often packaged using pins and sleeve keepers made of plastic. This prevents shirts from losing their shape and getting creased during transportation and when on display. Approximately 25 grams of plastic packaging materials are used to pack each individual shirt, so Haruyama Holdings has worked on the development and sale of shirts packaged with a greatly reduced amount of plastic in all packaging materials.

ECO i-Shirt is also working on reduction of the amount of plastic by using fibers made of 100% recycled plastic bottles.

Contact information

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CASE 12 Efforts to achieve Zero Waste

Specified Non-profit Organization Zero Waste Academy

Bulk sales (by weight)

Zero Waste Accreditation system

The Zero Waste Academy drives the initiative to achieve Zero Waste, founded and based in Kamikatsu, the first municipality in Japan to declare a “zero waste ambition”. The town achieved a recycle ratio of 80%, and the organization is taking the following measures to promote the “zero waste policy” in Japan and abroad:

1)Providing support for implementing “sell by weight” model that ensures the reduction of single-use plastic packaging, at restaurants and cafes.
2)Founding and organizing the "Zero Waste Accreditation system" – a system for public certification of businesses working on waste reduction.
3)"Zero Waste card game" makes a game out of understanding and individual practices of SDGs and waste reduction in daily life. It can be enjoyed by children and adults alike.

Contact information

Specified Non-profit Organization Zero Waste Academy Director Akira Sakano

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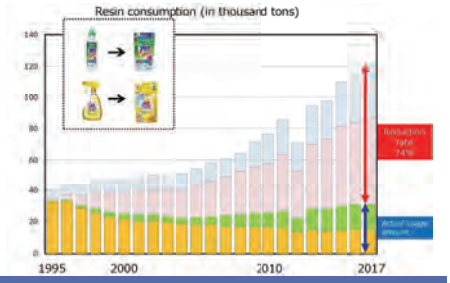
Reduce

CASE 13 From “Refill” to “Replacement”

Kao Corporation



Plastic reduction (promotion of refill containers)

Smart holder

Kao has further evolved its conventional refill products and realized a new idea in the form of a replacement system. By installing an exclusively-developed holder and pump system, known as the “Smart Holder”, consumers can use the entire content without having to go through the troublesome refilling process.

A replacement container uses only about one-sixth of the plastic materials needed for a bottle container, thus significantly reducing plastic use.

Contact information

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Recycle

CASE 14 Recycling of EPS (Expanded Polystyrene) fresh fish boxes and agricultural products boxes at wholesale markets in Japan

Japan Expanded Polystyrene Association

Toyosu Market EPS Recycling Facility ①

Toyosu Market EPS Recycling Facility ②

At wholesale markets where large amounts of EPS are used as containers for fresh fish boxes and agricultural products boxes, recycling equipment such as volume reduction machines have been introduced and recycling is being efficiently conducted directly onsite. Specifically, EPS boxes discarded at wholesale markets are collected at onsite volume reduction facilities, crushed after removal of foreign matter and reduced to 1/50 in volume using heat melting machines to be processed into PS ingots. They can be efficiently transported using technology allowing the reduction of volume to about one-fifth compared to conventional methods. These Japanese PS ingots are highly valued at home and abroad.

As a result of such efforts, 90.4% of used EPS in Japan gets effectively reused (54.4% for material recycling, 36.0% for energy recovery) (as of 2017).

In addition, PS ingots processed at recycling facilities in the wholesale markets throughout the country are recycled as raw materials for picture frames and stationery goods, while Japan Expanded Polystyrene Association has developed a fish odor removal technology to further improve the quality of recycled products to respond to quality demands at home and abroad.

Contact information

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Cleanup

CASE 15 Turning garbage clean-ups into a sport!

Japan Spo-GOMI Association General Corporate Judicial Body Social Sports Initiative

Spo GOMI activity photo ①

Spo GOMI activity photo ②

Sports x Garbage clean-ups "Spo-GOMI" is developed in Japan as the world's most eco-friendly sport. It involves teams of up to five people, who compete against each other to see who can pick up the most garbage and what type of waste, from a predetermined area within a one hour timeframe.

By incorporating the concept of sport into a clean-up activity, people can participate easily in a competitive and fun way. Approximately 800 events have been held, with the participation of around 88,000 people so far. There are also competitions held in Russia, Myanmar, South Korea, Panama, Hawaii, and others.

