

PRODUCT SELECTION GUIDE

## High-Performance Polyolefin and Styrenic Compounds for Extrusion and Thermoforming Applications



# OUR KEY PRODUCT AREAS

The LyondellBasell team is inspired by the power of possibility. We are passionate about the role we play in supporting our customers' efforts to develop products to meet the challenges of today while advancing innovations that will improve tomorrow. To do so, LyondellBasell develops products and solutions in **five key areas**.



CHEMICALS	POLYMERS	ADVANCED POLYMERS	FUELS	TECHNOLOGIES
<p>We produce the chemical building blocks for:</p> <ul style="list-style-type: none"> <li>automotive fluids</li> <li>furniture / household goods</li> <li>coatings / adhesive / cleaners</li> <li>cosmetics / personal care products.</li> </ul>	<p>Our versatile plastic resins are used to create a variety of products including:</p> <ul style="list-style-type: none"> <li>automotive parts</li> <li>packaging</li> <li>pipng</li> <li>textiles</li> <li>renewable energy technologies</li> <li>agricultural films / irrigation</li> <li>healthcare</li> <li>food supply products</li> </ul>	<p>Our diverse portfolio is used to create customizable products including:</p> <ul style="list-style-type: none"> <li>automotive parts</li> <li>differentiated packaging</li> <li>electronics / appliances</li> <li>construction materials</li> <li>roofing</li> <li>flooring</li> <li>geomembranes</li> <li>specialty pipe</li> </ul>	<p>Our refinery in the U.S. produces:</p> <ul style="list-style-type: none"> <li>gasoline / fuel components</li> <li>low-sulfur diesel</li> <li>jet fuel</li> <li>lubricants</li> <li>oxyfuels that help improve air quality</li> </ul>	<p>We license our state-of-the-art manufacturing and process technologies:</p> <ul style="list-style-type: none"> <li>technologies that are used by chemical and plastics companies around the globe</li> </ul>

## OUR MATERIALS AND TECHNOLOGIES ARE ADVANCING SOLUTIONS IN:



**Food safety and access** through food packaging and films that improve freshness, portability, extend shelf-life and prevent contamination.



**Sustainable and modern living** through components in solar panels and a variety of products such as children's toys, cosmetics, leak-proof and shatter-proof containers.



**Cleaner air and fuel efficiency** through stronger, lighter plastics that allow for the production of more fuel efficient cars and trucks and through special gasoline additives that help reduce air pollution from vehicles.



**Quality healthcare** through a variety of medical supplies including synthetic latex gloves, hand sanitizers, biohazard bags, medicine containers and pill coatings.



**Clean water** through strong, long-lasting pipes used in municipal water systems and key elements used in water filtration systems.



**Agricultural efficiency** through lighter machinery, crop protection and soil conditioning, as well as in greenhouses, landscaping and waste disposal.

## LyondellBasell's enhanced portfolio of polyolefin and styrenic compounds



LyondellBasell is one of the world's largest producers of versatile plastic resins and is the largest global manufacturer of polypropylene compounds.\* Our materials produce a variety of products that are used to advance solutions in nearly every sector of the economy, including automobile parts, renewable energy technologies, packaging, piping and textiles.

As a global leader in polyolefin compounds for the extrusion and thermoforming industry, we offer numerous benefits to our global customers.

### A comprehensive portfolio of proven products

- TPO substrate products with high melt strength and a superior balance of stiffness, impact strength and dimensional stability
- High gloss, low gloss and soft touch cap layer products which enable customized aesthetics and haptics in molded parts

### Industry-leading product development and commercialization support

- Best-in-class polyolefin compounds material development and testing expertise
- Expert field technical service for extrusion and thermoforming process optimization and troubleshooting

### A reliable, global supply

- Vertically integrated into polypropylene resins and olefinic impact modifiers, which facilitates unique product design and stability of supply
- Worldwide manufacturing sites to support our global customers

\* 2017 data as of Dec. 31, 2017

Dexflex, Indure and Sequel, are trademarks owned and/or used by the LyondellBasell family of companies.

