For automotive sensors
Introduction to TEIJIN Polycarbonate Resin

TEIJIN LIMITED
Resin & Plastic Processing Business Unit

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Introducing Teijin's polycarbonate resin for automotive sensors

Cars have traditionally enriched people's lives by transporting people and goods.
In recent years, the position of cars in society has been undergoing changes day by day due to factors such as CASE.
Sensing technology is one of the key technologies needed to advance this transformation, and we are developing highly functional materials by optimizing materials based on the characteristics required for various sensors. I did.

1. Materials for infrared transmission sensors

Contributes to reducing noise when receiving light by cutting visible light and passing infrared rays above a certain wavelength.

Series	Features	UV resistant	Liquidity	Surface Hardness	Flame Retardance
AL-Z	Standard	●			
AL-ZL	High flow	●	●		
AHL-Z	High hardness	●		●	
AN-Z	Flame retardant	●			●

2. Materials for millimeter wave radar

Compared to existing materials, it reduces the amount of gas generated during injection molding, contributing to total cost reduction.

Series	Features	UV resistant	low gas
L-1225Z	Standard	●	
L-7***Z	low gas	●	●

Proven materials for automotive sensor applications

For various parts around in-vehicle sensors Teijin PC materials and PC/ABS materials are widely used.

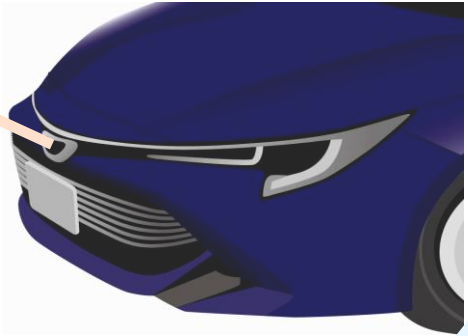
Millimeter wave emblem

<Requirements>

- Radio wave transparency
- Weatherability
- Impact resistance
- Optical properties

<Proven materials>

・General Weatherability PC
L-1225Z and others



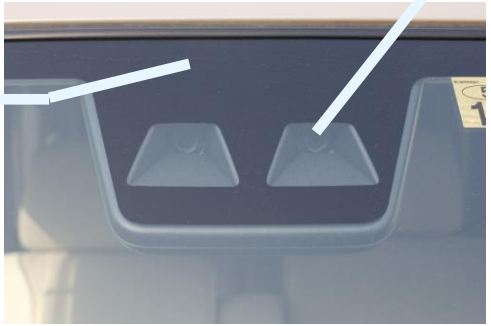
Automotive camera housing

<Requirements>

- Flowability
- Impact resistance
- Appearance
- Heat-resistant

<Proven materials>

・General PC/ABS
T-2810R and others



Driver monitor camera Lens cover housing

<Requirements>

- Infrared transparency
- Impact resistance
- Heat-resistant

<Proven materials>

・Infrared transparent
L-1225L, L-1225Z／Black

・General PC color
L-1225Z／Col.

