Biodegradable Product Series Debrief

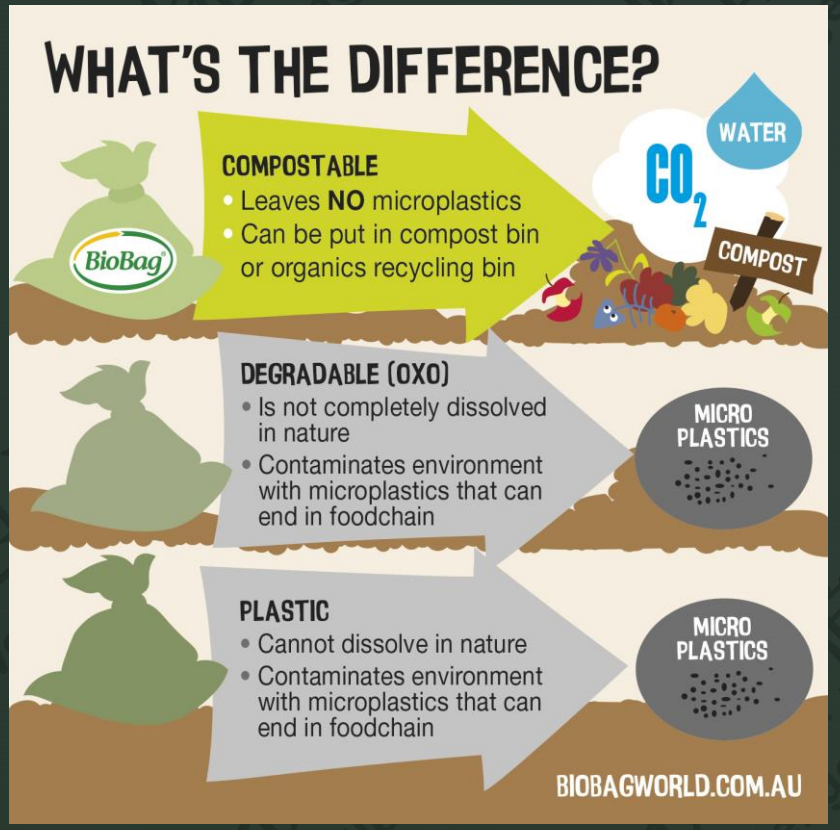
Challenge Wolves Packing

Debrief of Biodegradable Plastics

- Biodegradable plastic is a type of plastic that has emerged in recent years, which has chemical bonds that can be hydrolyzed and decomposed by living microorganisms, and eventually becomes water, carbon dioxide and other biomass, such as plastics composed of PLA, PBAT, PHA, PGA, PBS and other chemical components. The advantage of biodegradable plastic over traditional plastics like PP, PE, PET is that it can degrade, and the degradation process and products can return to nature, decomposing into water and carbon dioxide, without toxic effects on the environment.
- Bio-based PE plastic: such as starch-based, plant fiber-based (sugar cane residue, coffee residue, straw, corn stalk), is called bio-based plastic after being mixed and processed with PE. The bio-based part can degrade, but the PE plastic part only breaks down into smaller particles, which are still not degradable and the environmental hazard remains.
- Photo-oxidative degradable plastic (PE+D2W) can break the long molecules of PE under the action of additives, but cannot make them disappear from the microscopic level. After disappearing macroscopically, it forms microplastics, which are more harmful (they will be ingested by fish, earthworms and other organisms, thus entering the food chain, poisoning all organisms on the food chain, and ultimately endangering humans).