## Typical Properties

Properties	Method	Units	Sheet Extrusion Grades		Cap Layer Grades			Profile Extrusion Grades	
<b>GENERAL</b>			Sequel E3400	Sequel E3400FR	Indure E1500 HG	Dexflex E900	Dexflex E701	Sequel E4000	Sequel E5000
Melt Flow Rate (230°C, 2.16 kg)	ISO 1133	g/10 min	0.7	1.0	2.0	1.2	0.8	1.5	1.0
Specific Gravity	ISO 1183	--	1.12	1.26	0.90	0.92	0.98	1.11	1.16
Density	ISO 1183	lb/in <sup>3</sup>	0.041	0.046	0.033	0.033	0.035	0.040	0.042
Mold Shrinkage	ISO 294	%	0.80	0.70	1.10	1.10		0.90	0.70
Hardness	ISO 868	Shore D	64	65	70	63	32	71	71
<b>THERMAL</b>									
Heat Deflection Temperature @ 0.45 MPa	ISO 75	°C	102	103					
@ 1.80 MPa		°C	56	56					
CLTE (-30°C to 80°C)	ASTM E228	10 <sup>-5</sup> /°C	5.4	5.3					
<b>MECHANICAL</b>									
Flexural Modulus	ISO 178	MPa	2,100	2,200	1,014	621	200	2,600	3,100
Tensile Yield Strength	ISO 527	MPa	21.0	20.0	30.0	18.0	15.0	28.0	25.5
Tensile Elongation at Yield	ISO 527	%	10.0	4.0	13.0	15.0		4	4
Tensile Elongation at Break	ISO 527	%	>200	>150		>400	>400	40	60
<b>IMPACT</b>									
Izod Impact Strength @ 23°C (73°F)	ISO 180	kJ/m <sup>2</sup>	82	38				25	40
@ -30°C (-22°F)		kJ/m <sup>2</sup>	7	4				5	5
Multi-Axial Impact (2.2 m/s) -15°C	ASTM D3763		51	38					
Total Energy		J	100% D	100% D					
Failure Mode (D-Ductile; B-Brittle)		D/B							
Multi-Axial Impact (2.2 m/s) -30°C	ASTM D3763		57						
Total Energy		J							
Failure Mode (D-Ductile; B-Brittle)		D/B	100% D						
Attributes and Recommended Applications			Excellent balance of high stiffness and high impact; improved melt strength for thermoforming; UL 94 HB listed	For applications requiring UL 94 V-1 flame retardancy. Improved melt strength for thermoforming	High gloss polyolefinic cap layer	Cap layer to promote reduced stress whitening	Soft touch, low gloss cap layer	Medium M70/N70 grade	High stiffness grade for applications that require high dimensional and thermal stability

# Select the Polypropylene STR TPO Grade That's Right for You

Offering a broad product portfolio that has been designed to meet property performance balance through a diverse offering of stiffness, impact and thermal expansion properties

