Sustainable Biopolymers for Injection Molding

Compounds: PHACT™ CA1170P and CA1180P

Target Applications

Markets
- Consumer Goods
- Food Serviceware
- Personal Care/Cosmetics

End Products
- Hotel amenities & Office goods
- Cutlery/Plates
- Cosmetic jars/Containers

Bring a New Wave PHACT

PLA/PHA COMPOUNDS

PHACT CA1170P and PHACT CA1180P are environmentally friendly semi-crystalline biopolymer compounds that improve functional performance and enable faster composting relative to polylactic acid (PLA). These grades are compounded resins based on PLA and amorphous PHA (aPHA) known as PHACT A1000P. The addition of aPHA to PLA increases flexibility and impact strength and enhances water/oil resistance. These compounds also improve processability during injection molding, allowing greater design flexibility. The mold shrinkage of these grades is similar to that of ABS, thus the existing molds for ABS can be used. PHACT CA1170P is a general grade for injection molding with high impact strength and PHACT CA1180P is suitable for cosmetic or food & beverage applications.

PHACT CA1170P & CA1180P Features

- 100% bio content
- Industrial compostable
- High surface gloss
- Colorable and printable
- FDA-approved for food contact(1)
- Relative to PLA:
  - Increased flexibility and impact strength
  - Improved processability
  - Enhanced oil and water resistance

1) US FDA FCN2281, Korea FDA authorized substances (hydroxybutyl polyester (HBP), polylactic acid (PLA))

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Mechanical Properties

Compound Grades for Injection Molding				
Properties	**Units**	**ASTM**	**CA1170P**	**CA1180P**
Forms	-	-	Pellet	Pellet
Specific Gravity	-	D792	1.29	1.26
Hardness (Max / 15s)	Shore D	D2240	83 / 80	78 / 75
Tensile Strength at Peak(1)	MPa	D638	44	52
Elongation at Break(1)	%	D638	26	23
IZOD Impact Strength (Unnotched, RT)	kJ/m^2	D256	Non-Break	63
Heat Deflection Temperature / 0.455 MPa	℃	D648	50	51
Melting Point(2)	℃	D3418	165	162
Glass Transition Temperature(2)	℃	D3418	-15, 62	-15, 60
Melt Flow Rate (190°C, 2.16 kg)	g/10 min	D1238	9	7
Mold Shrinkage(3)	%	-	0.2	0.2

1) Injection specimens conform to ASTM D638. Crosshead speed 50 mm/min for tensile strength.
2) Differential Scanning Calorimeter (DSC), the peak of endotherm. Heating rate 10 ℃/ min.
3) Injection mold temperature was 25 ℃.

Recommended Processing Conditions

Compound Grades for Injection Molding	
Dry Temperature	60 ℃ X 5 hrs.
Feed Throat	20 ~ 40 ℃
Feed Temperature	155 ~ 175 ℃
Compression Section	170 ~ 185 ℃
Metering Section	175 ~ 185 ℃
Nozzle	175 ~ 190 ℃

Injection Speed	10 ~ 25%
Holding Pressure Time	5 ~ 25 sec
Mold Temperature	
1) 40 ℃ (for general purpose, HDT 50 ~ 55 ℃)	
2) 110 ~ 120 ℃ (for high performance, HDT 150 ℃)	

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Drying Process Conditions

- Biodegradable materials are highly hygroscopic. Store in a dry condition.
- Recommended to use all once opened. If an opened bag must be stored for reuse, seal completely, avoid air exposal, and store at a dry, well-ventilated condition/place/location. Avoid long-term storing.
- PHACT Compounds must be dried under 60 ℃ for over 5 hrs. or caking can happen because the Tg of this compound is around 60 ℃.
- PHACT Compounds are preferable to dry with air below -40 ℃ dew point.
- When exposed to moisture, completely dry in a dehumidifying dryer before use.

Purging Process Conditions (*Following PET, PA, HDPE)

It is critical to clean the material handling systems of PET, nylon, and high molecular weight HDPE to assure that these materials do not inadvertently feed into the extruder during or after the purging process.

1) Purge with low MFR (e.g., <1) transition resin at normal PET operating temperatures. PET and PHACT are temperature incompatible, so the transition resin is one that can be processed at the high temperatures of PET and the low temperatures of PHACT.
   Suggested transition resins include PP, crystal PS, and PETG. Purge for at least 7x average residence time, much of the time at the typical PET production rate (~30 minutes).
2) Let the system empty as much as possible. Clean out the hopper as much as possible.
3) Introduce higher melt flow transition resin (PP, PS, PETG) and change to normal PHACT operating temperatures.
4) Let the system empty as much as possible. Then transition to pure PLA resin or PHACT and purge, again, for a minimum 7x average residence time. Change the screen pack when it becomes obvious that primarily PLA (or PHACT) is exiting the die.
5) At the completion of run, purge all PHACT from the extrusion system, using low melt index PP or PS.

*Note: It is critical that all drying and conveying/receiving systems be free of all PET and vacuumed to ensure there is no remaining polymer dust before adding PHACT. PET will not melt at PHACT operating temperatures and will block screens if it is present in the system.

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

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

cj.biomaterials@cj.net or 339-999-2693