Green Planet™ by Kaneka

Kaneka Biodegradable Polymer Green Planet™

Polymers for a sustainable future

Green Planet™

A part of the Kaneka Corporation Group

Kaneka Corporation, founded in 1949 and headquartered in Japan, is a global leader in innovative, technology-driven solutions. The company operates through four strategic domains: materials, quality of life, health care, and nutrition. Kaneka serves a diverse range of markets, including specialty chemicals, biopolymers, fibers, pharmaceuticals, medical devices, life sciences, and food products.
As a pioneer in sustainable materials, Kaneka has developed and produces Green Planet™ PHBH, a 100% bio-based and biodegradable polymer designed to reduce plastic pollution and support the circular economy. With a global network and regional subsidiaries in Europe, Asia, and the Americas, Kaneka is dedicated to creating a healthier and more sustainable future through science and technology.

History of Green Planet™

Kaneka began developing PHBH in the early 1990s, at a time when pollution from microplastics in the world's oceans was not widely recognized as an environmental issue. This prompted Kaneka to launch the project to create an environmentally friendly solution that did not rely on fossil oil resources.
During their research, Kaneka's scientists traveled to various locations worldwide in search of suitable microorganisms to produce a polymer. They ultimately discovered a microbe capable of producing PHBH right in their backyard, in the soil at the Kaneka Takasago Manufacturing Site in Japan. However, this newly identified microorganism only produced small quantities of PHBH. Even if they could develop a microorganism suitable for mass production, experts still faced significant challenges in making it practical for use.
By the 2000s, Kaneka successfully combined its proprietary polymer technology with fermentation technology, becoming the first in the world to industrialize PHBH. This 100% bio-based and biodegradable polymer is nowadays branded as "Green Planet™".

Manufacturing capacity

Kaneka Corporation was one of the first companies to launch a pilot plant for PHBH in Japan in 2011, with an initial capacity of 1000 tons per year.
In 2020, it began operations at a new pilot plant at the Takasago manufacturing site, which had a capacity of 5000 tons per year.
By 2024, Kaneka became operational with a new industrial plant dedicated to KANEKA Biodegradable Polymer Green Planet™. In this upgrade, the existing plant's capacity was increased with 15000 metric tons per year, bringing the total production capacity to 20000 metric tons per year.

Green Planet Europe

The Green Planet Europe team, operating under the Kaneka Europe Holding Company, focuses on applied research, application development, technical support, and business development for Green Planet™ polymers throughout the EMEA region.
Based at the Kaneka Belgium plant facility in Westerlo, Green Planet™ features a dedicated warehouse and a specialized R&D center equipped with compounding and polymer processing facilities to ensure prompt deliveries and technical support.

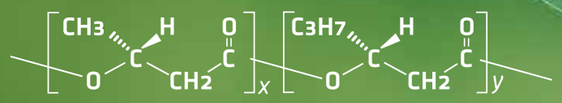
Biodegradable Polymer Green Planet™

Versatile PHA bio-polyester

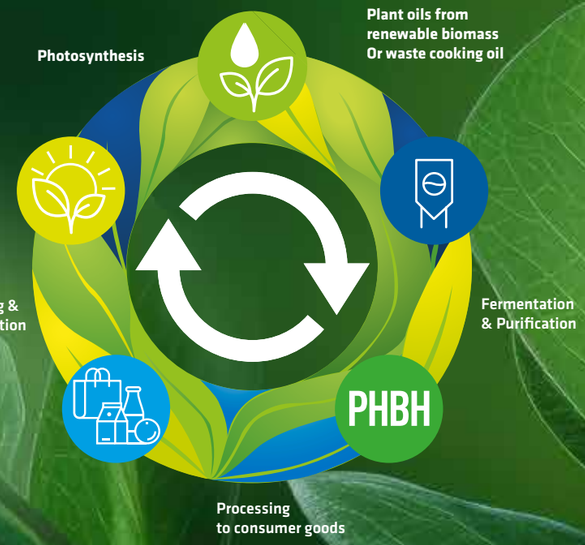
KANEKA Biodegradable Polymer Green Planet™ is a 100% bio-based PHBH polymer produced through an innovative natural fermentation process using plant oils derived from renewable biomass or waste cooking oil as feedstock. This polymer is accumulated in bacteria and extracted and purified using a water-based process. Consumer goods made from Green Planet™ are durable under everyday usage conditions but rapidly compost under both home and industrial compost conditions. Additionally, they are proven to be anaerobically digestible and biodegradable in open environments, such as soil and marine waters, leaving no persistent microplastics behind. As a result, KANEKA Biodegradable Polymer Green Planet™ can play a significant role in addressing the issue of plastic pollution.