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Sheet Extrusion Grades										
Properties	Units	Polypropylene STR 1025 TPO	Polypropylene STR 1030 TPO	Polypropylene STR 1032 TPO	Polypropylene STR 1040 TPO	Polypropylene STR 1050 TPO	Polypropylene STR 1060 TPO	Polypropylene STR 2030 FR TPO	Polypropylene STR 2031 FR TPO	
Melt Flow Rate	230°C/2.16kg gm/10 min.	1.0	0.45	0.7	0.5	0.5	0.7	0.8	0.8	RoHos Compliant FR, Excellent Property Balance
Specific Gravity	gm/ml	0.99	1.080	1.130	1.090	1.14	1.16	1.310	1.170	
Tensile at Yield	psi (Mpa)	3292 (22.7)	3370 (23.2)	3340 (23)	3730 (25.7)	3770 (26)	4470 (30.8)	2750 (19)	3100 (21.4)	
Elongation at Break	%	700	360	430	320	230	175	430	550	
Flexural Modulus Chord	psi (Mpa)	250,000 (1,724)	325,000 (2,241)	325,000 (2,241)	400,000 (2,758)	475,000 (3,275)	580,000 (4,000)	280,000 (1,930)	260,000 (1,790)	
Instrumented Dart Impact, Total Energy @ 5 mph (2.2 m/s)	in-lbs (Joules) Failure Mode Failure Temp.	420 (47.4) Ductile Failure -22°F (-30°C)	355 (40.1) Ductile Failure -22°F (-30°C)	310 (35) Ductile Failure 32°F (0°C)	360 (40.7) Ductile Failure -22°F (-30°C)	386 (43.6) Ductile Failure 5°F (-15°C)	360 (40.7) Ductile Failure 40°F (5°C)	310 (35) Ductile Failure 15°F (-9°C)	407 (46) Ductile Failure -5°F (-20°C)	
Notched Izod Impact Flow, 73°F (23°C)	ft-lb/in	No Break	No Break	No Break	17	14	7	8	13	
Notched Izod Impact Flow, -22°F (-30°C)	ft-lb/in	4.9	3.3	1.5	0.9	0.9	0.6	0.6	0.7	
Coefficient of Linear Thermal Expansion, -30°C to 100°C, Value Shown x 10 <sup>-5</sup>	in/in/°F (in/in/°C)	5.5 (9.9)	2.33 (4.2)	2.4 (4.3)	2.33 (4.2)	2.22 (4.0)	3.0 (5.4)	3.0 (5.4)	3.1 (5.6)	
Heat Deflection Temp, 66 psi (0.45 Mpa) load	°F (°C)	201 (94)	225 (106)	212 (100)	237 (114)	237 (114)	242 (117)	195 (91)	190 (88)	
Heat Sag, 8 Inch Span, Two Point, 300°F (149°C), Oven Temperature	Inch (mm)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	
Flame Rating All Colors	UL 94	HB @ 0.125 in	HB @ 0.125 in	HB @ 0.125 in	HB @ 0.125 in	HB @ 0.125 in	HB @ 0.125 in	HB @ 0.125 in V0 @ 0.0625 in 5VA @ 0.0625 in	HB @ 0.125 in V1 @ 0.0625 in	
Shrinkage after Forming, 24 hrs, 0.125 in Thick, Tool Temp of 180°F (80°C)	%	0.9 - 1.2	0.7 - 0.9	0.8 - 1.2	0.7 - 0.9	0.7 - 0.9	0.7 - 0.9	0.8 - 1.2	0.9 - 1.3	
Gardner Gloss, 60° Smooth Sheet, After Forming	%	20 - 40	20 - 40	20 - 40	20 - 40	20 - 40	20 - 40	20 - 40	20 - 40	

# Select the Weatherable Polymer That's Right for You

Our broad portfolio of ASA, ASA/PC and ASA/AES polymers can be customized to fit your injection molding, blow molding or extrusion process

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Sheet Extrusion Grades										
Properties	ASTM Standard	Units	Conditions	Centrex 485 CS	Centrex 825A	Centrex 833A	Centrex ST4800	Diamond ABS 9501	Diamond ABS TM-40	
Resin Type				ASA - Low Gloss	ASA - High Gloss	ASA / AES	ASA / TPE			
Melt Flow Rate	D 1238	g/10 min	200°C, 5 kg	N/A	N/A	N/A	N/A	0.40 to 1.2 g/10 min	0.40 g/10 min	
Melt Flow Rate	D 1238	g/10 min	220°C, 10 kg	5.0	12.0	10.0	N/A	N/A	N/A	
Melt Flow Rate	D 1238	g/10 min	230°C, 3.8 kg	1.5	3.5	1.8	15.0	N/A	N/A	
Tensile Modulus	D 638	psi	73°F, 0.2 in/min	210,000	330,000	295,000	N/A	N/A	N/A	
Tensile Stress at Yield	D 638	psi	73°F, 0.2 in/min	3,850	6,400	5,100	N/A	6,240	6,070	
Tensile Stress at Break	D 638	psi	73°F, 0.2 in/min	2,285	4,800	4,100	N/A	4,930	N/A	
Tensile Elongation at Break	D 638	%	73°F, 0.2 in/min	50	36	35	N/A	20	N/A	
Flexural Modulus	D 790	psi	73°F, 0.05 in/min	200,000	305,000	250,000	N/A	333,000	317,000	
Flexural Stress at Yield	D 790	psi	73°F, 0.05 in/min	50,600	7,800	7,500	N/A	N/A	N/A	
Izod Notched Impact Strength	D 256	ft - lb/in	73°F, 0.125"	2.5	2.5	9.0	N/A	9.7	2.9	
Hardness	D 785	scale		97 R	104 R	89 R	46 D	101	104	
Instrumented Impact, Total Energy	D 3763	joules	73°F, 0.125"	24	38	43	8	N/A	N/A	
Instrumented Impact, Total Energy	D 3763	joules	-30°F	6	12	30	N/A	N/A	N/A	
Deflection Temperature under Load, Unannealed	D 648	°F	66 psi, 0.125"	188	198	185	N/A	195	253	
Deflection Temperature under Load, Unannealed	D 648	°F	264 psi, 0.125"	155	172	160	N/A	168	223	
Vicat	D 1525	°F	1 kg, 120°C/hr	212	215	195	N/A	221	284	
Specific Gravity	D 792		23°C	1.06	1.05	1.05	1.08	1.04	1.07	
Gloss, Sheet/Profile*	D 523		60°	20	95	95	10	N/A	N/A	
Gloss, Formed Sheet*	D 523		60°	10	90	90	8	N/A	N/A	