Required characteristics for in-vehicle sensors

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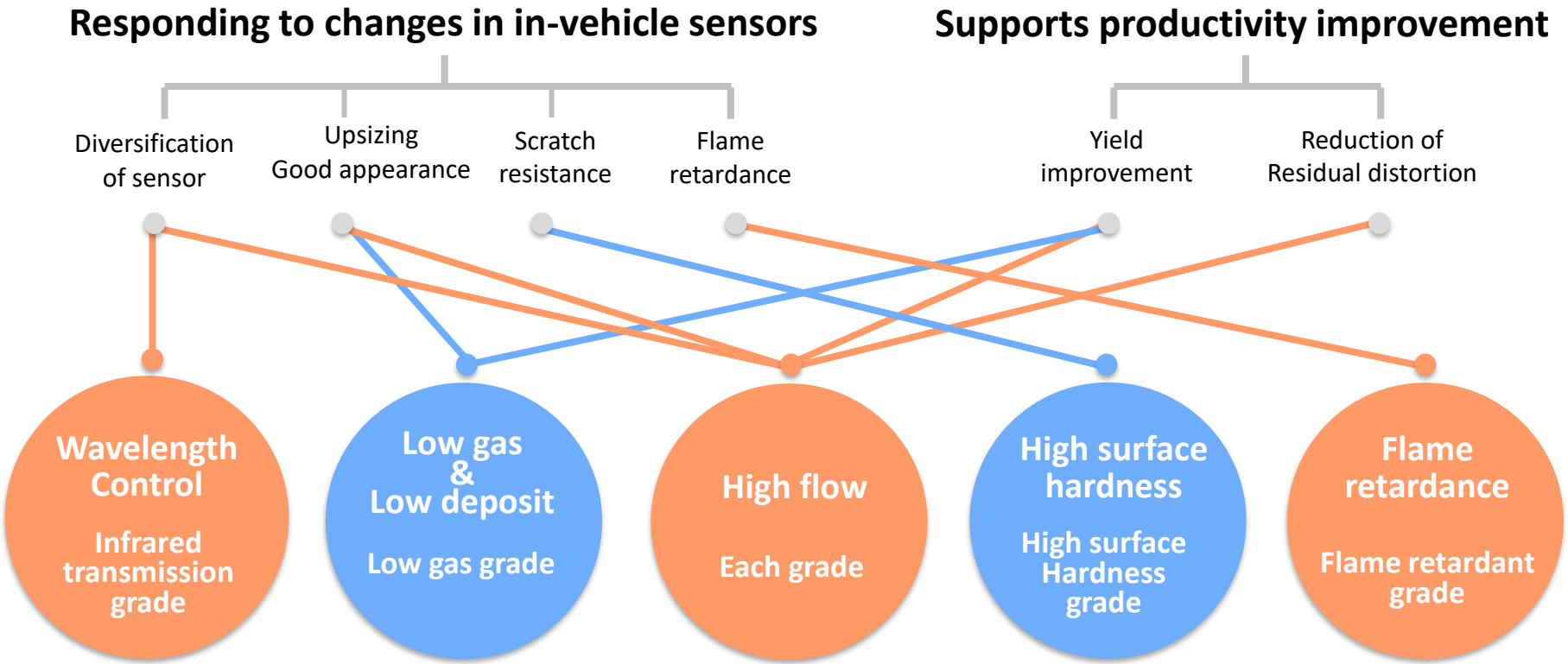
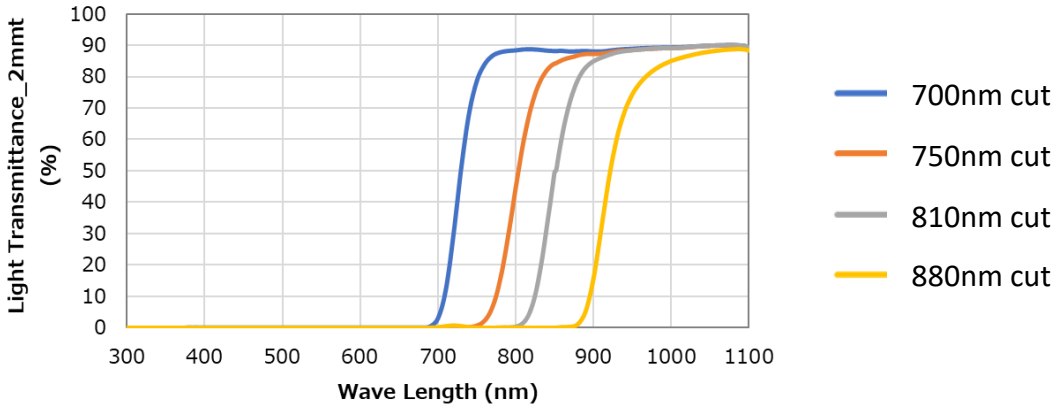


Materials for infrared transmission sensors

These grades shield visible light while transmitting infrared. Transmission wavelength can be controlled.

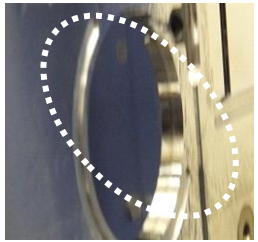
	700nm cut	750nm cut	810nm cut	880nm cut
Standard	AL-7000Z	AL-7540Z	AL-8140Z	AL-8840Z
High flow	AL-7000ZL	AL-7540ZL	AL-8140ZL	AL-8840ZL
High surface hardness	AHL-7000Z	AHL-7540Z	AHL-8140Z	AHL-8840Z
Flame retardant	AN-7000Z	AN-7500Z	AN-8100Z	AN-8800Z

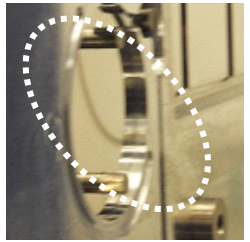
*There may be supply restrictions in some areas depending on the chemical substance registration status.