Structural formula

Green Planet™ is a random copolymer of poly(3-Hydroxybutyrate) (3HB) and 3-Hydroxyhexanoate (3HH). It belongs to the versatile class of PHA biopolymers. By changing the ratio between 3HB and 3HH, the properties of the material can be tailored to fit any application.



3-Hydroxybutyrate (3HB) 3-Hydroxyhexanoate (3HH)



TÜV-certifications

OK biobased — TÜV AUSTRIA ★★★★ S0318
OK compost — TÜV AUSTRIA INDUSTRIAL S0318
HOME OK compost — TÜV AUSTRIA HOME S0318
SOIL OK bio-degradable — TÜV AUSTRIA SOIL S0318
MARINE OK bio-degradable — TÜV AUSTRIA MARINE S0318

KANEKA Biodegradable Polymer Green Planet™

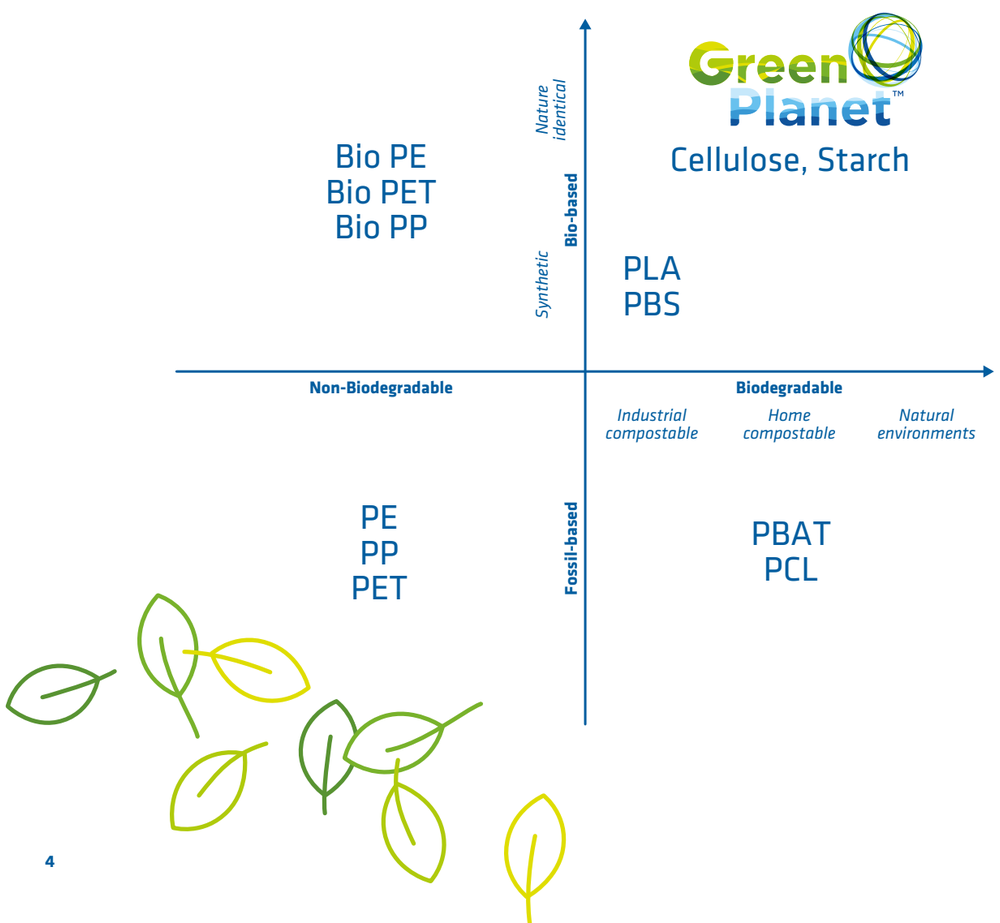
Biopolymers, what's in a name?

A biopolymer is a sustainable alternative to conventional plastics. It can be bio-based, biodegradable, or both.

- **Bio-based** materials are derived in whole or in part from renewable, non-fossil carbon resources.
- **Biodegradable** materials naturally break down through the action of microorganisms into carbon dioxide, water, and biomass, leaving no persistent residues.

