

Sustainable Biopolymer, Amorphous PHA

Neat Resin: PHACT™ A1000P

Bring a New Wave
PHACT

PHA Neat Resin

PHACT A1000P is an environmentally friendly amorphous PHA biopolymer. Amorphous PHA (aPHA) is a softer, more rubbery version of PHA that offers fundamentally different performance characteristics than crystalline or semi-crystalline forms of PHA (PHACT S1000P). aPHA is primarily used as a modifier to other polymers and biopolymers to improve functionality (e.g., flexibility and toughness) and processing characteristics. It is a 100% bio-based material derived from nature and produced sustainably. It is TUV OK certified home and industrial compostable and marine and soil biodegradable. PHACT A1000P is suitable for general compounding with other polymers and can be processed using various conversion technologies, such as injection molding, thermoforming, film, sheet, and fiber. Ideal market applications include rigid and flexible packaging for food & beverage, food serviceware, personal care, agriculture, and consumer goods where functional biodegradation is desired.

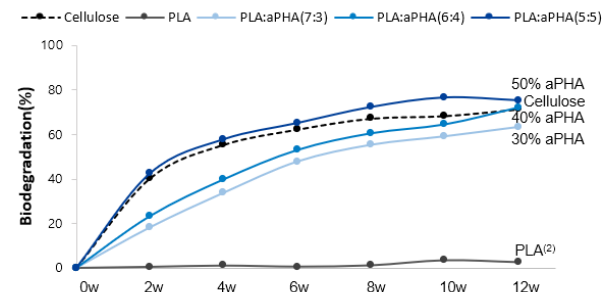


PHACT A1000P Features

- 100% Bio content
- TUV Certified home and industrial compostable
- TUV Certified marine and soil biodegradable
- Used as a modifier for other polymers
 - Improves impact strength of PLA
 - Enhances elongation of PLA
 - Enables faster composting relative to PLA

□ Evaluation of various PHA/PLA compositions in compost (58°C → 30°C, ISO14855-1⁽¹⁾)

□ PLA mineralization was accelerated by PHA content of 30% or more



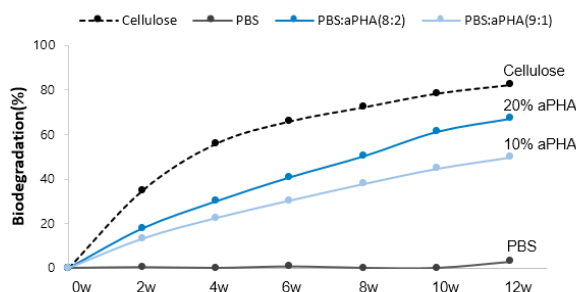
(1) The sample tests were conducted according to AS5810 with modified temperature condition of 30°C.

(2) Varying grades and crystallinity of PLA may effect acceleration of biodegradation differently.

(3) The sample tests were conducted according to AS5810 with modified temperature condition of 30°C. All samples were mixed by twin extruder.

□ Evaluation of various PHA/PBS compositions in compost (58°C → 30°C, ISO14855-1⁽³⁾)

□ PBS mineralization was accelerated by PHA content of 10% or more



Sustainable Biopolymer, Amorphous PHA

Neat Resin: PHACT™ A1000P

Certifications

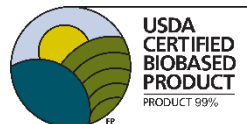
• Biobased Certificate



OK Biobased by TUV
Class4, 80%≤



Biobased Product by DinCertco
(8C265)



BioPreferred by USDA
(ID# 11346)

• Biodegradability Certificate



OK Compost Industrial



OK Compost Home



OK Biodegradable Soil



OK Biodegradable Marine



BPI Compostable



industrially
compostable
Seedling by EUBP



Industrial compostable by DinCertco



Biodegradable
Plastics
JBPA (A46001)



Korea Eco-Label
EL724

• Food contact and Packaging Compliance

- US FDA Food Contact Substance (FCN2281)
- Ministry of Food and Drug Safety of the Republic of Korea: Registered the list of Food Utensils, Containers, and Packages (registered as HBP (hydroxybutyl polyester))
- The Chinese Ministry of Health: Registered the list of National Food Safety Standard Food Contact Plastic Resin (GB 4806.6-2016)
- BRCGS Packaging Materials
- Kosher Certification (KLBD65399)
- Indonesia Halal Certification (ID00410000464030322)

CJ Biomaterials, Inc. makes no warranty, express or implied, regarding the information contained herein or its products, including but not limited to any warranty as to the accuracy or completeness of information, or any implied warranty of merchantability or fitness for a particular purpose.

