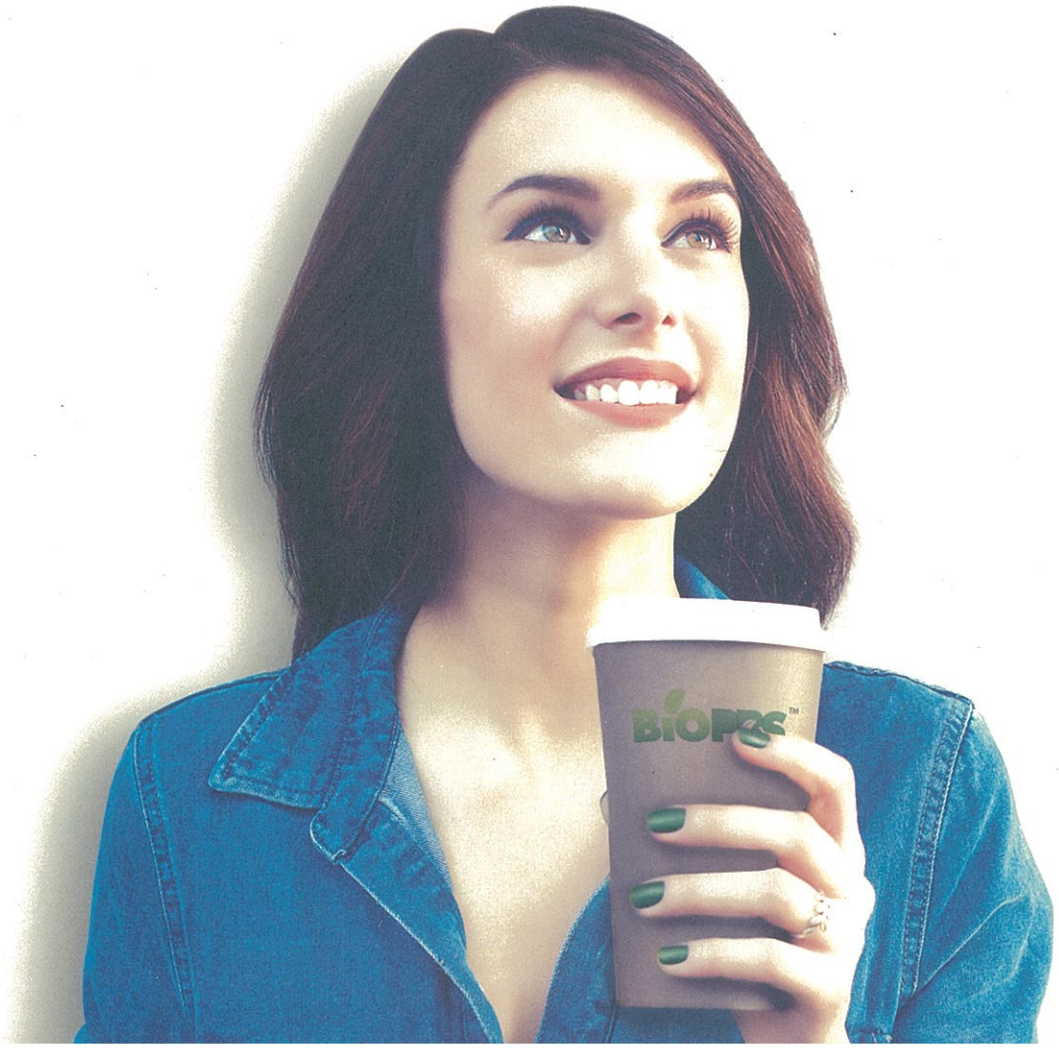
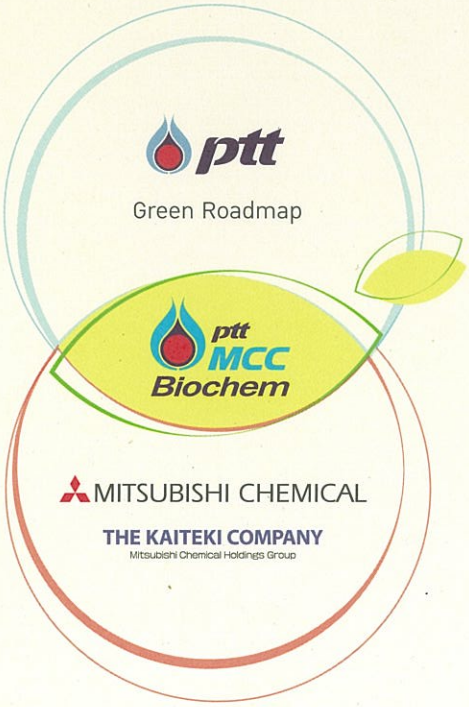
BIOPBS™

