





Luminy[®] PLA neat resins

PLA bioplastics for a brighter future



-  **Biobased**
-  **Reduced carbon footprint**
-  **Multiple end-of-life options**
-  **Proven in durable applications**

PLA (Poly Lactic Acid) is a biobased plastic derived from renewable resources and offers a significant reduction in carbon footprint compared to traditional oil-based plastics. PLA is currently being used in a variety of applications like packaging and food serviceware, and is increasingly becoming the material of choice for more durable applications in automotive, electronics and textiles.

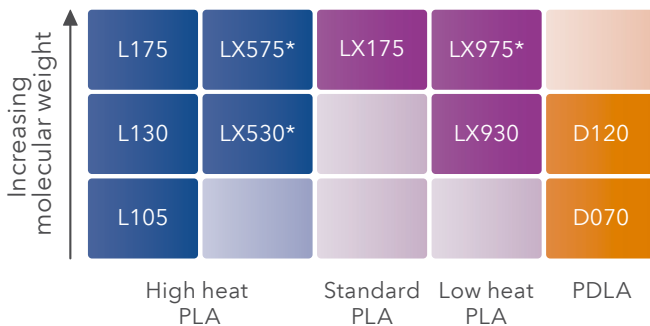
Total Corbion PLA's Luminy[®] portfolio includes products in four categories that can be used in various conversion technologies:

- High heat PLA for demanding applications,
- Standard PLA for general purpose applications,
- Low heat PLA typically used as seal layer,
- PDLA used either as a nucleating agent or to create full stereocomplex compounds.

Luminy[®] neat resins from Total Corbion PLA are compliant with the most relevant regulations and standards related to bioplastics:

- Approved for use in food contact applications (EU Framework Regulation EC No. 1935/2004 and No. 10/2011),
- Compliant with EN13432 standard for industrial composting,
- Biobased content of 100% according to EN16785-1,
- REACH compliant,
- Reduced carbon footprint - peer reviewed LCA study available.
- Made from GMO-free crops.

Fig 1. Luminy[®] PLA portfolio from Total Corbion PLA



* Development grade, check for availability with your account manager



biobased 100%
DIC-00001

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 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, will start up a new production plant in Thailand in the second half of 2018. The company is a 50/50 joint venture between Total and Corbion.

High heat PLA

High heat PLA resins in the Luminy® portfolio are available in a range of melt viscosities and deliver improved heat resistance over standard PLA. These grades can be used as neat resin or as part of a compound in order to further optimize overall material properties. In order to obtain improved heat resistance over standard PLA, these resins need to crystallize during processing.

- Luminy® PLA L175 is a high viscosity resin suitable for film extrusion, thermoforming or fiber spinning.
- Luminy® PLA L130 is a medium flow resin suitable for injection molding and fiber spinning.
- Luminy® PLA L105 is a high flow resin suitable for thin-wall injection molding.
- Luminy® PLA LX575 is a high viscosity resin suitable for extrusion processes.
- Luminy® PLA LX530 is a medium flow fiber-grade resin suitable for staple fiber or spunbond applications.

Standard PLA

- Luminy® PLA LX175 is a high viscosity, amorphous, transparent resin, suitable for film extrusion, thermoforming or fiber spinning. Also used to add strength to PBAT/starch compounds.

Low heat PLA

- Luminy® PLA LX975 is a high viscosity resin suitable for use as a heat-seal layer in film applications.
- Luminy® PLA LX930 is a medium flow resin suitable for use as low melting component in sheath-core configuration.

PDLA

PDLA, when combined with high heat PLA, will yield a compound that combines good heat resistance with excellent mechanical properties and a reduced processing cycle time. Typical nucleated formulations should include 3-7% PDLA.

- Luminy® PDLA D120 is a medium viscosity PDLA resin for use in full stereocomplex PLA compounds.
- Luminy® PDLA D070 is a general purpose nucleating agent for high heat PLA resins.

Fig 2. Visualisation of Luminy® polymer chains per PLA category

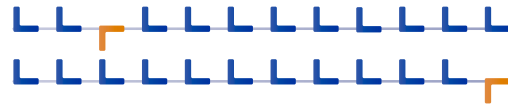
Luminy® stereocomplex PLA ($T_m = 445^\circ\text{F} / 230^\circ\text{C}$)



Luminy® high heat PLA ($T_m = 347^\circ\text{F} / 175^\circ\text{C}$)



Luminy® standard PLA ($T_m = 311^\circ\text{F} / 155^\circ\text{C}$)



┐ D Lactic Acid L L Lactic Acid

		PLA								PDLA	
		L105*	L130*	L175*	LX530**	LX575**	LX175	LX930	LX975**	D070	D120
Application	Injection molding	•	•								•
	Fiber spinning		•	•	•		•	•			•
	Extrusion / Thermoforming			•		•	•		•		•
	Nucleating agent									•	
Physical	Density	g/cm ³	1.24	1.24	1.24	1.24	1.24	1.24	1.24	1.24	1.24
	Optical purity	% isomer	>99% L	>99% L	>99% L	98% L	98% L	96% L	90% L	88% L	>99% D
	MFI (Flow, 210°C/2.16 kg)	g/10min	65	24	8	24	8	8	17	10	>100
	MFI (Flow, 190°C/2.16 kg)	g/10min	30	10	3	10	3	3	8	4	>50
Processing	Melting temperature (T_m)	°C	170-180	170-180	170-180	160-170	160-170	150-160	125-135	125-135	170-180
	Glass transition temperature (T_g)	°C	55-60	55-60	55-60	55-60	55-60	55-60	55-60	55-60	55-60
	Pre-drying before processing	yes/no	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Mechanical	Tensile modulus	MPa	3500	3500	3500	3500	3500	3500	3500	3500	3500
	Tensile strength	MPa	50	50	50	50	50	45	40	40	50
	Elongation at break	%	<5%	<5%	<5%	<5%	<5%	<5%	<5%	<5%	<5%
Impact	Charpy notched, 23°C	kJ/m ²	<5	<5	<5	<5	<5	<5	<5	<5	<5
Heat***	HDT B (amorphous)	°C	55 - 60	55 - 60	55 - 60	55 - 60	55 - 60	55 - 60	55 - 60	55 - 60	55 - 60
	HDT B (crystalline)	°C	100 - 110	100 - 110	100 - 110						

Values listed are typical values, not to be interpreted as specifications. * Values listed are for resins in crystalline state, for more detailed information please refer to specific datasheets. ** Developmental grades, check for commercial availability. *** HDT B, 0.45MPa, flatwise. HDT depends on processing conditions. For crystalline resins, formulation included 3 - 7% nucleating agent (Luminy® D070) and molding took place in a 90 - 100°C tool.

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