Materials for millimeter wave radar

Our new low gas, low deposit PC grade can contribute to better surface appearance, higher productivity, and lower production cost by reducin g the mold maintenance cycle.





■ Evaluation of mold deposit

After short-shot molding the disk-shaped test piece, we calculated the surface haze rate from measuring the gloss value.

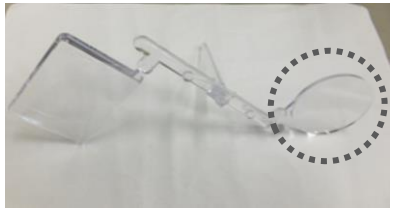


Photo of test piece

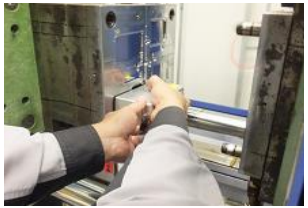


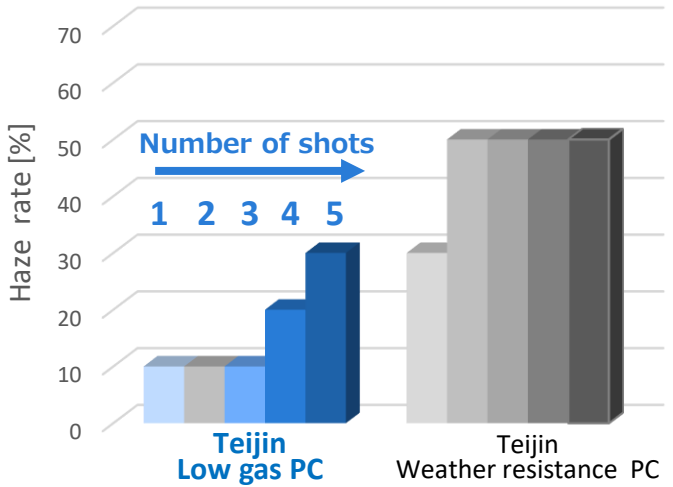
Image of gloss measurement

＊How to calculate the Haze rate

$$\text{Haze} = \frac{[\text{Initial gross value}] - [\text{Gloss value after molding}]}{[\text{Initial gross value}]} \times 100$$

＊Molding condition

- Injection molding machine: Our 85ton molding machine
- Molding temperature: Cylinder tem. 320℃ / Mold tem.: 80℃
- Injection pressure: 130MPa
- Injection speed: 30 mm / sec.
- Shot cycle: 42 sec. （※ Cooling time: 25 sec.）



Physical properties of infrared transmission grades

Item	Unit	Standard	Conditions	Infrared transmission PC							
				AL-7000Z	AL-7540Z	AL-8140Z	AL-8840Z	AL-7000ZL	AL-7540ZL	AL-8140ZL	AL-8840ZL
				Standard				High flow			
Density	kg/m^3	ISO 1183	-	1,200				1,200			
MVR	cm^3/10min	ISO 1133	300°C・1.2kg	11				18			
Tensile yield stress	MPa	ISO 527-1 ISO 527-2	50mm/min	62				61			
Tensile fracture strain	%			>50				>50			
Flexural strength	MPa	ISO 178	2mm/min	92				93			
Flexural modulus	MPa			2,350				2,350			
Charpy impact strength	kJ/m^2	ISO 179	Notched	71				53			
			Unnotched	NB				NB			
Load deflection temperature	°C	ISO 75-1 ISO 75-2	1.80MPa	128				126			
Molding shrinkage rate	%	In-house method (4mmt)	Parallel	0.5～0.7				0.5～0.7			
			Vertical	0.5～0.7				0.5～0.7			
Pencil hardness	-	ISO 15184	-	2B				2B			
Flame retardance	-	UL-94	-	-				-			

*The values listed are typical values, not guaranteed values.

