



Corbion

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, Corbion's breakthrough in high heat PLA is changing the face of biobased plastics, offering plastic producers an excellent level of performance.

Corbion is a technology leader in biobased plastics innovation. Now Corbion has raised the bar even higher when it comes to high heat PLA 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, Corbion 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. Corbion 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.



High heat PLA

Unlocking bioplastic potential for high heat applications

A biobased alternative, comparable heat performance

Corbion's PLA technology can replace PS, PP and ABS type materials in applications where heat performance (HDT B) is a key requirement (see Figure 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.

Figure 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

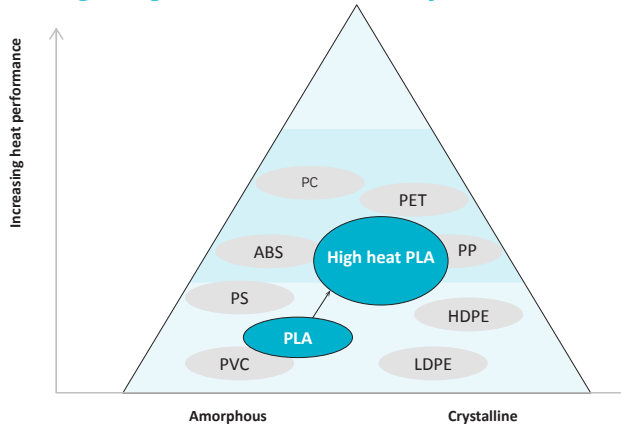
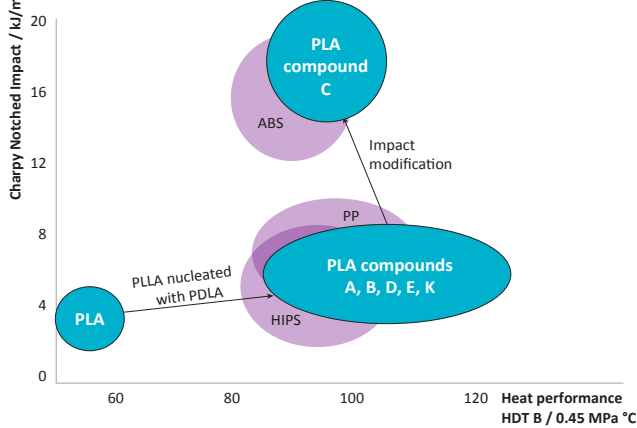


Fig 2. Closing the performance gap



		HIPS	PLA	Corbion PLA sample compounds*						
				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. Corbion 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.

Interested in our solutions for PLA bioplastics? Go to corbion.com/bioplastics  bioplastics@corbion.com  [@CorbionBioplast](https://twitter.com/CorbionBioplast)

Corbion is the global market leader in lactic acid, lactic acid derivatives and lactides, and a leading company in emulsifiers, functional enzyme blends, minerals and vitamins. For the plastics industry, Corbion offers lactides and PLA resins for general purpose and high performance bioplastics. PLA (Poly Lactic Acid) is a biobased plastic with a low carbon footprint and is used in packaging, disposables, fibers, electronics and automotive markets. Corbion operates 11 production plants, in the USA, the Netherlands, Spain, Brazil and Thailand, and markets its products through a worldwide network of sales offices and distributors.

© Copyright 2016 Corbion. All rights reserved. No part of this publication may be copied, downloaded, reproduced, stored in a retrieval system or transmitted in any form by any means, electronic, mechanical, photocopied, recorded or otherwise, without permission of the publisher. No representation or warranty is made as to the truth or accuracy of any data, information or opinions contained herein or as to their suitability for any purpose, condition or application. None of the data, information or opinions herein may be relied upon for any purpose or reason. Corbion disclaims any liability, damages, losses or other consequences suffered or incurred in connection with the use of the data, information or opinions contained herein. In addition, nothing contained herein shall be construed as a recommendation to use any products in conflict with existing patents covering any material or its use.