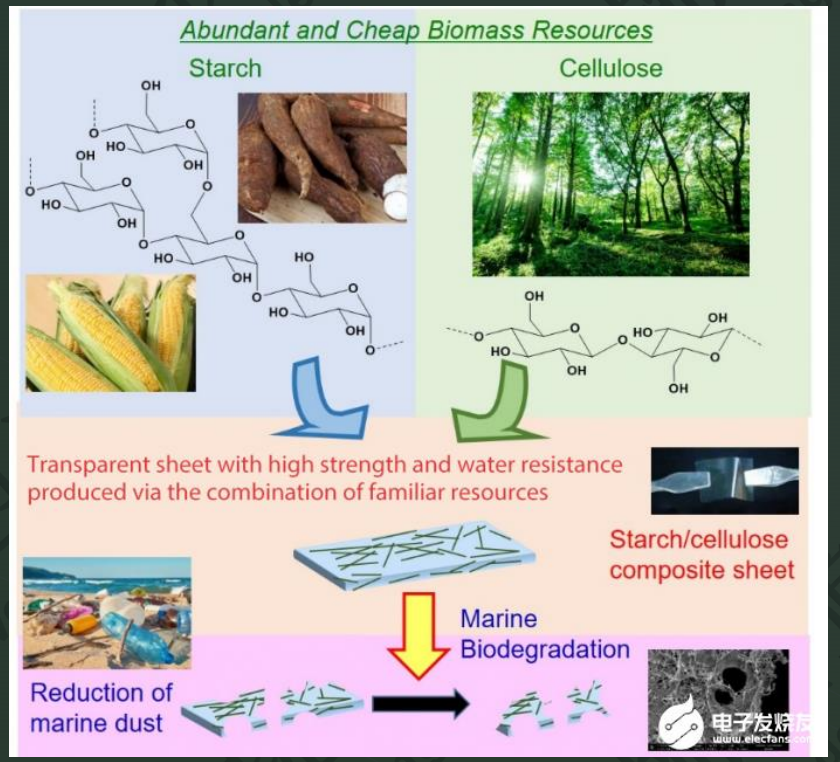
Why We Only Use 100% Biodegradable Plastics?

- PLA, PBAT, PHA, PGA, PBS and other 100% biodegradable plastics degrade into water, carbon dioxide, other biomass and various inorganic salts, which are harmless to the environment. They also have the advantages of being reusable (requiring industrial composting conditions for rapid degradation), recyclable (rPLA, rPLA+rPBAT), and mixed with other plant materials (PBAT+starch, PLA+PBAT+plant fiber) to reduce costs and enhance environmental awareness. They can still be degraded and painlessly return to nature after their life cycle is exhausted or their recycling value is exhausted.

