



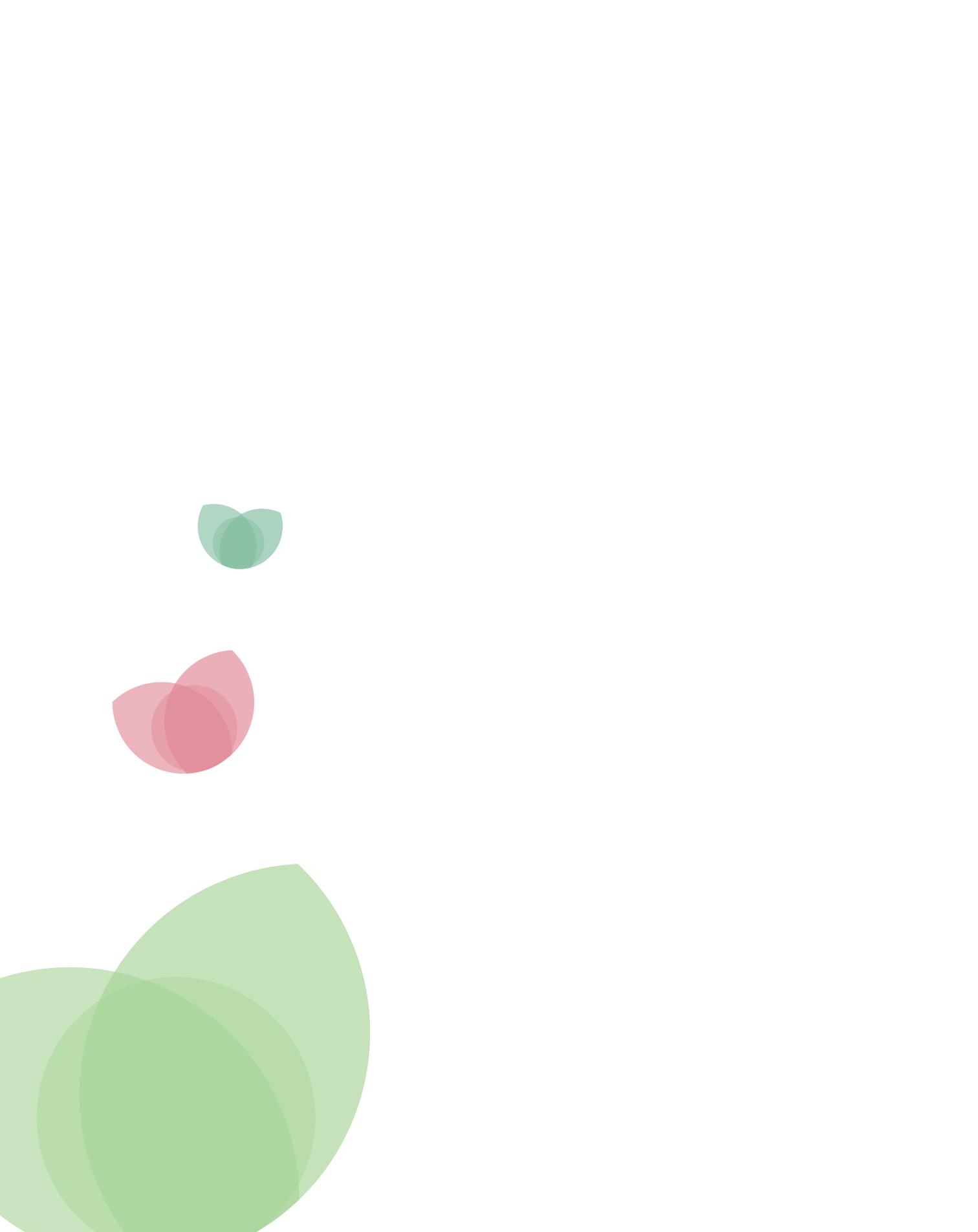
**BASF**

We create chemistry

# ecovio®

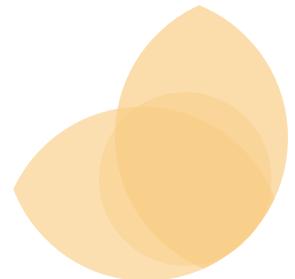
Certified compostable polymer  
with biobased content