KANEKA Biodegradable Polymer Green Planet™

Green Planet™ represents a new generation of biopolymers with dual sustainability benefits. It is produced through natural microbial fermentation using renewable plant oils or waste cooking oils, resulting in a material that is 100% bio-based. At end of its life cycle, Green Planet™ demonstrates complete biodegradability and compostability in a wide range of environments, including soil, freshwater, seawater, and industrial or home composting systems — without leaving behind persistent microplastics.



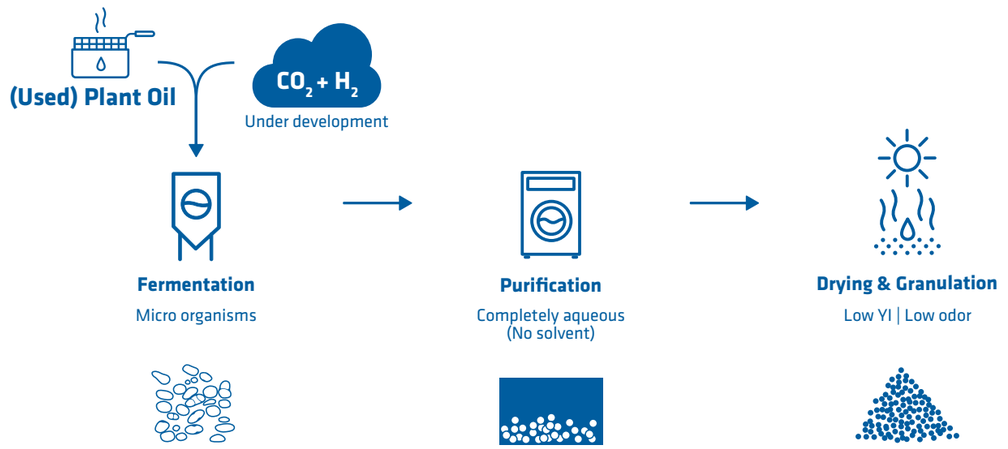
Natural production process

Green Planet™ PHBH starts its life in renewable biomass. Currently, Kaneka uses plant oils and waste cooking oils as the primary feedstocks in its proprietary bio-fermentation process. In this process, microorganisms are cultured under controlled fermentation, allowing them to accumulate PHBH polymers inside their cells. After sufficient accumulation, the polymer is extracted and purified using a water-based method that avoids the use of harsh chemicals.

Kaneka is also investing in **next-generation pathways**. Development projects are currently underway to produce **Green Planet™ directly from captured CO_2** via unique microorganisms. This approach will further reduce reliance on biomass feedstocks and enhance the greenhouse gas (GHG) profile of the product.

Since the feedstocks are renewable - consisting of plant oils and waste cooking oil - rather than solely fossil carbon, the carbon embedded in Green Planet™ is 100% biogenic. Moreover, using waste cooking oil supports circularity by revalorizing a by-product/waste stream instead of consuming virgin agricultural land or oilseed crops. This practice reduces upstream impacts, such as the need for agricultural inputs, land use, and fertilizers, and contributes to closing material loops.

The planned CO_2-based production route will further enhance circularity by converting atmospheric or industrial CO_2 into a functional polymer. The environmental footprint of such materials has the potential to be lower than that of conventional petroleum-based plastics.



Versatile End of life options

KANEKA Biodegradable Polymer Green Planet™ is designed for responsible use and not for careless disposal. As a top priority, it is always recommended to collect and recycle or compost the product at the end of its life, paying attention to local waste management rules. However, if items made from Green Planet™ accidentally end up in the ocean or on land, nature's microorganisms will break them down into carbon dioxide, water, and biomass, leaving no lasting microplastics behind. In this way, Green Planet™ provides an environmental safety net while supporting a cleaner and healthier planet.

Biodegradability & Compostability

Green Planet™ is designed and certified to biodegrade under diverse conditions:

- **Marine Biodegradable**: It breaks down into CO_2, water, and biomass via the action of microorganisms in marine environments.
- **Soil Biodegradable**: Biodegradation in soil has been demonstrated for articles intended to be used for agricultural applications, like for instance tree shelters and clips.
- **Industrial & Home Compostable**: The material can be composted not only in industrial compost facilities but also in your own backyard home compost system.
- **Anaerobic Digestibility**: Green Planet™ is digestible under anaerobic conditions (e.g., in anaerobic digestion facilities), producing biogas.