Sustainable Biopolymer, Amorphous PHA

Neat Resin: PHACT™ A1000P

Mechanical Properties

PHA Neat Resin			
Properties	Units	ASTM	A1000P
Forms	-	-	Pellet
Specific Gravity	-	D792	1.23
Hardness (Max/15s)	Shore A	D2240	
- Max			< 80
- 15s			< 70
Tensile Strength at Break ⁽¹⁾	MPa	D638	< 2.2
Elongation at Break ⁽¹⁾	%	D638	500 <
Glass Transition Temperature ⁽²⁾	° C	D3418	-17 ~ -14
Melt Flow Rate (165 ° C, 5 kg)	g/10 min	D1238	< 5
Haze ⁽³⁾	%	E313-73	8.9 <
Transmittance ⁽³⁾	%	-	< 93

- (1) Injection specimens conform to ASTM D638 and D2240. Crosshead speed 200 mm/min for tensile strength. Tensile strength and Hardness Data were collected after the injected specimens were stored for 24 hours at room temperature.
- (2) Differential Scanning Calorimeter (DSC), the peak of endotherm. Heating rate 10 °C/min.
- (3) Film thickness 90um.

Recommended Processing Conditions

For General Purpose	
Dry Temperature	50 ° C X 5 hrs.
Feed Temperature	40 ° C
Melt Temperature	135 ~ 175 ° C
Compression Section	130 ~ 165 ° C
Nozzle	130 ~ 165 ° C
Screw Speed	80 ~ 150 rpm

Storage Conditions

- PHACT A1000P is an amorphous polymer that is aggregated easily when exposed to 60 ° C with humid condition.
- Avoid direct sunlight, heat or fire, and store it in a dry ventilated cool place.

CJ Biomaterials, Inc. makes no warranty, express or implied, regarding the information contained herein or its products, including but not limited to any warranty as to the accuracy or completeness of information, or any implied warranty of merchantability or fitness for a particular purpose.

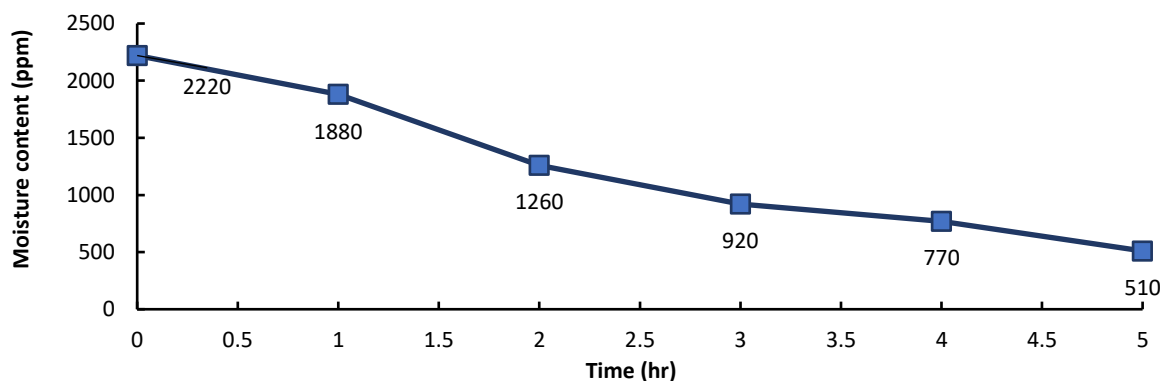
Sustainable Biopolymer, Amorphous PHA

Neat Resin: PHACT™ A1000P

Drying Process Conditions

- Biodegradable materials are highly hygroscopic. Store in a dry condition.
- PHACT A1000P is supplied in foil-lined boxes or bags dried to < 500 ppm.
- Recommended to use all once opened. If an opened bag must be stored for reuse, seal completely, avoid air exposure, and store at a dry, well-ventilated condition/place/location. Avoid long-term storing.
- Recommended to dry PHACT A1000P from packaging under 50 °C for 4~6 hrs.
- It is preferable to dry with air below -40 °C dew point.
- For the drying process, the paddle-type dehumidifying dryer is recommended to prevent aggregation during drying.

*Figure 1 shows the moisture content of PHA reached 500 ppm after 5 hrs. in the paddle-type dryer at 50 °C.



[Figure 1 - Moisture content of PHA in Paddle Dryer]

General Compounding Conditions

- PHACT A1000P is suitable for compounding with PLA. However, due to the high heat-sensitive properties of PHA, the extrusion temperature condition should be mild for reducing degradation of PHA during the process.

*Figure 2 shows an example of the extrusion temperature profile for PHA/PLA compounding.

Screw RPM	b1	b2	b3	b4	b5	b6	b7	b8	b9	b10	b11	DA	head
120-150	40	80	155	165	165	165	170	175	165	165	165	165	165
	Feeding zone	Heating zone			Melting zone			Mixing zone		Compression zone			

[Figure 2 - Extrusion temperature profile]

CJ Biomaterials Inc., 19 Presidential Way – Suite 301, Woburn MA 01801

For additional information or specific recommendations for your intended applications, please contact us.

Website: <https://cjbiomaterials.com> Email: cj.biomaterials@cj.net

CJ Biomaterials, Inc. makes no warranty, express or implied, regarding the information contained herein or its products, including but not limited to any warranty as to the accuracy or completeness of information, or any implied warranty of merchantability or fitness for a particular purpose.