

The background features a close-up of a plant with yellow and orange flowers and green buds on the left. On the right, there are several overlapping, semi-transparent shapes in shades of yellow and orange, resembling petals or leaves. A large, semi-transparent dark red shape is positioned behind the main text.

# Transforming visions into realities.

Compostable polymers  
with biobased content

# This is ecovio®

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**Certified compostable  
polymer based on  
renewable raw materials**

ecovio® IS A HIGH-QUALITY AND VERSATILE BIOPLASTIC FROM BASF. THE PRIMARY ADVANTAGES: IT'S CERTIFIED COMPOSTABLE AND CONTAINS BIOBASED CONTENT.

### ecovio®:

- is a finished compound
- is certified worldwide
- is certified compostable and biodegradable
- is printable and has excellent heat sealing properties
- has a variable biobased content

The main areas of use for ecovio® are plastic films such as organic waste bags, dualuse bags (first for shopping, then for organic waste) or agricultural films. Furthermore, compostable packaging solutions such as paper-coating, shrink films, foam packaging and injection molding products can be produced with ecovio®.

ecovio® is highly transformable, meaning a wide range of end use applications are possible. This makes organic waste diversion easier for stadiums and large venues, where a variety of compostable food service packaging is required.

#### **An innovative mix of proven ingredients**

With ecovio®, BASF offers a certified compostable polymer which at the same time has a variable biobased content. The biobased portion can be adjusted to suit client requirements.

ecovio® consists of the compostable and biodegradable BASF polymer ecoflex® and polylactic acid (PLA), which is derived from corn or other sugar generating plants like manioc. In contrast to simple starch based bioplastics, ecovio® is more resistant to mechanical stress and moisture.

#### **Ready for use**

ecovio® is a finished product that can be used by the customer as a drop-in solution with standard plastic production procedures. Additional blending is therefore not required.

#### **High performing and certified compostable**

ecovio® products are just as high-performing and strong in use as conventional plastics. An ecovio® bag can take the same load as its polyethylene counterpart. The product properties were designed such that the products only fully biodegrade in compost after use.

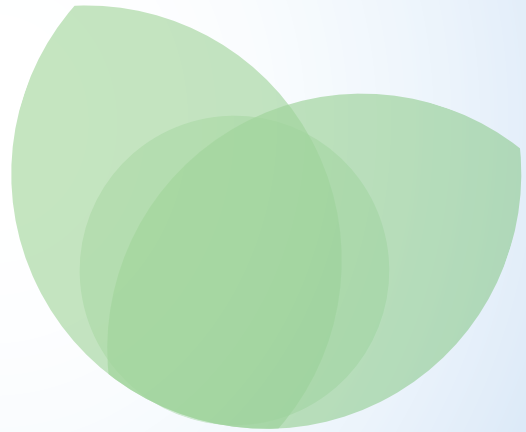
# One step ahead Together

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AS A LEADING PROVIDER OF HIGH QUALITY AND HIGH-PERFORMING PLASTICS, BASF HAS BEEN RESEARCHING BIODEGRADABLE AND BIOBASED POLYMERS FOR MORE THAN A QUARTER CENTURY.

The continual development of innovative plastic solutions and the improved functionality of the products occurs in close cooperation with internal BASF units as well as with external partners.

There are no general advantages or disadvantages to fossil or renewable resources. For each individual application, environmental safety, cost efficiency and the social consequences for a product's entire life cycle must be examined, for example as part of an ecoefficiency analysis. Compostable or biobased polymers are generally not more environmentally friendly than others. They are, however, the optimal solution for particular applications – organic waste bags, compostable packaging for food or subarable agricultural films to name a few.



## What is meant by bioplastics?

	not compostable	compostable
based on renewable raw materials	Bio-PE, Bio-PA, Bio-PUR, Bio-PP	 PLA, PHA
on a fossil basis	PE, PP, PVC	 PBS

Source: cf.: Hans-Josef Endres, Technische Biopolymere, 2009.

Two different groups of products fall under the term “bioplastics”: “biobased” and “compostable” plastics.

**Biobased** materials are partly or entirely made of renewable raw materials. Polylactic acid, polyhydroxyalkanoate (PHA), starches, cellulose, chitin and gelatin for example, belong to this group. Biobased plastics can be biodegradable – but they are not always. Numbering among the biobased but not biodegradable plastics are biopolyethylene, natural fiber plastics, and composites of wood and plastic.

