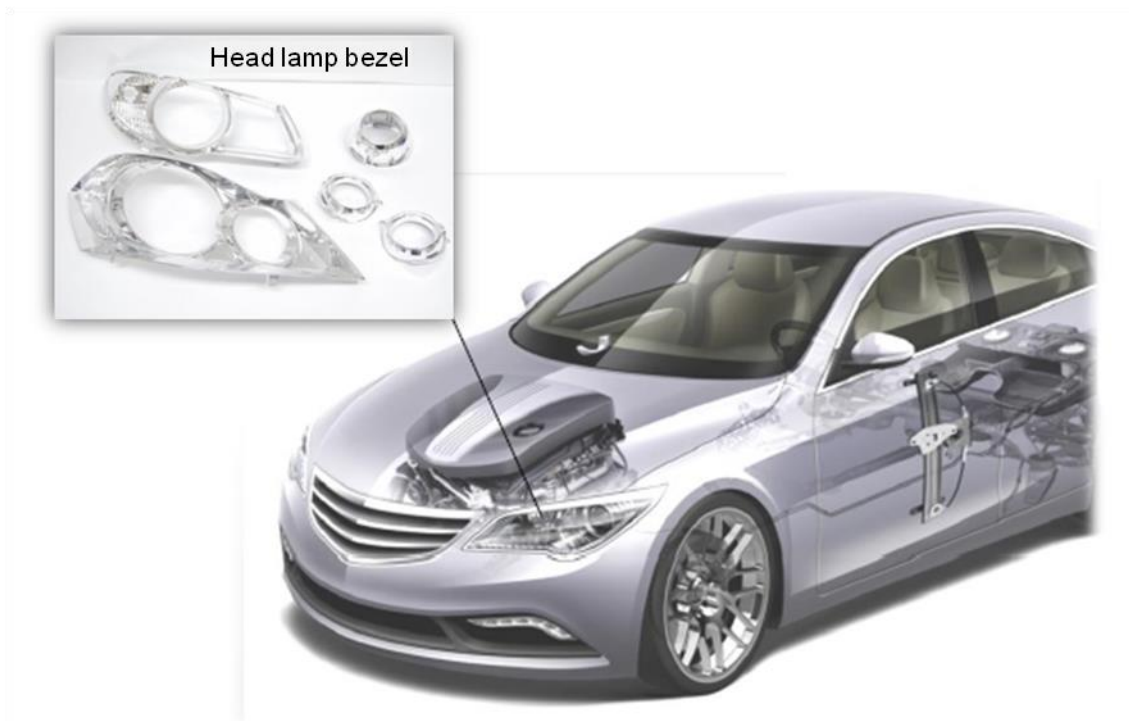


KEPEX[®] 3300C

R&D Center

1. Summary

- (1) KEPEX® 3300C is an unfilled PBT grade suitable for high-gloss material for automotive head lamps.
- (2) Automotive head lamp bezels are divided into the aluminum metalized type and non-metalized type. KEPEX® 3300C can be used regardless of metalizing.
- (3) KEPEX® 3300C has characteristics as follows:
 - Low fogging
 - Superior surface property
 - Excellent metalizing property
 - Excellent chemical resistance property
 - Low mold deposit
 - Excellent mechanical strength and heat resistance properties
 - OEM approval : MS 216-03, GMP.PBT.037



2. Characteristics

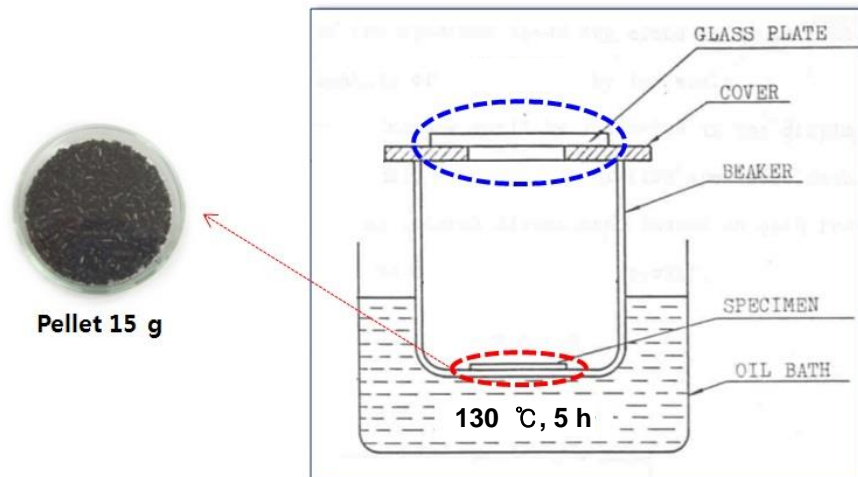
(1) Low fogging

Automotive head lamp systems consist of the housing, reflector, bezel and lens. Material can generate volatiles due to heat inside the engine and heat emitted by the lamp while driving. Lenses can become hazy because of contamination in the case of heavy volatiles or accumulated volatiles.