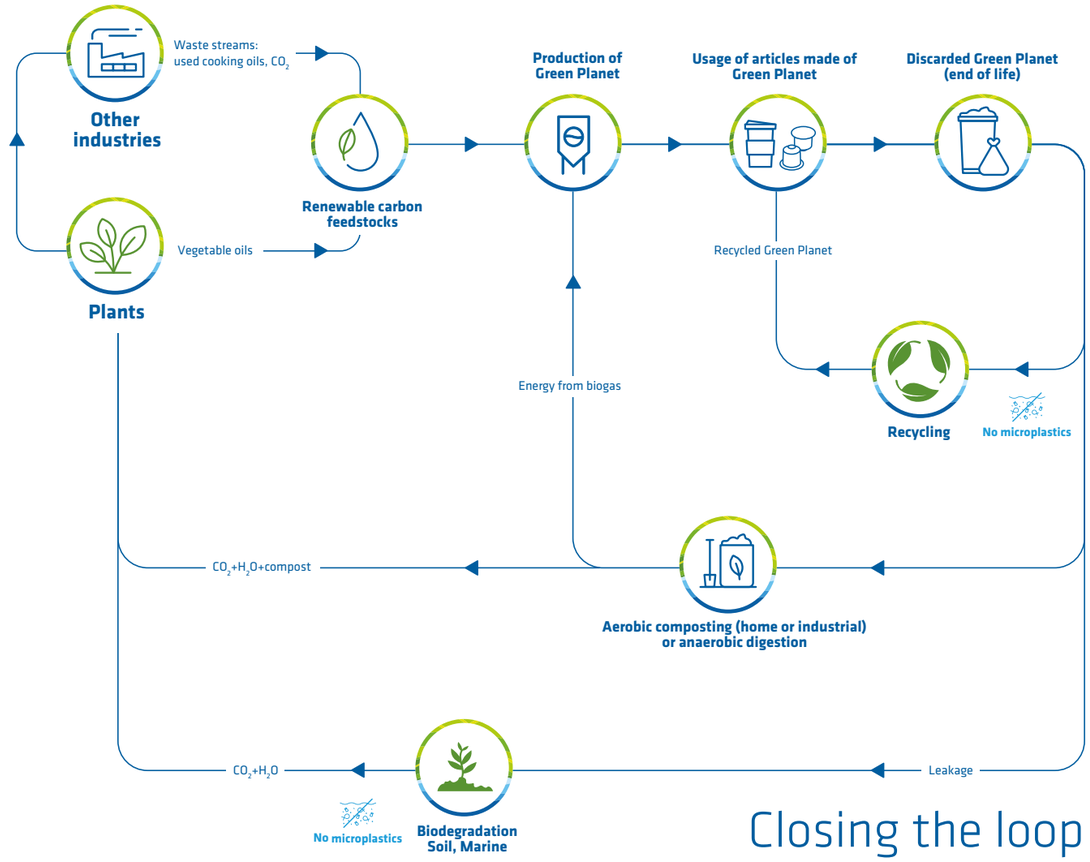
Green Planet™ shows biodegradable properties in soil and seawater

Microplastics & Open Environment

Green Planet™ biodegrades through microbial action. As a result, it does not leave behind persistent microplastic fragments in marine or soil environments. Over time, the polymer is completely metabolized into carbon dioxide (CO_2) and water (H_2O) (rather than only fragmentation).

Recyclability

A common misconception is that compostable materials cannot be recycled or that they contaminate existing recycling streams. However, Kaneka has demonstrated that Green Planet™ PHBH from conventional plastics can be easily achieved through density separation or near-infrared (NIR) detection. The resulting fraction can then be reused through mechanical recycling.



Closing the loop

KANEKA Biodegradable Polymer Green Planet™

Green Planet™ features and properties

Mechanical / Physical / Thermal Properties

Property	Typical Values / Behavior*
Density	~1.20 g/cm³
Melting point	~ 123–145 °C
Elongation at break	10%-300%
Modulus	500-2500
Thermal resistance / heat distortion	80-110 °C

** Note: The values depend significantly on the grade (rigid vs. flexible), thickness, additives, and other factors.*

Processability

- Green Planet™ can be processed on existing extrusion, injection molding and film equipment.
- Different grades (rigid vs. flexible) allow it to be formed into a wide variety of articles: films, straws, cups, cutlery, food packaging, shopping bags, etc.
- The processing window is improved over more crystalline PHAs, especially because the inclusion of 3HH comonomer broadens the safe processing temperature range (less risk of thermal degradation).