Contact information

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CASE 16 Town beautification "Adopt Program" (+ initiative of the beverage industry)

The Beverage Industry Environment Beautification Association (BIEBA)
Japan Soft Drinks Association(JSDA)

Cost and equipment for clean-up are subsidized ①

Cost and equipment for clean-up are subsidized ②

The Beverage Industry Environment Beautification Association, which works to prevent littering of beverage containers, promotes the "Adopt Program", a new town beautification method in collaboration between citizens and local governments.

"Adopt Program" involves citizens "adopting" public spaces to carry out a clean-up, such as roads, rivers and parks and cleaning them up with as much care as they would if it were their own home. Local governments support their activities.

Currently more than 45,000 groups and approximately 2.5 million people participate in the program and have been making contributions to the beautification of local environments.

In addition, in order to achieve a "100% effective utilization of PET bottles" by FY2030, the soft drink industry is working on promoting "bottle-to-bottle" recycling.

Contact information

The Beverage Industry Environment Beautification Association (BIEBA)
Japan Soft Drinks Association (JSDA)

Cleanup

CASE 17 Establishing a marine waste collection and disposal system collaboratively managed by the prefectural government and fishery operators

Kagawa Prefecture

Pulling garbage out of the sea

Storing garbage

Kagawa Prefecture, in collaboration with national and municipal governments, and the Kagawa Prefecture Fisheries Cooperative Association, has designed and implemented a system to collect and dispose of seafloor waste. One defining characteristic of this system is that all municipalities in the prefecture participate, including those located inland.
In the past, there was no protocol for the collection and disposal of seafloor waste. Consequently, garbage extracted by fishermen was returned to the sea. However this system can be applied as an opportunity to remove waste from the seafloor.

The system of collection and disposal works as follows:
1)Fishermen volunteer to bring garbage pulled out of the sea back to the fishing port, where it is sorted and stored.
2)This stored garbage is transported and disposed of as general waste by a coastal city or town with a fishing port.
3)The prefecture commissions a waste management company to transport and process garbage that is difficult to process in municipal facilities.
4)Waste transportation and processing expenses are paid for by the prefecture and all municipalities within Kagawa, including those located inland.
From April 2018 to March 2019, 16 tons of garbage have been collected and processed.

Contact information

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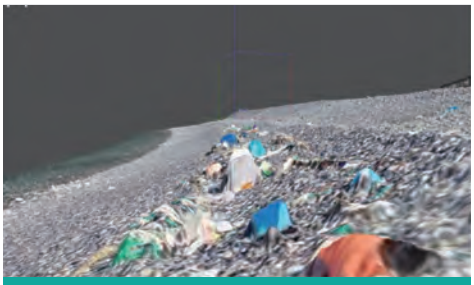
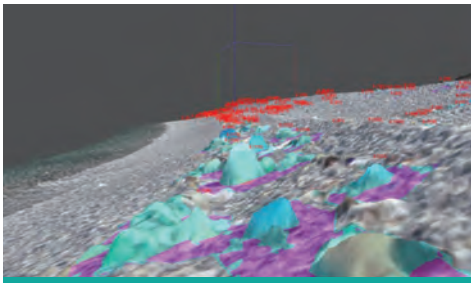
Research

CASE 18 Development of a monitoring technology of marine plastic waste by drone-assisted aerial photography

Prof. Atsuhiko Isobe, Kyushu University & Assistant Prof. Shinichiro Kako, Kagoshima University



Beach flotsam seen in 3D



Extraction of plastic waste

Two academics at universities in Kyushu have developed a drone-assisted system to measure the total volume of plastic waste that is washed up in coastal areas. By using drones that automatically fly along a predetermined trajectory, it is possible to obtain multi-directional aerial images of a coastal area, which can then be processed to detect floating objects that are scattered on the coast in three dimensions and calculate the volume of each object. In addition, plastic waste can be automatically identified based on color differences with the background color (sand, driftwood, etc.). This technique enables automatic measurement of the amount of plastic waste that lands in coastal areas.