Renewable . Ambient Compostable . FCN Approved



ptt MCC Biochem

PTT MCC BIOCHEM
COMPANY LIMITED



PTT MCC Biochem (PTTMCC) is a strategic joint venture between PTT Public Company Limited (PTT) and Mitsubishi Chemical Corporation (MCC) with the intention to focusing solely on the bio-chemical industry and creating products of benefit to mankind and to build a greener world. Consequently, PTTMCC is determined to produce bio-chemical products that will initiate changes for a better future. We have launched our first project with the Polybutylene Succinate (PBS) Plant in Thailand, which is also the first bio-based PBS plant in the world, and scheduled to commercialize by 2016.

However, the BioPBS™ project is only our first step. PTTMCC will continue to develop and create new bio-chemical products that will help to save the world for the future. Our aim is to become a leading Bio-Driver in order to create a greener world.

Sugarcane / Corn / Cassava

Paper coating

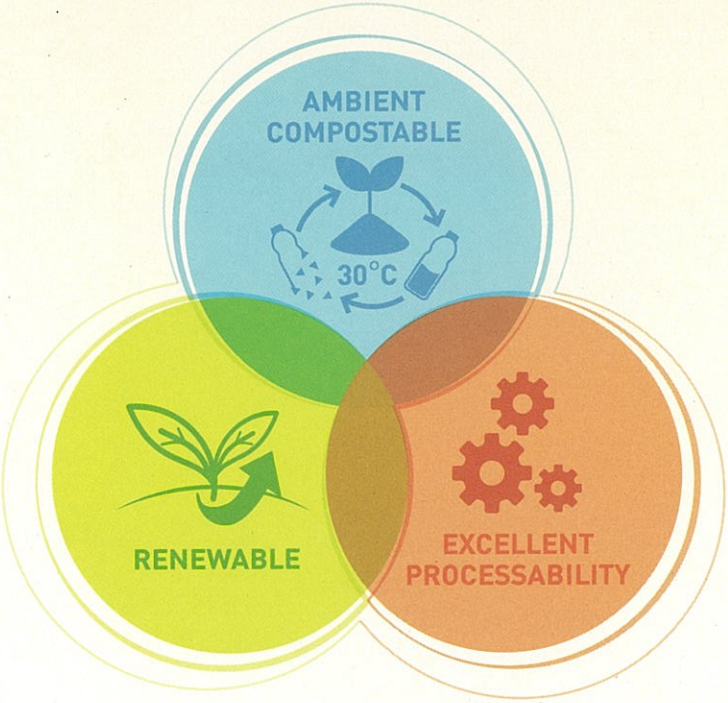
Flexible Packaging

Injection Molding

BioPBS™ (bio-based polybutylene succinate) is revolutionary in its two-fold bio properties. It is both bio-based and biodegradable plastic, using advanced technology from Mitsubishi Chemical Corporation. Derived from natural resources, such as sugarcane,cassava and corn, BioPBS™ decomposes into biomass, carbon dioxide and water in ambient condition (30 °C).

Products made from BioPBS™ can be disposed of along with organic waste. It is compostable at open-air landfill site in ambient condition (30°C), without requiring a specialized composting facility. So, BioPBS™ is the truly environmentally-friendly plastic for green products.

BioPBS™ Benefits?



1. Superior compostable in ambient condition (30 °C) without composting facility.

2. With BioPBS™, your products are conceived from nature and will return to nature at the end of life.

3. You can utilize this advance material with the same machines you currently owned with no additional investment.

Easy Implementation

FOOD CONTACT APPROVED
FZ grades are listed in U.S.FCN No.1574, comply with OM-6 in EU 10/2011 and JHOSPA. FD grade comply with OM-3 in EU10/2011.

HIGH SERVICE TEMPERATURE
Applications made by BioPBS™ can withstand up to 100°C. BioPBS™ can be used for hot beverage cups, boxes, and utensils for freshly cooked food.