For such a reason, head lamp material requires low fogging property.

KEPEX® 3300C satisfies spec requirements of MS 216-03, with a haze under 5 %.

- Test method : MS 216-03, MS 300-54 (Pellet 15 g, 130 °C, 5 h)
- Test equipment : Fogging tester, haze meter
- Test result : Haze 2 %



Fogging Test : collecting volatiles at upper glass plate and measuring haze

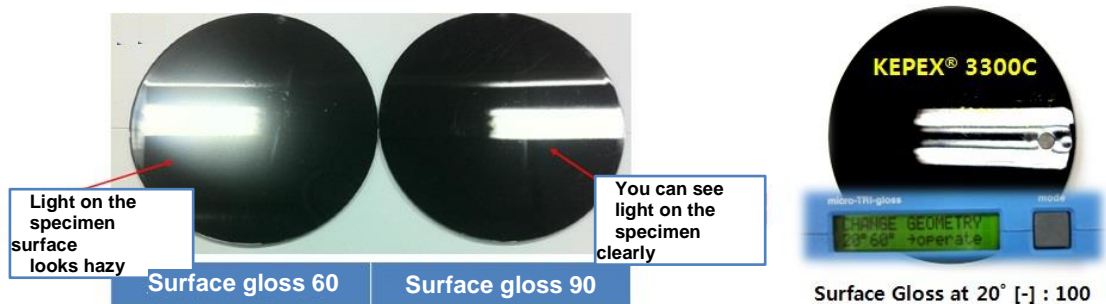
(2) Surface gloss

Gloss is an optical phenomenon observed when examining the appearance of a surface. The evaluation of gloss is equal to the capability of a surface to reflect directed light. The measurement of the reflectometer is a relative measurement compared to a highly polished black glass with a refractive index of 1.567.

Excellent surface gloss is needed for automotive head lamp bezels which KEPEX® 3300C features.

For example, you can clearly see your reflection if the surface gloss is over 95.

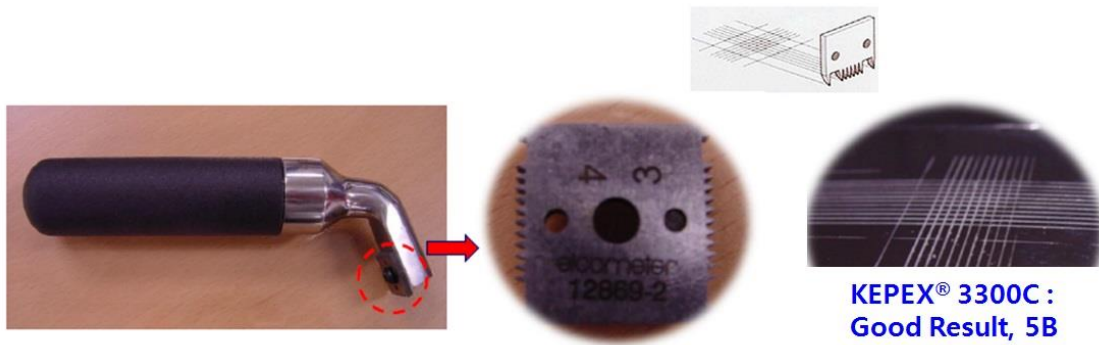
- Test method : Measuring surface gloss of circular disk specimen ($\Phi=100$ mm, $t=2$ mm, mold temperature 40 °C)
- Test equipment : Micro-TRI-Gloss
- Test result : Surface gloss over 95 at 20°



(3) Adhesive property

KEPEX® 3300C has excellent adhesive property to aluminum metallization.

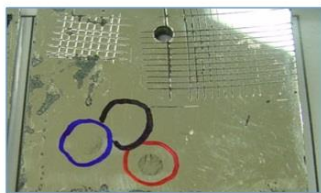
- Test method : ASTM D3359
- Test equipment : Cross Hatch Cutter
- Test result : None of the squares of the lattice detached, 5B



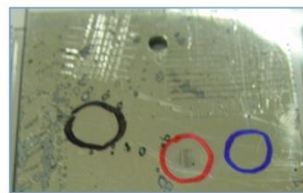
(4) Chemical resistance property

Aluminum metalized parts can be contaminated by detergent penetrating into the head lamp. For that reason, excellent chemical resistance property is required. KEPEX® 3300C has equal or superior chemical resistance property to competitors.