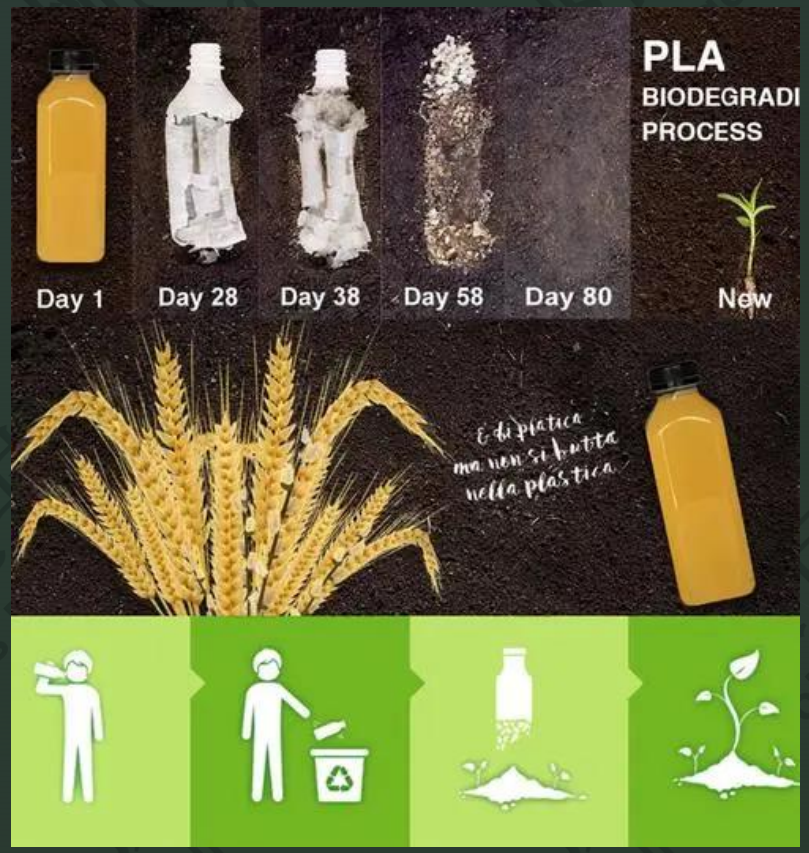


PLA Debrief

- PLA (polylactic acid) is a plastic comes from fermenting lactic acid from biobased resources such as corn, sugarcane, beet, etc., then making lactic acid oligomers, then making propyl lactate, and finally polymerizing polylactic acid. As a kind of biodegradable biobased plastic, it has similar physical properties to traditional plastic polyethylene terephthalate (PET), which has good transparency, high strength, but also has the problem of high brittleness and poor process ability after cooling.
- PLA (polylactic acid) has been applied for a longer time than other biodegradable plastics, so it has mature production technology, but it also has problems, such as limited raw materials, high price, and its performance not suitable for some application scenarios.



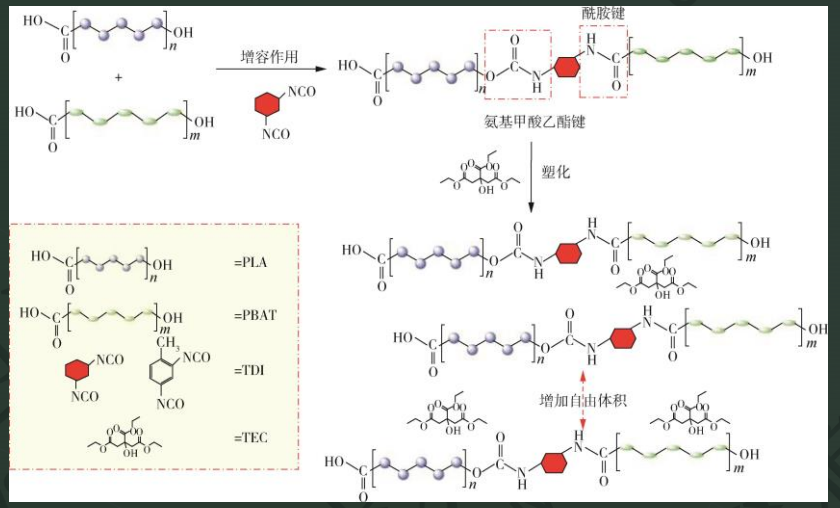
PLA Degrading Process



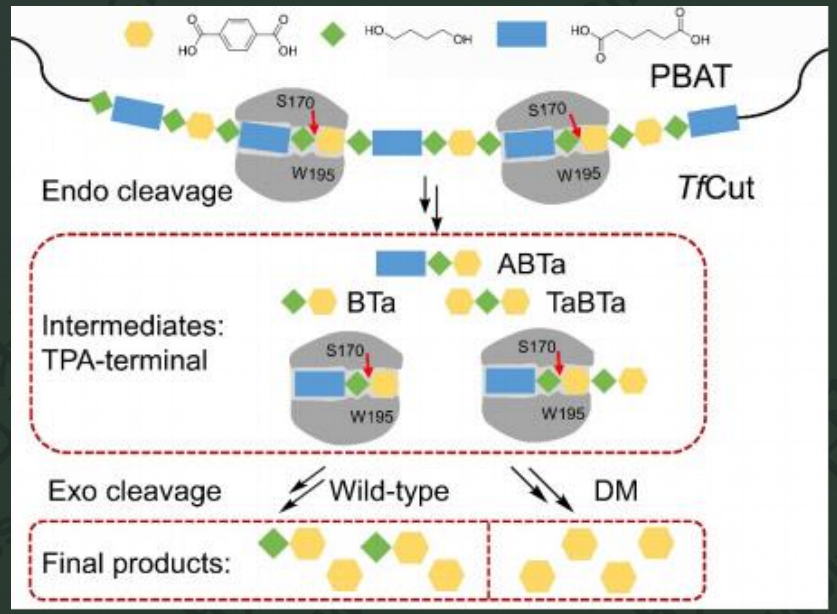
- Microorganisms that have the ability to degrade PLA secrete corresponding extracellular depolymerases (commonly used microorganisms for degrading PLA include Fusarium oxysporum, Aspergillus, Humicola and so on), which are stimulated by some inducers (such as silk protein, elastin, gelatin) and some peptides and amino acids to accelerate the degradation of PLA. The degradation of PLA by depolymerases breaks the ester bonds of PLA molecules, producing oligomers, dimers and monomers. Since the degradation products are very small and can be absorbed and utilized as carbon sources and energy through the semi-permeable bacterial membrane, they are finally decomposed into CO_2 and H_2O.