THIS IS ECOVIO®	4-5
ONE STEP AHEAD TOGETHER	6-7
BIODEGRADABLE	8-9
TESTED AND CERTIFIED	10-11
MORE THAN JUST A BIOPOLYMER	12-13
ONE BIOPOLYMER – MANY APPLICATIONS	14-20
ecovio® for ...	
Organic waste bags	15
Fruit and vegetable bags	16
Mulch films	17
Paper coating	18
Thermoformed packaging	19
Injection molding applications	20

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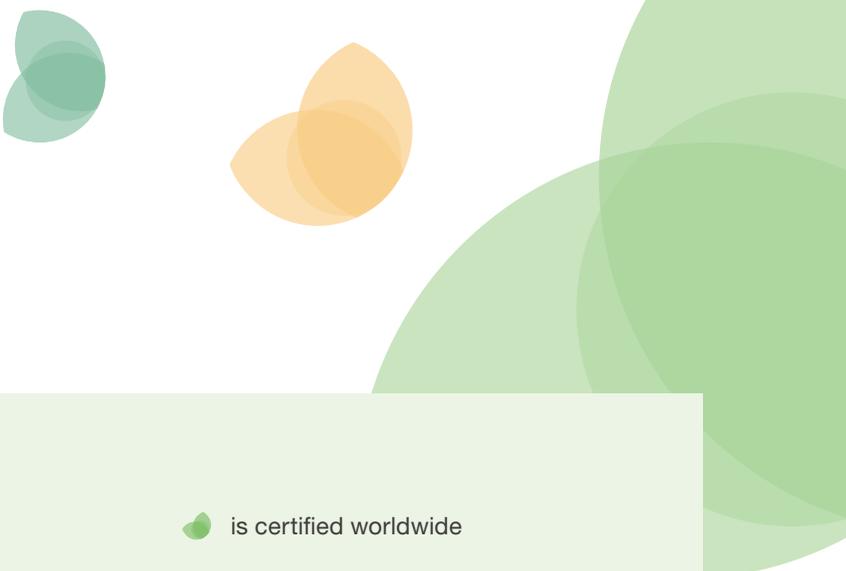
# This is ecovio®

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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 IS CERTIFIED COMPOSTABLE AND HAS 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 application areas for ecovio® are plastic films such as organic waste bags, fruit and vegetable bags, cling film, dual-use bags (first for shopping, then for organic waste) and agricultural films. Furthermore, compostable packaging solutions such as paper-coating and injection molding products can be produced with ecovio®.

As a wide range of applications is possible with ecovio®, solutions for Closed-Loop Systems can be implemented, e.g. for food catering in sports venues.

#### **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 as a drop-in solution with standard plastic production technologies. 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. A bag made of ecovio® can take the same load as its polyethylene counterpart. The product properties were designed in such a way that the products only fully biodegrade in compost after use.

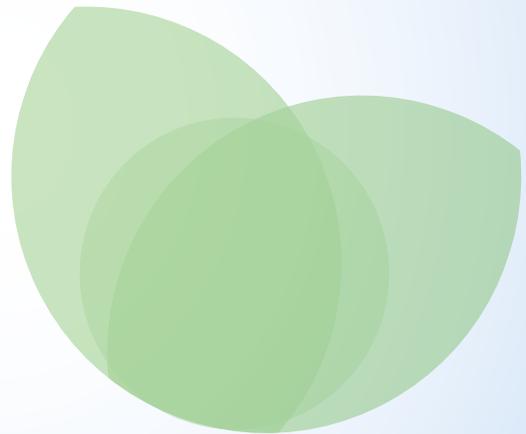
# One step ahead together

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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 continuous development of innovative plastic solutions and the functionality improvement of the products happen in close cooperation with internal BASF units as well as with external partners.

Certified biodegradable and biobased plastics can be the optimal solution for specific applications, e.g. certified compostable organic waste bags or soil-biodegradable mulch films. The biodegradability does not depend on the origin of the plastic – it can be fossil-based or biobased. For each application a detailed consideration of ecological compatibility, economic viability and social consequences over the entire life cycle is necessary, for example with an eco-efficiency analysis.



## 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, PA, PBT	PBS 

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. Biobased but not biodegradable plastics are e.g. biopolyethylene, natural fiber plastics, and composites of wood and plastic.

**Compostable** plastics can be biodegraded by microorganisms. Special micro-organisms give off enzymes which break down the material’s flexible polymer chains into small parts. These are then digested by the organisms together with other organic material such as, for example, organic waste. Water, carbon dioxide and biomass remain. This has been verified in several independent scientific studies. 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 paper tableware coated with ecovio®, 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 valuable and very limited phosphate, which is used for fertilization.

