

TOPAS[®]5013LS-01
Grade for Optical Lens

TOPAS[®] Cyclic Olefin Copolymer (COC)
Your Clear Advantage in Optics

Polyplastics Co. LTD.
TOPAS Business Development Unit
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Features of TOPAS® 5013LS-01

q **Excellent Optical Property**

- u **Extremely low Birefringence
(Low Photo Elasticity, Low Optical Stress)**
- u High Abbe Number : 56
- u High Light Transmittance: 91.2% (ISO13468-1)

q **Good Flowability**

- u **Extra-precision optical lenses and parts can be molded.**
 - è Good replicability for lenses that require high surface accuracy.
 - è Lenses can be molded at low injection pressure and process temperature.
 - è Diameters of sprue runners can be reduced.



Features of TOPAS® 5013LS-01 In comparison to other COC & COP

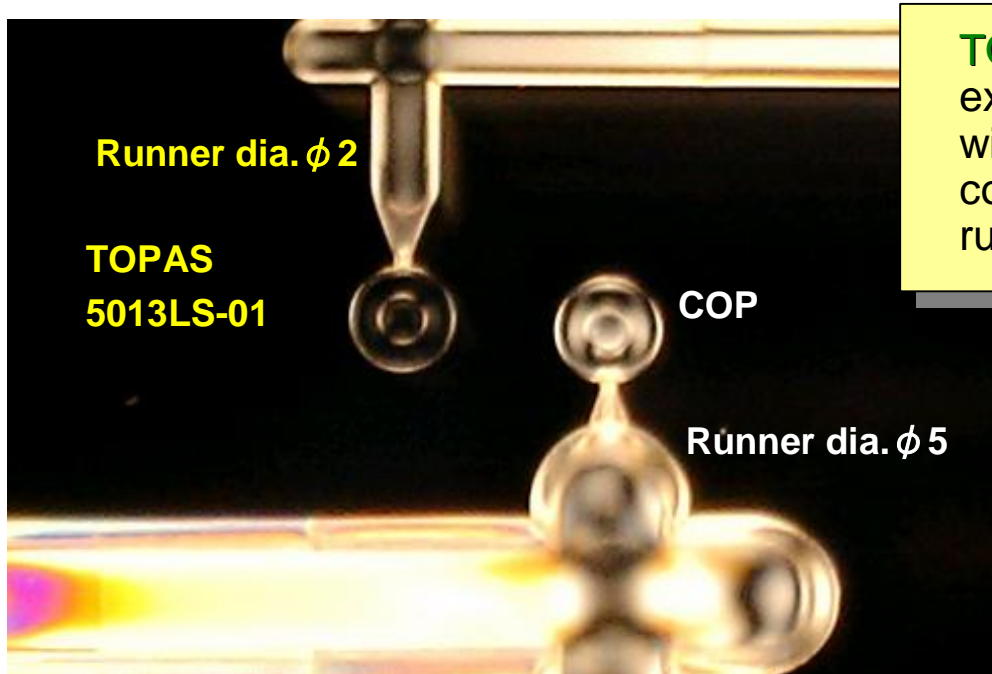
Table-1

Properties	5013LS-01	Other COC	Other COP	Remarks
Birefringence	AAA	AAA	A	
Melt viscosity	50	120	182	Share rate 1216 (sec-1) @260degC
Flowability	AAA	AA	A	
Replicability	AAA	AA	A	
AR coating behavior	AA+	AA	AA	According to customers evaluation result
Light transmittance	91.2	90.9	92	COP: Catalog Value
Reflective Index	1.53	1.54	1.52/1.53	
Yellowness Index	AA	A	AAA	

Features of TOPAS® 5013LS-01 : Low Birefringence

q Comparison of birefringence at Optical lenses

Pic-1) Imaging sensor lens ($\phi 3.5$)