PBAT Debrief

- PBAT (polybutylene adipate-co-terephthalate) is a new type of petroleum-based biodegradable plastic that has emerged recently. It is a new material made by polymerizing adipic acid and butanediol terephthalate. The two components for synthesizing PBAT are mature petroleum products, which can be synthesized on a large scale after years of experience accumulation. It is the lowest-priced biodegradable plastic. As a petroleum-based plastic, it can be well absorbed and utilized by various bacteria, and has good degradability. With the increase of environmental awareness in various industries, PBAT is being widely used in various fields. PBAT, as a petroleum-based product, has the problem of higher carbon emissions than PLA. The performance problems of PBAT are fast degradation, similar physical properties to PE (polyethylene), soft, good tensile, but also poor heat dissipation and poor drawing performance. Therefore, in the application field, we usually mix PBAT and PLA.



PBAT Degrading Process



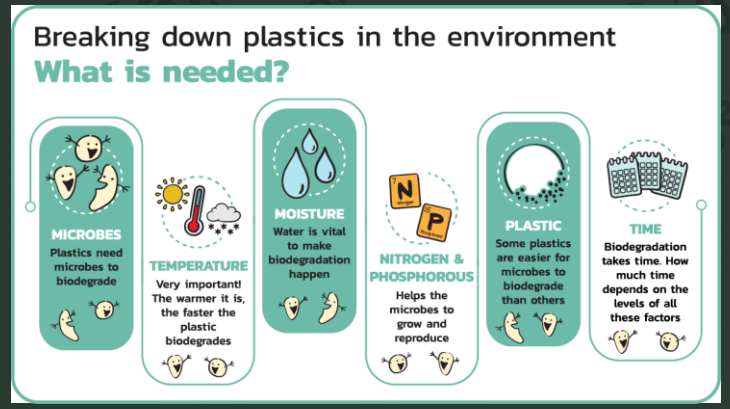
- First, microorganisms decompose the degradation products of PBAT into short-chain alcohols, water and small amounts of cellulose, which can be used as bacterial cell components, participate in the subsequent bacterial cell synthesis process, and supplement nutrients to degrade PBAT more effectively. Second, bacteria synthesize various organic substances from their internal components, such as acetic acid, sugars, etc., which can be used to maintain the normal growth of bacteria and the energy conversion of their internal cells. Finally, bacteria excrete radioactive substances inside the cytoplasm, such as calcium chloride and calcium ions, through hydrolysis, and the pollutants gradually decay over time, eventually achieving the effect of environmental pollution purification.