**Compostable** plastics can be biodegraded by microorganisms. Special bacteria give off enzymes which break down the material’s flexible polymer chains into small parts. These are then digested by the bacteria together with other organic material such as, for example, organic waste. Water, carbon dioxide and biomass remain. Compostable polymers can, but need not be produced from renewable raw materials. They can also be based on crude oil. The biodegradability does not depend on the raw material, rather, it depends entirely on the chemical structure of the polymer.

# Biodegradable

THANKS TO A SPECIAL CHEMICAL STRUCTURE, ecovio® CAN BE DEGRADED BY MICROORGANISMS AND THEIR ENZYMES.

In the conditions of an industrial composting plant biodegradation only takes a few weeks, as the plant provides optimal conditions for composting.



Biodegradation of a compostable film in the first week ...

... in the second week ...

... and in the fourth week



### Advantages of the separate collection of organic waste:

Incinerating organic kitchen waste is not an effective option, because its high water content yields virtually no energy value whatsoever. It is worse when organic waste is disposed to landfills. There they produce methane, which has a 20 times more effective greenhouse gas potential than carbon dioxide.

Composting organic waste can therefore reduce the production of greenhouse gases. According to calculations resulting from an ecoefficiency analysis, the composting of ecovio®-coated paper tableware, even with small amounts of food remains, brings along environmental benefits compared to disposal to landfill. Furthermore, compost can prevent soil erosion and be used to improve soil fertility. It contains the valuable and very limited phosphate, which is used for fertilization.

### ecovio® bags – proved thousands of times across the planet

BASF has tested the use and composting of ecovio® bags in various conditions in composting projects all over the world. The results show that the bag material biodegrades without any problems in different industrial composting sites, without adversely affecting the quality of the compost. When asked, residents of the respective regions also report positively on the clean and hygienic collection of organic waste.

You can find additional information on [www.ecovio.com/projects](http://www.ecovio.com/projects)



# Tested and certified

THE COMPOSTABILITY OF ecovio® HAS BEEN CERTIFIED BY RECOGNIZED AND INDEPENDENT TEST INSTITUTES.

## Certified by test institutes

Independent institutes test bioplastics in special certification procedures with respect to biodegradability, compostability, compost quality and plant compatibility.

Only when a material meets the clearly defined test criteria may it be identified as compostable.









## Proven in practice

Practical tests at industrial composting plants show that ecovio® organic waste bags can be processed within three to four weeks.

## Suitable for food

ecovio® offers product grades that comply with the requirements of the European food contact regulation<sup>1</sup> as well as the US Food Contact Substance Notification<sup>2</sup> and are suited for food packaging among other things.

ecovio® offers various product grades that conform to the following international and national standards and norms for composting, among others:

			
European standard EN 13432	Home composting	Home composting	Italian certification CIC
			
European standard EN 13432 Australian standard AS 4736	American standard ASTM 6400	Japanese standard GreenPla	Canadian standard CAN/BNQ 0017-088

<sup>1</sup> Commission Regulation (EU) No. 10/2011 of January 14, 2011 on materials and objects of plastic, designed to be in contact with food.

<sup>2</sup> According to Food Contact Substance Notification No. 178, 475 and 907 of FDA



### ecovio® bag filled with organic waste



#### Biodegradation into:

- Water
- CO<sub>2</sub>
- Biomass

### “Oxo-degradable” bag filled with organic waste



- **No biodegradation** (does not comply with international composting standards)
- **Disintegration to plastic fragments (PE)**
- Premature loss of mechanical properties upon exposure to strong light

### Bio-polyethylene (PE) bags filled with organic waste



- **Biodegradation impossible** (only extremely slow disintegration into plastic fragments (PE))
- **Disposal to landfill** (prohibited in some European countries)
- **Incineration** (not appropriate due to the high content of water in organic waste)

### “Oxo-degradable” plastics and bio-polyethylene plastics are not compostable

“Oxo-degradable” PE films are conventional plastics which only decompose with the addition of special additives. Triggered by exposure to UV or heat, they oxidize the polymer chains and break them up into smaller fragments. To date it has not been possible to scientifically prove any biodegradability of these PE fragments after decomposition that meets the composting standards, whether or not the materials were pretreated with UV radiation or heat.

Bio-polyethylene (PE) plastics are made with renewable resources. But they too are not biodegradable. Compostability does not depend on the origin of the raw materials, but on the chemical structure of the polymer.