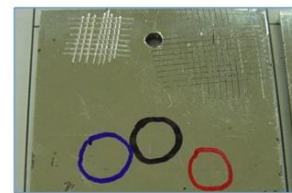
- Test method : Soaking in chemicals
Blue (NaOH 1 %), red (NaOH 2 %), black (NaCl 3 %)
- Test condition : Aluminum metalized specimen + 10-minute soaking
- Test result : Surface measurement of metalized specimen with a naked eye, superior to competitor's



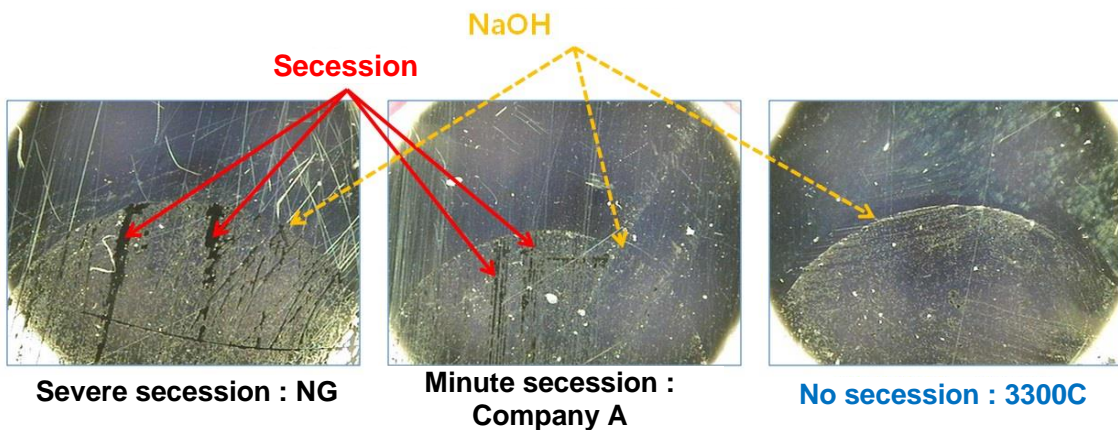
Poor chemical resistance



Company A



KEPEX® 3300C



Severe secession : NG

**Minute secession :
Company A**

No secession : 3300C

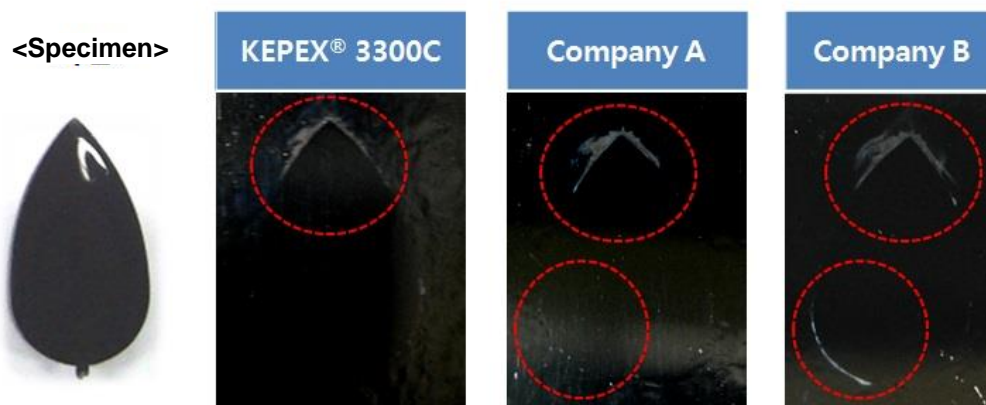
(5) Low mold deposit

Mold is cleaned during injection molding to prevent gas marks on the product surface. Mold washing cycle can differ due to various factor, we measured mold deposit by injecting a leaf-shaped specimen.

KEPEX® 3300C generates less mold deposit than its competitors. We ascertained longer mold washing cycle than competitor's in the customer field test.