### Bags made of ecovio® – tried and tested for a thousand times in composting projects all over the world

BASF has tested the use and composting of bags made of ecovio® 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.



# 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 organic waste bags made of ecovio® can be processed within three to four weeks.

## Suitable for food

ecovio® grades 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>. Therefore they are suited for food packaging.

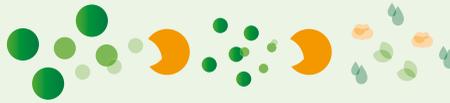
ecovio® offers various product grades that conform to the following international standards and norms for composting, among others:

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

<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

### Bag made of ecovio® 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 bags filled with organic waste



- **Biodegradation impossible** (only extremely slow disintegration into plastic fragments)
- **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” polyethylene films (PE) 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 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 CUSTOMERS AND PARTNERS

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

Due to its wide variety of 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 or paper tableware made of ecovio® are used. These can either be cups, plates or, straws. After use, the compostable tableware and remaining food are collected in compostable waste bags made of ecovio®, then converted into valuable compost at a composting plant.

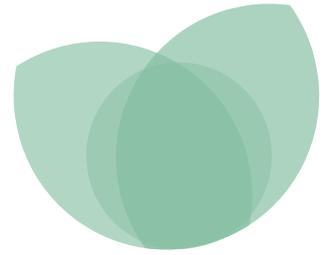
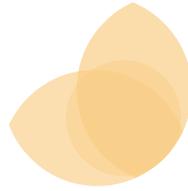
Disposable tableware is often heavily soiled with food remains: Therefore the biodegradability of the material to valuable compost is a useful disposal alternative. Recycling is too costly; disposal to landfill, due to methane gas formation, brings along environmental disadvantages.

Advantages of the Closed-Loop System: Due to a stadium's well-defined area, it is possible both to prevent foreign materials from entering the loop and 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 for 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.





### 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 up to 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.



# One biopolymer – many applications

ECOVIO® CAN BE USED FOR SEVERAL PURPOSES.

Application	
Organic waste bags	
Fruit and vegetable bags	
Mulch films	
Paper coating	
Thermoformed packaging	
Injection molding applications	



# ecovio® for organic waste bags

ECOVIO® IS A CERTIFIED COMPOSTABLE POLYMER RESIN 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 bags made of ecovio®, then turned, together with the bag, into compost. Unpleasant odors 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 fruit and vegetable bags

ECOVIO® IS A COMPOUND FOR CERTIFIED HOME-COMPOSTABLE, TRANSPARENT FRUIT AND VEGETABLE BAGS.

Fruit and vegetable bags made of ecovio® are more than simple carrier bags: They can be used to buy fruit and vegetables at the supermarket in a safe and hygienic way, to carry them home and to store them for a long time in the fridge. Re-used as organic waste bags they can improve the collection and recovery of organic food waste. Bags made of ecovio® comply with the standards in France and Italy for compostable fruit and vegetable bags made of renewable resources. In France, for example, single-use plastic bags that are thinner than 50 micrometer have to consist of at least 40 percent of renewable resources (from 2020 on at least 50 %) and be home-compostable.

Thus fruit and vegetable bags made of ecovio® support a safer, cleaner and easier food waste collection and help to close the loop of the food value chain.

For blown-film extrusion, standard grades are available that can be easily extruded on conventional blown-film extrusion machines up to 12 µm. In order to fulfil the demands of high transparency (to make goods easily recognizable at the supermarket checkout), special ecovio® grades were developed that can be extruded to transparent mono- or multilayer-films. The films can be processed to rolled bags with or without handles and possess high tear and wear stability. Due to the good breathability of the material fruit and vegetables stay fresh for a longer time.

- Mostly biobased
- Certified home-compostable
- Different transparencies possible
- Suitable for food contact





# ecovio<sup>®</sup> for mulch films

ECOVIO<sup>®</sup> M 2351 IS A PLASTIC COMPOUND FOR SOIL-BIODEGRADABLE MULCH FILMS.

For agricultural use, BASF offers the certified soil-biodegradable ecovio<sup>®</sup> M 2351 for mulch films. The compound consists of the biodegradable copolyester polybutylene adipate terephthalate (PBAT) ecoflex<sup>®</sup>, other biodegradable polymers made from renewable raw materials and inorganic fillers.