# More than just a biopolymer

## ADDED VALUE FOR OUR CUSTOMERS AND PARTNERS.

### **Closed-Loop System: Compostable food service packaging for stadiums and large venues**

Due to its wide variety of end use applications, ecovio® can be used to develop comprehensive system solutions. The Closed-Loop System approach is a good example. In stadiums, for example, only certified compostable food service packaging made with ecovio® or ecovio® coated paper tableware is used. These can either be cups, plates, or straws. After use, the compostable tableware and remaining food are collected in compostable ecovio® waste bags, then converted into valuable compost at a composting plant.

The compostability of the material is a particularly useful disposal alternative for heavily soiled disposable tableware with lots of food remains. Recycling is too costly and disposal to landfill, due to methane gas formation, brings along environmental disadvantages. Advantages of the Closed-Loop System: Thanks to a

stadium's enclosed nature, it is possible both to prevent foreign materials from entering the loop, and also to ensure the proper disposal of the compostable, single-use items.

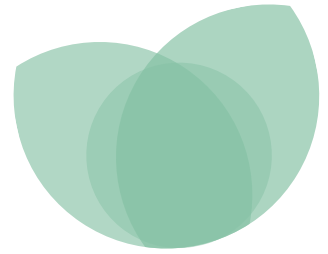
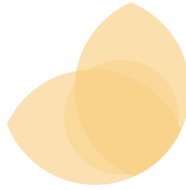
### **ecovio® in compostable multilayer films**

In combination with other BASF technologies, certified compostable multilayer films can be produced with ecovio®. Due to its good barrier properties, these films are suited to a wide range of food packaging, and at the same time offer an alternative end-of-life option. Together with the Major League baseball team Seattle Mariners, BASF introduced a compostable peanut bag into the Safeco Field's existing Closed-Loop System.

You can find additional information on our projects all over the world at

[www.ecovio.com/projects](http://www.ecovio.com/projects)





### Multiple options: Even after use

With ecovio®, BASF is not only a raw material supplier, but also supports partners right across the value chain and over the entire product life cycle – from production to consumption and onto disposal. According to the application, ecovio® products make different end-of-life options possible, such as composting or recycling (e. g. with ecovio® PS).

### Eco-efficiency: Consulting and service

For which applications is the use of compostable polymers sensible and truly sustainable? More and more, industry, consumers and politicians are confronted with this question. BASF has a vast pool of competence and expertise in eco-efficiency and life cycle analyses. By comparing the ecological foot print of various product alternatives, it can be examined which product offers what environmental advantages.

More information at  
[www.ecovio.com/life-cycle-assessment](http://www.ecovio.com/life-cycle-assessment)



# One biopolymer – many applications

ecovio® CAN BE USED FOR SEVERAL PURPOSES.

Application	
Organic waste bags and shopping bags	
Mulch films	
Paper coating	
Shrink film applications	
Thermoformed packaging	
Injection molding applications	
Transport packaging	



# ecovio® for organic waste bags and shopping bags

ecovio® OFFERS CERTIFIED COMPOSTABLE AND MOSTLY BIOBASED POLYMER RESINS FOR FILM APPLICATIONS.

Compostable shopping bags offer the customer an additional advantage. They are not only strong enough to be used many times as a shopping bag: In their final phase, the bags can be used for collection of organic waste.

Whether shopping bag or organic waste bag – kitchen and food waste can be collected hygienically in ecovio® bags, then turned, together with the bag, into compost. Undesirable odor and pest infestation are prevented. Thanks to its good wet strength, liquid from teabags or the remains of fruit do not leak through, so there is no more laborious scrubbing of the organic waste bin.

During use, products made from ecovio® are just as strong and resilient as conventional polymers. A bag made of ecovio® can bear the same load as its polyethylene counterpart. The product properties are designed in such a way the bags biodegrade only after use.

- Industrially compostable
- Mostly biobased
- Moisture and tear resistant
- Certified worldwide

# ecovio® for applications in farming

ecovio® M MULCH WAS SPECIALLY DEVELOPED FOR BIODEGRADABLE FILM APPLICATIONS IN FARMING AND GARDENING.

Conventional mulch films made of polyethylene (PE) have to be arduously collected after the harvest. Recycling these contaminated films is a costly, laborious task. In contrast, mulch films made of ecovio® can be easily plowed into the soil after harvesting. Microorganisms such as bacteria and fungi in the soil then decompose the ecovio® mulch film. This saves farmers both time and money. What is more, no film scraps remain in the soil, a situation that over the long term could have an adverse effect on soil yield. Thanks to the good mechanical properties of ecovio® M, films with thicknesses of 12, 10, or 8 µm can be manufactured, making this film suitable for different types of crops.

The ready-to-use compound contains lubricants and anti-blocking agents, and enables processing using conventional PE film production facilities.