- Test method : Injection of leaf-shaped specimen for mold deposit

- Test equipment : Micro injection molding machine
- Test result : We observed mold deposit after 200 shots, far more excellent than our competitor's



3. General Properties

(1) ASTM

Physical Properties	Test Standard	Unit	Value
Specific gravity	ASTM D792	-	1.31
Water absorption (23 °C, 50 % R.H.)	ASTM D570	%	0.07
Mold shrinkage(flow direction, $\Phi = 100$ mm, t = 3 mm)	KEP Method	%	1.9~2.1

Mechanical Properties	Test Standard	Unit	Value
Tensile strength(Yield point), 5 mm/min	ASTM D638	MPa	55
Tensile strain(Yield point), 5 mm/min	ASTM D638	%	8
Flexural strength, 5 mm/min	ASTM D790	MPa	88
Flexural modulus, 5 mm/min	ASTM D790	MPa	2,560
IZOD impact strength (Notched)	ASTM D256	J/m	38
Rockwell hardness (M-scale)	ASTM D785	-	87

Thermal Properties	Test Standard	Unit	Value
Melting point (10 °C/min)	ASTM D3418	°C	220
Heat deflection temperature (0.45 MPa)	ASTM D648	°C	170
Heat deflection temperature (1.8 MPa)	ASTM D648	°C	-
Flammability (t = 0.8 mm)	UL 94	Class	HB

Electrical Properties	Test Standard	Unit	Value
Permittivity (1 MHz)	IEC 60250	-	3.0
Volume resistivity	IEC 60093	$\Omega \cdot \text{cm}$	10^{16}

(2) ISO

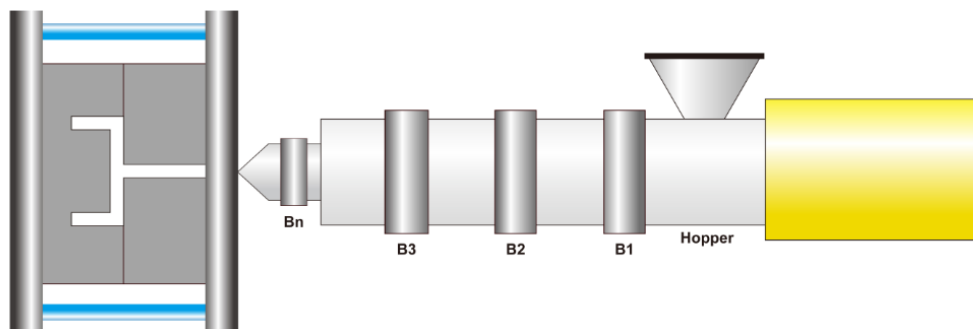
Physical Properties	Test Standard	Unit	Value
Specific gravity	ISO 1183	-	1.31
Water absorption(23 ℃ , 50 % RH)	ISO 62	%	0.07
Mold shrinkage(flow direction, Φ = 100 mm, t = 3 mm)	KEP Method	%	1.9~2.1

Mechanical Properties	Test Standard	Unit	Value
Tensile strength(Yield point)	ISO 527	MPa	60
Tensile strain(Yield point)	ISO 527	%	8
Flexural strength	ISO 178	MPa	88
Flexural modulus	ISO 178	MPa	2,650
Charpy impact strength (Notched)	ISO 179	kJ/m ²	3.8
Rockwell hardness(M-scale)	ISO 2039	-	87

Thermal Properties	Test Standard	Unit	Value
Melting point(10 ℃/min)	ISO 11357	℃	220
Heat deflection temperature(0.45 MPa)	ISO 75	℃	160
Heat deflection temperature(1.8 MPa)	ISO 75	℃	60
Flammability (t= 0.8 mm)	UL 94	-	HB

Electrical Properties	Test Standard	Unit	Value
Permittivity (1 MHz)	IEC 60250	-	3.0
Volume resistivity	IEC 60093	Ω · cm	10 ¹⁶

4. Standard Molding Conditions



Pre-drying (Suggested max. moisture : 0.02 %)

It is recommend to dry material at 120~130 °C(248~266 °F) for 3 h ~ 5 h in a dehumidifier.

Temperature

Mold temperature : 30 °C ~ 40 °C (86 °F ~ 104 °F)

Barrel temperature : 240 °C ~ 250 °C (464 °F ~ 482 °F)

Mold	Bn (Nozzle)	B3 (Metering)	B2 (Compression)	B1 (Feeding)	Hopper
30~40°C	250°C	250°C	245°C	240°C	60~80°C
86~104°F	482°F	482°F	473°F	464°F	140~176°F

Plastication

Screw speed : 80 ~ 120 rpm

Back pressure : 5 ~ 10 kgf/cm²

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