Certifications & Food Contact Approvals

Kaneka's Green Planet™ materials are certified biodegradable and have food contact approvals across the key regions. These credentials facilitate safe use for food-related applications. More information on specific grades, technical data sheets, or suitability for specific applications is available upon request.

The material is free from harmful additives such as PFAS (per- and polyfluoroalkyl substances) and does not require toxic plasticizers or stabilizers, ensuring consumer and environmental safety.

Certification			Europe	Japan	USA
Conditions	Compost	Industrial Compost	OK compost INDUSTRIAL S0318	Biodegradable & Biobased Plastics	COMPOSTABLE IN INDUSTRIAL FACILITIES BPI
		Home Compost	OK compost HOME S0318	No system	Planned in 2026
	Natural environment	Soil	OK bio-degradable SOIL S0318	No system	No system
		Marine	OK bio-degradable MARINE S0318	Marine Biodegradable & Biobased Plastics	ASTM D7081
Bio-based (up to 100%)			OK biobased ★★★★ S0318	BiomassPla	No system
Food Contact			Listed in the positive list of Commission Regulation (EU) No. 10/2011 (FCM No. 1059)	Listed in the positive list of Ministry of Health, Labor and Welfare (No. 57-1)	Listed in the inventory of Food Contact Substance Notification with US-FDA (FCN No. 1835)

The certification marks, as shown in the table, are issued by the official certification bodies TÜV Austria (EU), Japan BioPlastics Association (JBPA), and BPI (USA).

KANEKA Biodegradable Polymer Green Planet™ Expanded Beads

Sustainable Particle Foam Technology

KANEKA Biodegradable Polymer Green Planet™ Expanded Beads are the result of integrating Kaneka's long-established Eperan™ particle foam technology with the development of Biodegradable Polymer Green Planet™. This innovative material is used in a wide range of lightweight, shock-absorbing applications, such as cushioning materials for home electric appliances, transportation containers for fresh food, and materials used in the automotive and transport industries. The foam particles can be processed with existing molding equipment, and their characteristics are similar to those of polyolefin foams.

Microplastics free

Thanks to its excellent biodegradable nature, Green Planet™ Expanded Beads are officially excluded from the definition of synthetic polymer microparticles under EU Commission Regulation 2023/2055.

Successful Fusion of KANEKA Eperan™ foam technology and KANEKA Biodegradable Polymer Green Planet™