- Simple processing with low coating thickness on conventional PE equipment
- Can be directly plowed in
- Prevents weeds, increases yield

Please also take account of the information about using biodegradable mulch films made of ecovio® at the back of this brochure.





# ecovio® for paper coatings

ecovio® PS WAS SPECIALLY DEVELOPED FOR COATING PAPER AND PAPERBOARD.

The certified compostable and mostly biobased polymer has multiple advantageous properties. In extrusion coating, ecovio® PS offers a low coating thickness at high coating rates and process stability. The excellent adhesion of ecovio® PS to many types of paper and paperboard, its temperature stability up to 100 °C and sealing capacity comparable to PE make it ideal for the production of paper- and paperboard-based packaging. Whether in cups for hot or cold drinks, freezer products, fast food or other food packaging.

In addition to the option of composting packaging which is contaminated with the remains of food after use, ecovio® PS also offers the option of paper recycling.

- Mostly biobased
- Good barrier properties against liquids, fat and odors
- Suitable for food

# ecovio<sup>®</sup> for shrink films

WITH ecovio<sup>®</sup> FS SHRINK FILM, BASF HAS DEVELOPED A COMPOUND SPECIALLY FOR THE MANUFACTURE OF CERTIFIED COMPOSTABLE, FLEXIBLE SHRINK FILMS.

The mostly biobased ecovio<sup>®</sup> FS Shrink Film gives the film an especially balanced relationship between shrink and durability. Depending on the application area, the film's excellent mechanical properties can reduce coating thickness considerably, compared to conventional polyethylene film. For example, the packaging thickness of 0.5l drink six-packs can be reduced by up to 50%. The shrinking temperature can also be lowered by about 30°C, which saves energy.

- Mostly biobased
- Lower coating thickness compared to PE
- Saves energy through lower shrinking temperature
- Simplified certification without additional composting test







# ecovio® for thermoformed packaging

ecovio® T IS OPTIMALLY SUITED FOR SHEETING WHICH IS SUBSEQUENTLY THERMOFORMED. THE COMPOSTABILITY OF ecovio® T DOES NOT PRECLUDE CONVENTIONAL PROCESSING.

With ecovio® T, processing on conventional sheeting equipment is possible with and without calenders. The result: A stiff yet very tough sheet which wraps extremely well – ideal prerequisites for the thermoforming of demanding components. Whether inline or offline – the sheet, produced in a processing window of 105-140°C, can be thermoformed through a die with or without pre-stretching. This results in thermoformed components of high design freedom which are compostable after use.





- Mostly biobased
- Usable on conventional flat-film equipment
- Very wide processing window
- Suitable for single- and multi-layered sheeting
- Suitable for food

# ecovio® for injection molding applications

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ecovio® CAN BE USED FOR A WIDE RANGE OF PACKAGING APPLICATIONS. IT ALLOWS CUSTOMERS TO PRODUCE COMPOSTABLE PLASTIC PARTS ON STANDARD INJECTION MOLDING MACHINES.

Products made of ecovio® IS benefit from an optimal balance of stiffness and toughness. Depending on the application, the flow behavior is flexibly tunable: from a medium to a high flow capacity. The surface look ranges from beige to light gray, depending on the amount of mineral fillers. Especially for plastic components in packaging or for applications with high mechanical loads, these products are a good choice.

-  Mostly biobased
-  Usable on conventional injection molding machines
-  Runs on single- and multi-purpose tools
-  Suitable for food





# ecovio® for transport packaging

ecovio® EA IS THE IDEAL SOLUTION FOR PERFECT PROTECTION OF SENSITIVE GOODS.

Consumer packaged goods are sent around the world and are often repeatedly loaded and unloaded – this may easily cause damage, making the product unusable. A solution to this problem offers the biobased and certified compostable polymer ecovio® EA with its optimized multi-shock behavior.

It can be processed on existing conventional EPS and EPP systems, thus enabling transport packaging with low density, which is comparable to the properties of EPS moldings.

Through the use of ecovio® EA you know your cargo is safely protected and you utilize a sustainable raw material base which – at the end of the product lifetime – can convert into a valuable resource: compost.

- Mostly biobased
- Expandable pellets, similar to EPS
- Can be used in any complex geometry and in different densities
- Excellent multi-shock behavior – perfect protection
- Very good chemical and thermal resistance



PMPB 1503 BE

Photo: Sevgru/Keeskn

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Please visit us at  
[www.ecovio.com](http://www.ecovio.com)  
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**Note**

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 **BASF**  
We create chemistry