EXCELLENT HEAT SEALABILITY
Having the same level of seal strength as conventional petro-plastic, we provide the same performance with less cost in waste disposal expense.

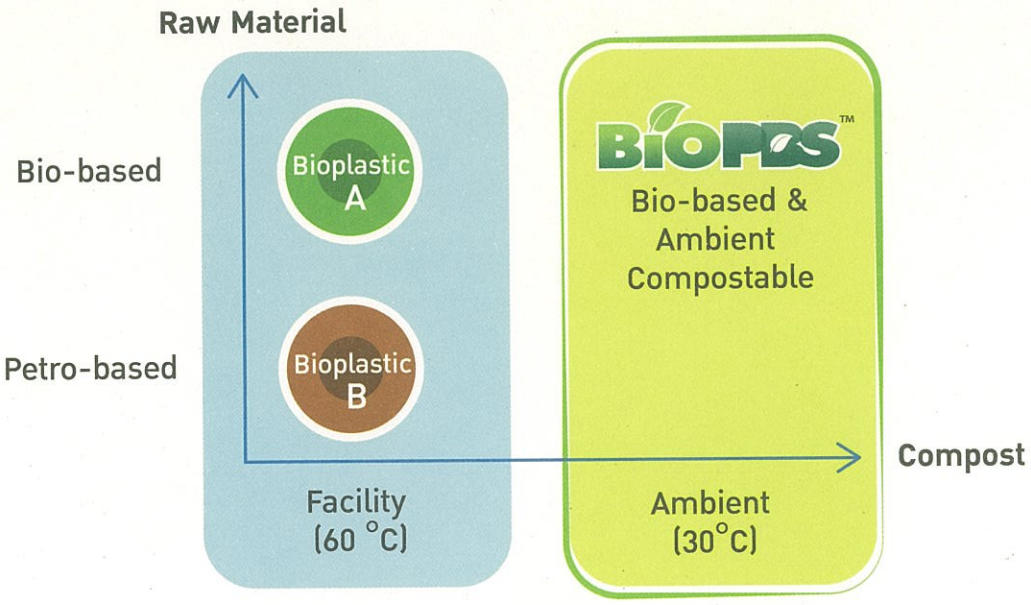
EASY TO COMPOUND WITH OTHER BIOPLASTICS
Compounding BioPBS™ with other types of biopolymer can enhance each other to a greater degree of mechanical and thermal properties.

Compostable plastic and Bio-based plastic

BioPBS™ is compostable & derived from renewable material

Compostable plastic can be made from either renewable or petroleum material, after used and end up in composting condition, it will be broken down into a natural elements such as H_2O, CO_2 and biomass. Compostable plastics are divided into two groups. Plastics that are compostable at ambient temperature such as BioPBS™ and plastics that are compostable in composting facility in which higher composting temperatures can be reached. While bio-based plastics are made from renewable material but not every bio-based plastic is compostable.

BioPBS™ is a combination of both bio-based plastic and compostable bioplastic. It can be composted at open-air landfill site in ambient condition (30 °C) without composting facility.

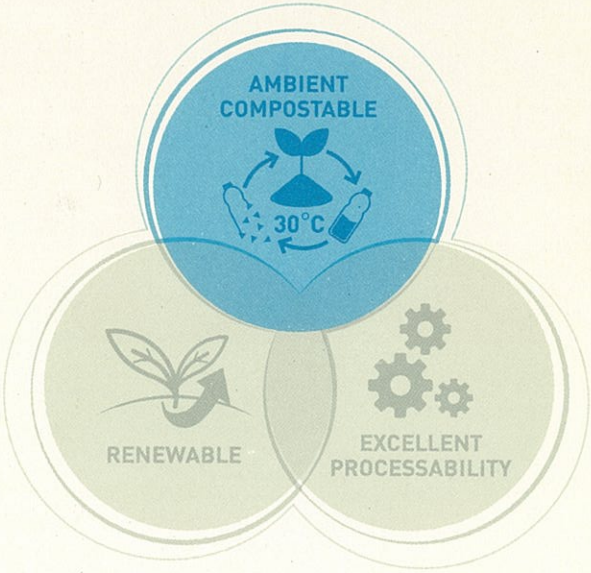


Whereas some bioplastics are compostable in composting facility, but not enough composting facility !

Country	Facilities
USA	almost 5,000
Germany	980
Canada	350

Despite there are almost 5,000 composting facilities in the USA, it's not enough for the world's most development country in which 3 billion populations are living in.