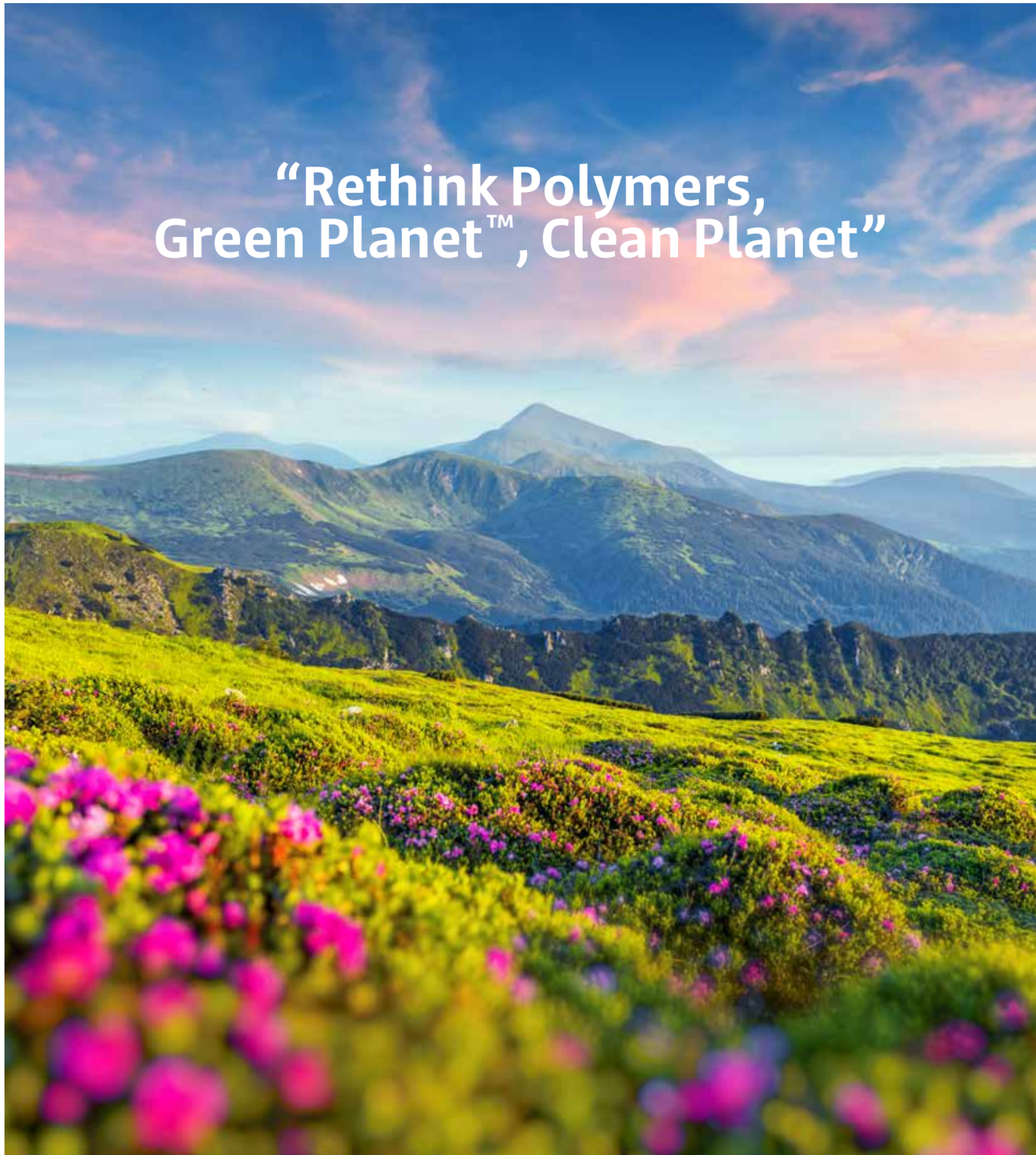
Global Application Development

Use cases

The Green Planet™ family accommodates a wide range of market applications due to its versatile performance. KANEKA Biodegradable Polymer Green Planet™ has mechanical properties like polyolefins and can be processed on conventional plastic processing equipment.
Depending on the specific type and grade, Green Planet™ can be used for injection molding, extrusion, film production, fiber and non-woven materials, foam, thermoforming, and paper coating. Its applications include coffee capsules, organic waste bags, straws, cutlery, hotel amenities, cushioning materials, agricultural mulch films, plant clips, and food packaging. Furthermore, Kaneka is committed to continuously enhancing its materials and production processes to improve material properties and broaden the range of applications.

Green Planet™

Injection Molding	→	Coffee capsule, Food container, Cutlery, Hotel amenities
Extrusion	→	Straw, Tree shelter
Film	→	Bag, (Food) packaging, Agricultural mulch film
Fiber/Nonwoven	→	Tea bags, Filter paper, Hygiene nonwovens, monofilament
Foam	→	Cushioning material, Fish box
Thermoforming	→	Lid, Food container, Plant nursery pot
Paper coating, lamination	→	Paper packaging, Drinking cups, container



Green Planet™ Selected by Various Domestic and International Brands

Versatile applications

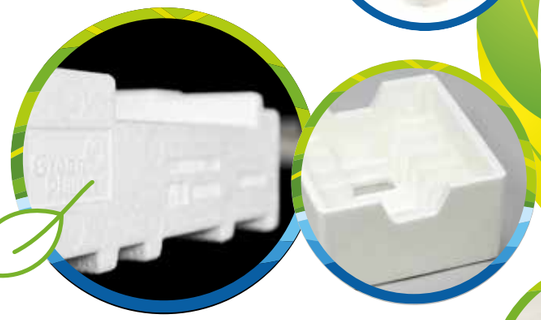
Paper Coating / Lamination

Film

Extrusion

Thermoforming

Foam



Fiber / Nonwoven

Injection Molding

kaneka
The Dreamology Company
—Make your dreams come true—

Kaneka Green Planet™ Global Presence

Europe | Africa | Middle East

KANEKA EUROPE HOLDING COMPANY NV
Green Planet Project Europe
Nijverheidsstraat 16
B-2260 Westerlo-Oevel, Belgium
info.greenplanet@kaneka.be
www.kaneka.be

The Americas

KANEKA AMERICAS HOLDING, INC.
Green Planet Division
6250 Underwood Rd
Pasadena, TX 77507, U.S.A.
info@kanekagreenplanet.com
www.kanekagreenplanet.com

Japan | Asia

KANEKA CORPORATION
Green Planet Division
1-12-32, Akasaka, Minato-ku
Tokyo 107-6028, Japan
bdp_phbh@kaneka.co.jp
www.kaneka.co.jp