\* Gloss data will vary with processing conditions.

# Select the Polypropylene STR Capstock Grade That's Right for You

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These capstock resins provide many exciting benefits in performance and appearance with a broad range of gloss levels depending on your application requirements

Cap Layer Grades							
Properties	Units	Polypropylene STR 3035 TPO Capstock Resin	Polypropylene STR 3566 TPO Capstock Resin	Polypropylene STR 3567 TPO Capstock Resin	Polypropylene STR 3568 TPO Capstock Resin	Polypropylene STR 3570 TPO Capstock Resin	Polypropylene STR 3571 TPO Capstock Resin
Melt Flow Rate	230°C/2.16kg gm/10 min.	0.4	3	2.5	0.6	0.8	3.9
Specific Gravity	gm/ml	1.06	0.90	0.90	0.89	0.93	0.92
Tensile at Yield	psi (Mpa)	3,480 (24)	3,500 (24)	6,110 (42.1)	2,400	2,400 (16.6)	2,969 (20.5)
Elongation at Break	%	410	500	200	650	250	510
Flexural Modulus Chord	psi (Mpa)	275,000 (1,897)	145,000 (1,000)	300,000 (2,070)	37,000 (255)	55,000 (380)	108,502 (748.1)
Instrumented Dart Impact, Total Energy @ 5 mph (2.2 m/s)	in-lbs (Joules) Failure Mode Failure Temp.	354 (40) Ductile Failure 14°F (-10°C)	340 (39) Ductile Failure 5°F (-15°C)	310 (35) Ductile Failure 73°F (23°C)	320 (36.1) Ductile Failure -22°F (-30°C)	340 (39) Ductile Failure -22°F (-30°C)	340 (39) Ductile Failure 5°F (-15°C)
Heat Deflection Temp, 66 psi (0.45 Mpa) Load	°F (°C)	167 (75)	170 (77)	198 (92)	140 (60)	130 (54.4)	168.44 (75.8)
Flame Rating All Colors	UL 94	HB @ 0.125 in	HB @ 0.125 in	HB @ 0.125 in	HB @ 0.125 in	HB @ 0.125 in	HB @ 0.125 in
Gardner Gloss, 60°, Smooth Sheet, After Forming	%	2 - 10	85 - 95	60 - 70	10 - 20	50 - 70	<20

# ABOUT US

**LyondellBasell (NYSE: LYB)** is one of the largest plastics, chemicals and refining companies in the world. Driven by its employees around the globe, LyondellBasell produces materials and products that are key to advancing solutions to modern challenges like enhancing food safety through lightweight and flexible packaging, protecting the purity of water supplies through stronger and more versatile pipes, improving the safety, comfort and fuel efficiency of many of the cars and trucks on the road, and ensuring the safe and effective functionality in electronics and appliances. LyondellBasell sells products into more than 100 countries and is the world's largest producer of polymer compounds and the largest licensor of polyolefin technologies. In 2019, LyondellBasell was named to Fortune magazine's list of the "World's Most Admired Companies." More information about LyondellBasell can be found at [www.LyondellBasell.com](http://www.LyondellBasell.com).

For more information, visit [lyondellbasell.com](http://lyondellbasell.com).

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