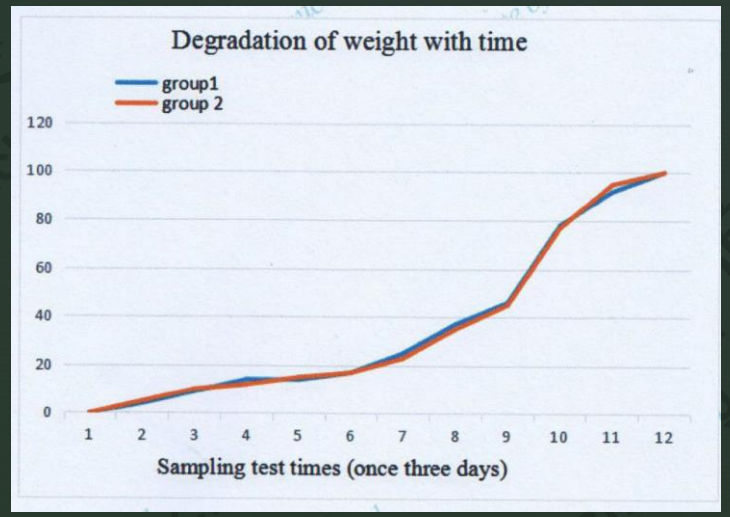
Industrial Composite

- Industrial composting is the process of producing fertilizer by piling up organic waste together and going through a certain treatment process. This fertilizer can be from household, agricultural or industrial organic waste, such as food residues, lawn clippings, cow dung, etc. In the industrial composting process, organic matter is decomposed into fertilizer by microorganisms through decomposition and redox reactions. This process requires suitable conditions of temperature, humidity, oxygen and carbon-nitrogen ratio. In order to achieve the best results, proper mixing and ventilation are usually required. The benefits of industrial composting include reducing the cost of disposal and treatment of organic waste, and producing fertilizer that can improve soil fertility, soil structure and water retention capacity, and promote plant growth.

Industrial Composite Conditions

- Temperature: At the appropriate temperature, the activity of microorganisms is the highest and the decomposition of organic matter is the fastest. Generally speaking, industrial composting needs to maintain a temperature between 50° C and 70° C, which can be achieved by controlling ventilation and watering.
- Oxygen: Industrial composting requires sufficient oxygen to maintain the respiration and decomposition of microorganisms. Usually, regular turning and ventilation are needed to ensure the oxygen content in the compost.
- Moisture: Proper moisture can promote the reproduction and decomposition of microorganisms. Too little moisture will prevent microorganisms from growing, while too much moisture will squeeze out the oxygen in the compost and affect the decomposition. Generally speaking, industrial composting needs to maintain a humidity range of 50%-60%.
- Carbon-nitrogen ratio: The carbon-nitrogen ratio in industrial composting is an important factor affecting the quality of compost. Too high carbon-nitrogen ratio will make microorganisms lack nitrogen source and affect decomposition, while too low carbon-nitrogen ratio will cause nitrogen in the compost to be released as ammonia gas, producing odor. Generally speaking, the carbon-nitrogen ratio in industrial composting needs to be controlled at about 25:1-30:1.
- Our fully biodegradable products can degrade more than 90% of their own weight within 180 days under industrial composting conditions, and completely transform into water and carbon dioxide, achieving an environmentally friendly and harmless effect. And in normal storage conditions, the degradation speed can be negligible. We still recommend to use our 100% biodegradable products within one year of production date to prevent performance degradation caused by slow degradation.