Physical properties of infrared transmission grades

Item	Unit	Standard	Conditions	Infrared transmission PC							
				AHL-7000Z	AHL-7540Z	AHL-8140Z	AHL-8840Z	AN-7000Z	AN-7500Z	AN-8100Z	AN-8800Z
				High surface hardness				Flame retardant			
Density	kg/m^3	ISO 1183	-	1,170				1,200			
MVR	$cm^3/10min$	ISO 1133	300°C・1.2kg	26				7			
Tensile yield stress	MPa	ISO 527-1 ISO 527-2	50mm/min	72				64			
Tensile fracture strain	%			>50				>50			
Flexural strength	MPa	ISO 178	2mm/min	100				98			
Flexural modulus	MPa			2,450				2,270			
Charpy impact strength	kJ/m^2	ISO 179	Notched	5				11			
			Unnotched	NB				NB			
Load deflection temperature	°C	ISO 75-1 ISO 75-2	1.80MPa	113				122			
Molding shrinkage rate	%	In-house method (4mmt)	Parallel	0.5～0.7				0.5～0.7			
			Vertical	0.5～0.7				0.5～0.7			
Pencil hardness	-	ISO 15184	-	H				2B			
Flame retardance	-	UL-94	-	-				V-0 (1.5mm) equivalent			

*The values listed are typical values, not guaranteed values.

Physical properties of weather resistance grades

Item	Unit	Standard	Conditions	Standard			Low gas / Low deposit		
				L-1225Z /100M	L-1225ZL /100	L-1225ZL /100M	L-7200ZA	L-7170ZA	L-7160ZA
Density	kg/m³	ISO 1183	-	1,200	1,200	1,200	1,200	1,200	1,200
MVR	cm³/10min	ISO 1133	300°C·1.2kg	19	25	38	19	36	46
Tensile yield stress	MPa	ISO 527-1 ISO 527-2	50mm/min	62	62	64	62	63	63
Tensile fracture stress	MPa			-	-	-	74	54	55
Tensile fracture strain	%			>50	>50	>50	>50	>50	>50
Flexural strength	MPa	ISO 178	2mm/min	95	95	98	95	96	96
Flexural modulus	MPa			2,400	2,400	2,400	2,300	2,400	2,400
Charpy impact strength	kJ/m²	ISO 179	Notched	62	53	13	66	32	14
			Unnotched	NB	NB	NB	NB	NB	NB
Load deflection temperature	°C	ISO 75-1 ISO 75-2	1.80MPa	125	123	123	126	124	124
Molding shrinkage rate	%	In-house method (4mmt)	Parallel	0.5～0.7	0.5～0.7	0.5～0.7	0.5～0.7	0.5～0.7	0.5～0.7
			Vertical	0.5～0.7	0.5～0.7	0.5～0.7	0.5～0.7	0.5～0.7	0.5～0.7

*The values listed are typical values, not guaranteed values.

Molding condition

● Pre-drying

For drying conditions, if using a box dryer, make the pellet layer 3cm or less and pre-dry at 120℃ for 5 to 8 hours. Heat the hopper and keep the pellets at a temperature of 110℃ to 120℃ to prevent them from absorbing moisture. When drying with a hopper dryer, one with a capacity that allows molding for 5 hours or more is appropriate, and the temperature inside the hopper should be 120℃. In addition, if it is a dehumidifying type, drying will be more efficient.

● Injection molding

For injection molding, it is appropriate to select a molding machine whose injection capacity is approximately 1.5 to 3 times the weight of the molded product, and to perform molding under the conditions shown in the molding conditions table below. If the resin temperature exceeds the molding temperature range, the resin will deteriorate, resulting in poor appearance and poor physical properties, leading to defects such as cracking, so care must be taken. Also, apply back pressure of about 10 to 20 MPa to reduce air entrainment as much as possible. Set the screw rotation speed as low as possible, and ensure that weighing is completed 2 to 3 seconds before the cooling completion time.

● Precautions when stopping the molding machine

Retention of resin inside the cylinder causes poor appearance and deterioration of physical properties. If the molding machine is to be stopped for a long period of time, lower the cylinder temperature to around 150℃, and when restarting, perform a purge to completely remove the remaining resin before restarting.

Pre-drying		Barrel temperature	Mold temperature	Injection pressure
Temperature	Time			
120℃	5~8 hours	270~320℃	80~120℃	98~147MPa

● CAUTION

- The values listed in this technical document are representative values determined by standard test methods, and do not guarantee performance in specific applications.
- If the product is used for medical equipment, food containers and packaging, or toys, please contact us separately.
- When using various additives (antibacterial agents, stabilizers, flame retardants, etc.) and colorants with this resin, be sure to consult Teijin Limited.
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- For other detailed precautions, please refer to the Product Safety Data Sheet (SDS) before use.