They have proposed a system whereby a local government or agency conducts the drone-assisted coastal aerial photography and sends image data to the center, where image processing will be done collectively. It is expected that a system can be constructed to quickly and accurately determine the total amount of plastic waste that land in coastal areas in Japan.

Contact information

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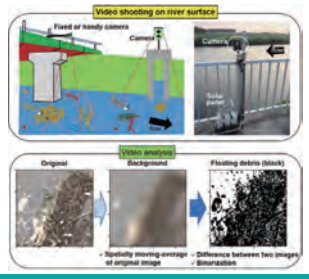
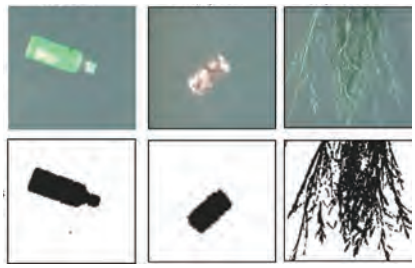
Research

CASE 19 Development of river debris monitoring technology for identifying sources of marine debris

Tokyo University of Science – Prof. Yasuo Nihei, Assistant Prof. Tomoya Kataoka



Overview of monitoring technology



Identification results of river debris by applying this technology (labratory experiment)

Two academics from Tokyo University of Science have developed a technology to monitor the amount of floating-debris transport in rivers (river debris), which is necessary to prevent such debris from becoming marine debris. This technology measures the amount of transported river debris based on a video recording of the water surface using video cameras and video analysis to realize a simple, economical, safe, and automatic continuous monitoring system.

It has been confirmed that this technology can identify natural debris (grass, trees, etc.) and man-made debris (plastics, cans, etc.) with a certain level of accuracy. This technology is an inexpensive method that can use commercially-available cameras and is expected to be applicable to support developing countries that face marine debris-related problems.

Contact information

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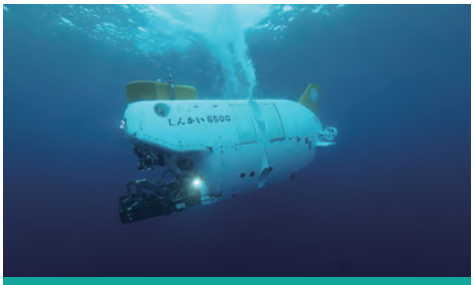
CASE 20 Development of the semi-automated microplastics measurement system by JAMSTEC

Japan Agency for Marine-Earth Science and Technology (JAMSTEC)



Shinkai 6500 ©JAMSTEC

Seminar pictures ©JAMSTEC

To tackle the problem of marine plastic pollution, the Japan Agency for Marine-Earth Science and Technology (JAMSTEC) has been developing a system to semi-automatically analyze marine microplastics using hyperspectral camera imaging technology. This technology is used to efficiently and quickly detect the types, shapes, and other properties of microplastics.

JAMSTEC has also developed and launched the world's first "Deep-sea Debris Database" that has been collating information of marine (deep-sea) debris on the images collected by deep-sea research submersibles including "Shinkai 6500" for over 30 years. The database has been used for education, media, and scientific research.

Contact information

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Research

CASE 21 Prevention of plastic waste scattering using the "Fukuoka Method"

Fukuoka University, Professor Emeritus Yasushi Matsufuji, City of Fukuoka

Global diffusion of 'Fukuoka Method'

「Pilot landfill by introducing the 'Fukuoka Method' in Kiambu, Kenya (2015)」

The "Fukuoka Method" is a waste landfill technology jointly developed by the City of Fukuoka and Fukuoka University to solve problems such as contamination of water and odors from landfills. It is a method to promote a semi-aerobic landfill type for stable management of sites of final waste disposal. By naturally directing air into disposal sites, it promotes hygienic decomposition of accumulated waste at low cost.

In order to prevent the outflow of plastic waste that is generated in large quantities across the world into the oceans, etc., it is important to limit the production of plastic waste and to promote its recycling along with properly managing the final waste disposal sites to prevent scattering of plastics which cannot be utilized effectively. The "Fukuoka Method", which was developed during a period of high economic growth in Japan, has recently been introduced to developing countries including African countries such as Kenya and Ethiopia because it is simple to manage and can be realized at low cost.

Contact information

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Plastics Smart

Plastics Smart campaign website now open.

plastics-smart.env.go.jp/en/

MEMO