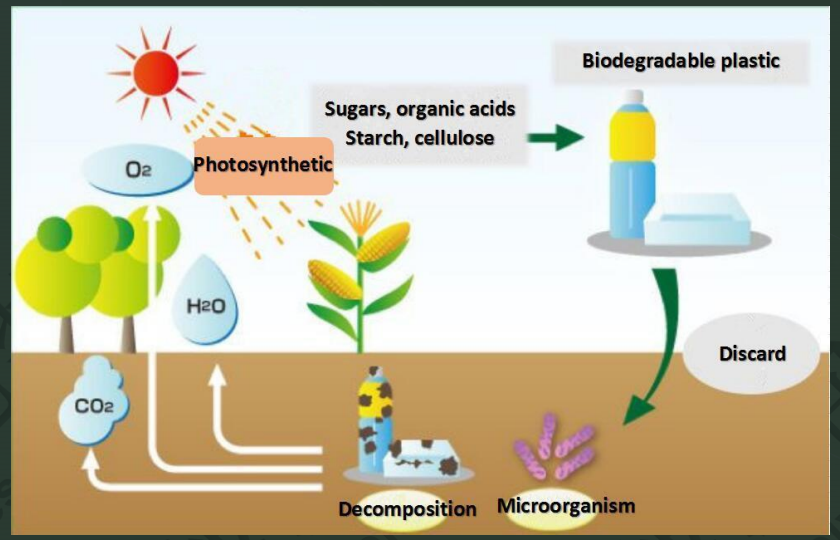




Home Composting

- Home composting is the process of treating organic waste at home, by decomposing kitchen scraps, grass clippings, fallen leaves and other organic waste in a backyard or indoor compost bin through microbial decomposition and oxidation-reduction reactions, thus producing fertilizer. Home composting requires some management and precautions, such as proper watering, ventilation and mixing.
- The benefits of home composting include reducing the transportation and treatment costs of organic waste, and producing fertilizer that can be used for home gardens, planting flowers, vegetables and so on. In addition, by treating organic waste through home composting, environmental problems caused by landfill and incineration can also be reduced.
- In summary, home composting is a simple, effective and environmentally friendly way of treating organic waste, which has positive effects on reducing waste, improving soil quality and protecting the environment.

Home Composting Conditions



- Air circulation: Composting requires sufficient oxygen to maintain the respiration and decomposition of microorganisms. Therefore, air circulation needs to be ensured in the compost bin, which can be achieved by the design of the compost bin.
- Humidity: Proper humidity can promote the reproduction and decomposition of microorganisms. Too little moisture will prevent microorganisms from growing, while too much moisture will affect the aeration of the compost. Generally speaking, home composting needs to maintain a humidity range of 50%-60%.
- Temperature: Composting requires a certain temperature to accelerate decomposition, but too high temperature will kill useful microorganisms. In home composting, generally there is no need to control the temperature specifically, because the microorganisms in the compost bin will naturally produce a suitable temperature.
- Carbon-nitrogen ratio: The carbon-nitrogen ratio in home composting is an important factor affecting the quality of compost. Too high carbon-nitrogen ratio will make microorganisms lack nitrogen source and affect decomposition, while too low carbon-nitrogen ratio will cause nitrogen in the compost to be released as ammonia gas, producing odor. Generally speaking, the carbon-nitrogen ratio in home composting needs to be controlled at about 25:1-30:1.

Our Certificatory and Suppliers

- TUV Rheinland (TÜV Rheinland) is a global technical service company, headquartered in Cologne, Germany. The company was founded in 1872, aiming to provide third-party technical inspection, certification, testing, training and consulting services for enterprises. TUV Rheinland covers a wide range of fields, including industry, energy, information and communication, transportation, medical, chemical, food, environment and sustainable development. The main goal of the company is to ensure the quality, safety, reliability and sustainability of products and services, to help customers improve their competitiveness, reduce risks and meet regulatory requirements. TUV Rheinland has more than 20,000 employees worldwide, and has branches and laboratories in nearly 70 countries. It is a trusted third-party technical service provider.

- We also cooperate with China Chemical Industry Research Institute to provide testing and certification services for our biodegradable plastic products.

- Now, we also work with major material suppliers to develop new materials, to achieve better processing performance and produce more exquisite printing packaging products. Among them are large listed companies and industry leaders, such as Kingfa Technology, Shanghai Red Avenue, Zhejiang Hisun, Anhui BBCA Group and so on.

现阶段部分供应商证书展示

About Our Products

- In order to reduce the use cost of biodegradable plastics, we have adopted various composite processes to reduce their use cost or improve their printing effect. For example: PLA non-woven fabric laminate with paper maintains biodegradability and reduces use cost and improves printing effect, PLA non-woven fabric laminate with PLA+PBAT plastic film achieves more exquisite printing effect and reduces use cost.
- At present, we mainly use PLA non-woven fabric, PLA+PBAT laminated medium, PLA+PBAT blended blown film or paper and other natural plant fibers to make our non-woven fully biodegradable products. And for plastic products, we use PLA+PBAT blended blown molding to make our final products.
- We can also use recycled PLA and PBAT, just like rPET, to reduce the use cost of raw materials and maintain the biodegradability of the products. rPLA composite recycled paper and rPLA+rPBAT blended blown molding are a set of samples with typical properties.

Dare to Challenge, Make More Possibilities

Challenge Wolves Packing