





High heat PLA

Compounding with Luminy® for high heat PLA



-  **Biobased**
-  **Reduced carbon footprint**
-  **Multiple end-of-life options**
-  **Heat resistance similar to PP, PS & ABS**

The global shift towards a biobased economy has placed pressure on plastic producers to seek alternatives to their oil-based products. Until now, PLA (Poly Lactic Acid) could not be used in applications where higher heat resistance was required. However, Total Corbion PLA's breakthrough in high heat PLA is changing the face of biobased plastics, offering brand owners and plastic converters an excellent level of performance.

Unlocking bioplastic potential for durable applications

Most PLA bioplastics of the past had the major drawback that they could not withstand increased temperatures. However, Total Corbion PLA has developed a high heat solution for PLA-based bioplastics.

At the heart of this technology, you find high heat PLA compounds based on stereochemically pure lactides, a type of PLA that until recently was not commercially available. These new high heat PLA resins open up new markets for bioplastic products, including consumer electronics, high heat packaging, automotive interiors, apparel and many more. Total Corbion PLA has demonstrated that this is not just a theory by developing a range of compounds in cooperation with our PLA partners, Universities, Institutes, compounders and brand owners.

About Total Corbion PLA

Total Corbion PLA is a global technology leader in Poly Lactic Acid (PLA) and lactide monomers. PLA is a biobased and biodegradable polymer made from annually renewable resources, offering a reduced carbon footprint versus many traditional plastics. The Luminy® PLA portfolio, which includes both high heat and standard PLA grades, is an innovative material that is used in a wide range of markets from packaging to consumer goods, fibers and automotive. Total Corbion PLA, headquartered in the Netherlands, operates a 75,000 tons per year PLA production facility in Rayong, Thailand. The company is a 50/50 joint venture between Total and Corbion.



A biobased alternative, comparable heat performance

Total Corbion PLA's technology can replace PS, PP and ABS type materials in applications where heat performance (HDT B) is a key requirement (see Fig. 1). This higher heat performance is achieved by improving the purity of the PLA polymer backbone. The key driver behind this innovation, is adding PDLA as a nucleating agent to high heat PLA neat resin. This results in a compound that combines good heat resistance with excellent mechanical properties.

Fig. 2 and the table below show typical results of using high heat PLA neat resins in a number of sample compounds:

- **Compound A:** a general purpose compound, featuring increased heat performance without adding significant amounts of filler.
- **Compound B:** a mineral (talc) filled compound with a higher modulus, and an even higher temperature resistance than compound A.
- **Compound C:** an impact modified compound featuring an ABS type of impact resistance.
- **Compound D:** a cost optimized base compound for sheet/film extrusion. PDLA can be added separately to increase crystallization speed and optimize processing.
- **Compound E:** a general purpose compound optimized for sheet/film extrusion and thermoforming.
- **Compound K:** compliant with industrial composting requirements while maintaining good heat resistance.

Fig 1. High heat becomes a reality

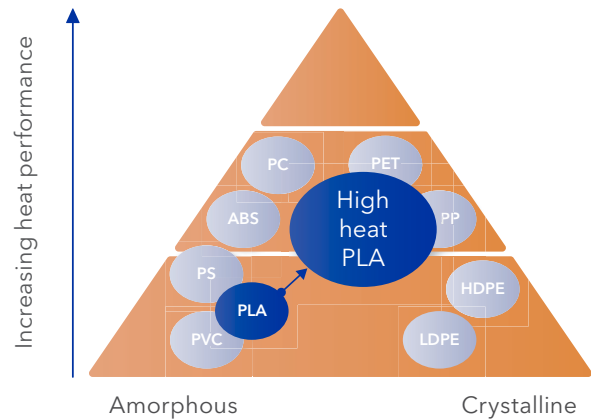
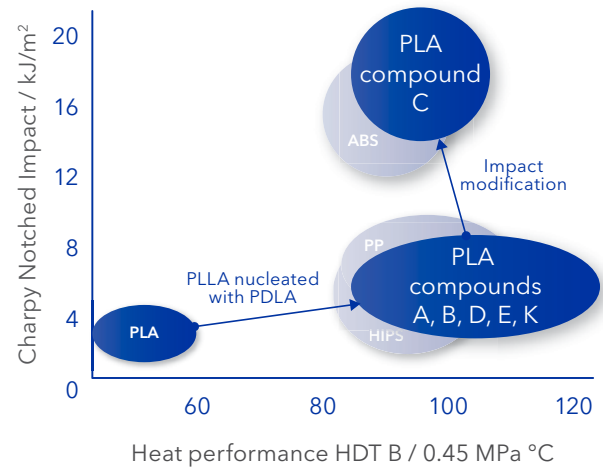


Fig 2. Closing the performance gap



				Total Corbion PLA sample compounds*						
		HIPS	PLA	A	B	C	D**	E	K***	
				General purpose	Mineral filled	Impact modified	Base compound	General purpose	Compostable	
Market	Injection molding			•	•	•			•	
	Extrusion/thermoforming						•	•	•	
	Food contact			•	•		•	•	•	
Physical	Density	g/cm ³	1.05	1.24	1.25	1.37	1.27	1.39	1.34	1.29
	Clarity	yes/no	no	yes	hazy	no	no	no	no	no
Processing	MFI (210°C/2.16kg)	g/10min			12	10	6	6	5	8
	Melt temperature	°C	210-240	190-220	190-220	190-220	190-220	190-220	190-220	190-220
	Mold temperature	°C	30-60	25	90-100	90-100	90-100	90-100	90-100	90-100
	Pre-drying	yes/no	no	yes	yes	yes	yes	yes	yes	yes
Mechanical	Tensile modulus	MPa	2000	3300	3600	5500	4000	5500	5400	3600
	Tensile strength	MPa	35	48	60	60	40	60	60	50
	Strain at break	%	35	<5	<5	<5	47	<5	<5	8
Heat	HDT B, 0.45MPa, flatwise	°C	93	55	90	110	90	120	120	80
Impact	Charpy notched, 23 °C	kJ/m ²	8	3	3	2	18	2	2	8

* Developmental grades, all data is preliminary. Data was obtained by measuring IM test bars. Total Corbion PLA does not commercially produce these PLA compounds. ** For high heat applications it is recommended to add 3-7% Luminy® PDLA D070 (nucleating agent). *** Compliance with EN13432 to be verified on actual end product.

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