Mulch films made of ecovio<sup>®</sup> M 2351 can remain in the soil and ploughed in after mechanical harvest: Naturally occurring soil microbes like bacteria or fungi recognize the structure of the film as food they can metabolize. The remaining end products after biodegradation are CO<sub>2</sub>, water and biomass.

The responsibility for maintaining yield stability of agricultural land is of major social importance. This is why extensive internal and external studies not only verified the biodegradability of mulch films made of ecovio<sup>®</sup> M 2351, but also identified and analyzed the microbes in the soil (bacteria and fungi) that are involved in biological degradation.

-  Certified for soil-biodegradability according to EN 17033
-  Very good mechanical properties: layer thicknesses of 12, 10 and 8 µm possible
-  Ready-to-use compound: can be processed on conventional machines used for the extrusion of polyethylene films without any additional lubricants or anti-block agents
-  Advantages for farmers: yield increase, less herbicides, water savings and earlier harvest

# ecovio® for paper coating

ECOVIO® PS WAS SPECIALLY DEVELOPED FOR EXTRUSION COATING ON PAPER AND PAPERBOARD.

The certified compostable and mostly biobased polymer has a lot of advantages. 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 ideally suited for the production of paper- and paperboard-based packaging – whether in cups for hot or cold drinks, 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. Thus a coating with ecovio® increases the end-of-life options for paper and paperboard applications.

- Mostly biobased
- Good barrier properties against liquids, fat and migrants like mineral oils
- Suitable for direct food contact (also when microwaved)





# ecovio® for thermoformed packaging

ECOVIO® T AND TA ARE OPTIMALLY SUITED FOR SHEETING WHICH CAN BE THERMOFORMED. THE COMPOSTABILITY OF ECOVIO® T AND TA DOES NOT PRECLUDE PROCESSING ON CONVENTIONAL MACHINES.

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

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

# ecovio® for injection molding applications

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ECOVIO® IS AND IA CAN BE USED FOR A WIDE RANGE OF PACKAGING. THEY ALLOW MANUFACTURERS TO PRODUCE COMPOSTABLE PLASTIC PARTS ON STANDARD INJECTION MOLDING MACHINES.

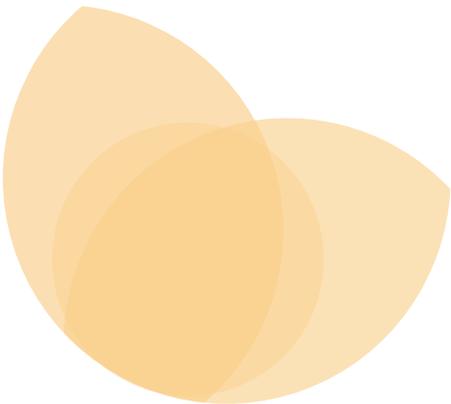
Products made of ecovio® IS and IA benefit from an optimal balance of stiffness and toughness. All types are characterized by a high flowability. Thus they can be easily used for thin-walled applications. Especially for plastic components in packaging or for applications with high mechanical loads, these products are a good choice.

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



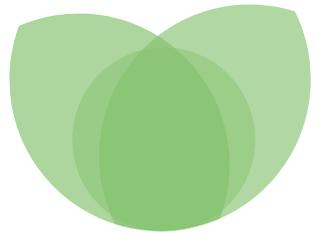
# For your notes

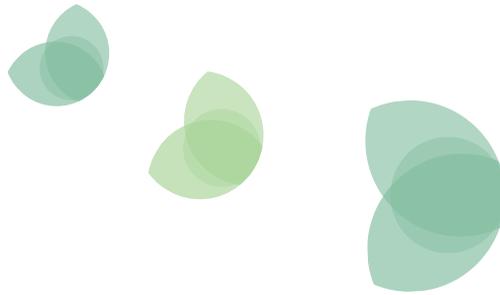
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**For your notes**







#### **Note**

The data contained in this publication are based on our current knowledge and experience. In view of the many factors that may affect processing and application of our product, these data do not relieve processors from carrying out own investigations and tests; neither do these data imply any guarantee of certain properties, nor the suitability of the product for a specific purpose. Any descriptions, drawings, photographs, data, proportions, weights etc. given herein may change without prior information and do not constitute the agreed contractual quality of the product. It is the responsibility of the recipient of our products to ensure that any proprietary rights and existing laws and legislation are observed. (September 2020)

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