How to dispose of BioPBS™ products ?



1. Drop
Just simply drop into a regular trash can and let them go forward to the waste management system.

2. Ambient compost
BioPBS™ can be composted in ambient condition (30 °C) in soil at open-air landfill site.

3. Back to nature
H_2O, CO_2 and biomass that are left in soil will be used as part of biocycle for the plant growth over again and again.

*** BioPBS™ can be applied in current extrusion coating machines, blown film extruders, and injection molding machines.**

BioPBS™ is available in various grades which meets the following international standard for compostability and bio-based content. Product made from BioPBS™ can be disposed of along with organic waste. Thus, BioPBS™ is the true environmentally-friendly plastics for green products.

HOME OK compost S534 VINÇOTTE

OK compost S534 VINÇOTTE

BPI COMPOSTABLE IN INDUSTRIAL FACILITIES
Check locally, as these do not exist in many communities. **Not suitable for backyard composting.** CERT # 10528580

No.299/No.300

BIOBASED 50 - 85 % DIN Geprüft
8C084/8C085

BIOBASED 20 - 50 % DIN Geprüft
8C083

BioPBS™-Paper coating

recyclable

certified at WMU

Easy Implementation

- Process is stable and low neck-in
- Can run as fast as LDPE in existing LDPE machine
- Easy penetration into pore and around fiber yielding excellent adhesion to cup stock paper
- Low heat seal temperature and excellent heat seal strength at lower coating thickness compared to typical bioplastic
- Excellent printability without pre-treatment
- Listed in U.S.FCN No. 1574, JHOSPA and comply with EU10/2011
- Resistance to elution of vinegar, cooking oil, olive oil, etc.
- Resistance to percolation of cooking oil, worcester sauce, ketchup, etc.

WESTERN MICHIGAN UNIVERSITY

PASS/FAIL SUMMARY

	Trial #1	Trial #2	Trial #3
1. For both treated and untreated were the substrate, samples, specimens appropriate? (Y/N)	Y	Y	
2. Fibre Yield ≥ 85%? (Y/N)	Y	Y	
3. Operational impact acceptable? (Y/N)	Y	Y	
4. Product performance acceptable? (Y/N)	Y	Y	
5. Product appearance/spot count acceptable? (Y/N)	Y	Y	
Overall Pass / Fail - by trial: (Pass/Fail)	PASS	PASS	

MATERIAL AS SUBMITTED "PASSES" VOLUNTARY STANDARD.

Pass or Fail: PASS

Signed:

Print name: Jeff Kendrick

Environmentally-friendly

- Compostable at room temperature can significantly reduce a landfill space.
- Slash waste management cost as it needs no special composting facilities.
- As high as 96% of BioPBS™-coated paper is repulpable, certified by the well-known institute, Western Michigan University. It greatly impacts on lowering deforestation rate.
- No need to change consumer behavior. They just simply throw them out in regular trash cans and let waste management system work on their own.

Due to its outstanding processability in several facets, BioPBS™ can save your operational cost in comparison with other bioplastics. It partly reduces deforestation rate as a result of their superior recyclable property. Being friendly to the surrounding environment, BioPBS™-coated paper also helps reduce the amount of waste as it can be composted along with organic waste at ambient temperature (30 °C).

Properties	Test Method	Unit	BioPBS™		
			FZ71 (PM/PB)	FZ91 (PM/PB)	FD92 (PM/PB)
Density	ISO 1183	g/cm^3	1.26	1.26	1.24
MFR (190 °C, 2.16 kg)	ISO 1133	g/10 min	22	5	4
Melting Point	ISO 3146	°C	115	115	84
Yield Stress	ISO 527-2	MPa	40	40	17
Stress at Break	ISO 527-2	MPa	30	36	24
Strain at Break	ISO 527-2	%	170	210	380
Flexural Modulus	ISO 178	MPa	630	650	250
Flexural Strength	ISO 178	MPa	40	40	18
Izod Impact Strength (23 °C)	ISO 180	kJ/m^2	7	7	47
Heat Deflection Temperature (0.45 MPa)	ISO 75-2	°C	95	95	63
Rockwell Hardness	ISO 2039-2	R Scale	107	107	56
Remarks			Standard grades		Flexible grade

*PM grades are intended to come into contact with food applications.

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