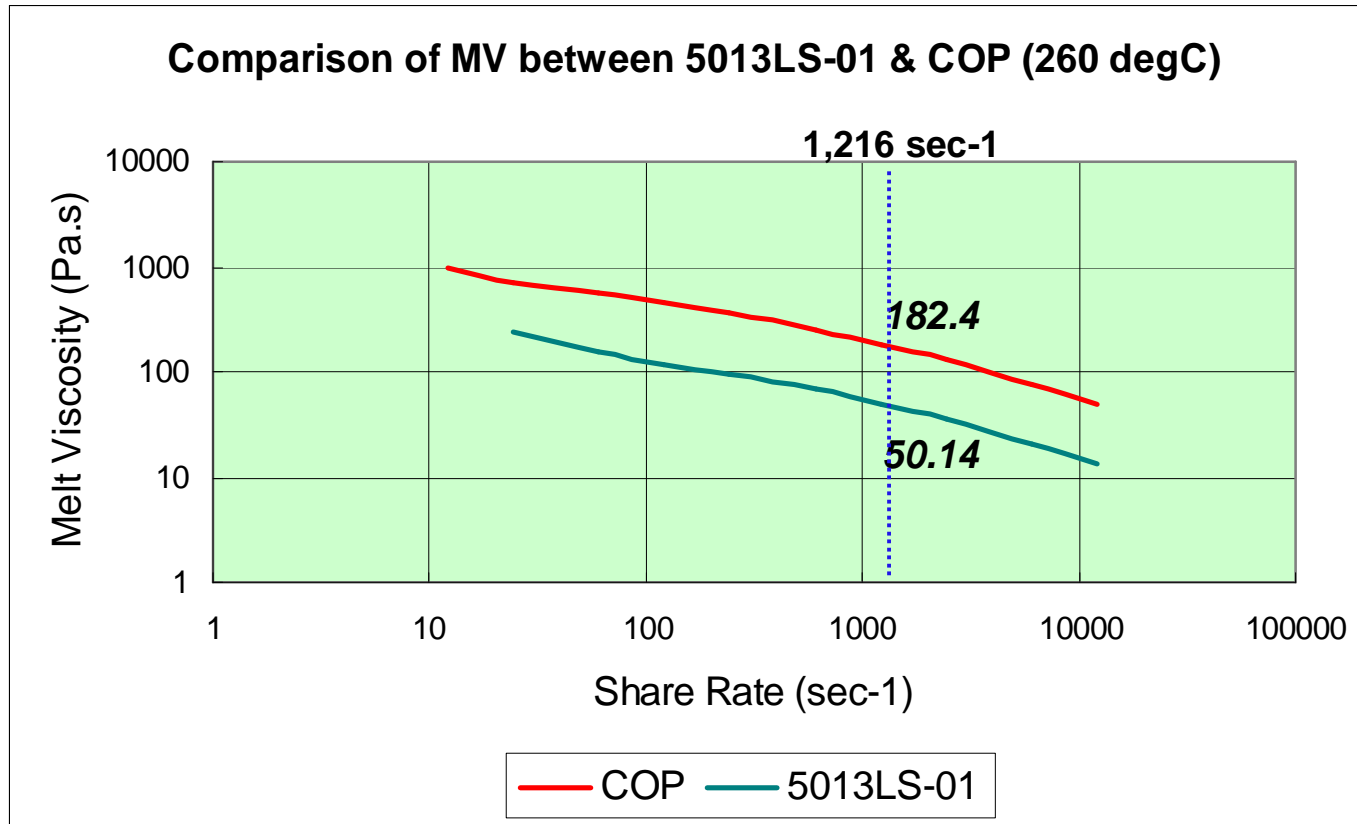
TOPAS® 5013LS-01 exhibits extremely low birefringence even with a small diameter of $\phi 2$ as compared to the COP with a $\phi 5$ runner.

Pic-2) Flat plate test piece ($2\text{mm} \times 70\text{mm}^2$)



Features of TOPAS® 5013LS-01 : Very low Melt Viscosity

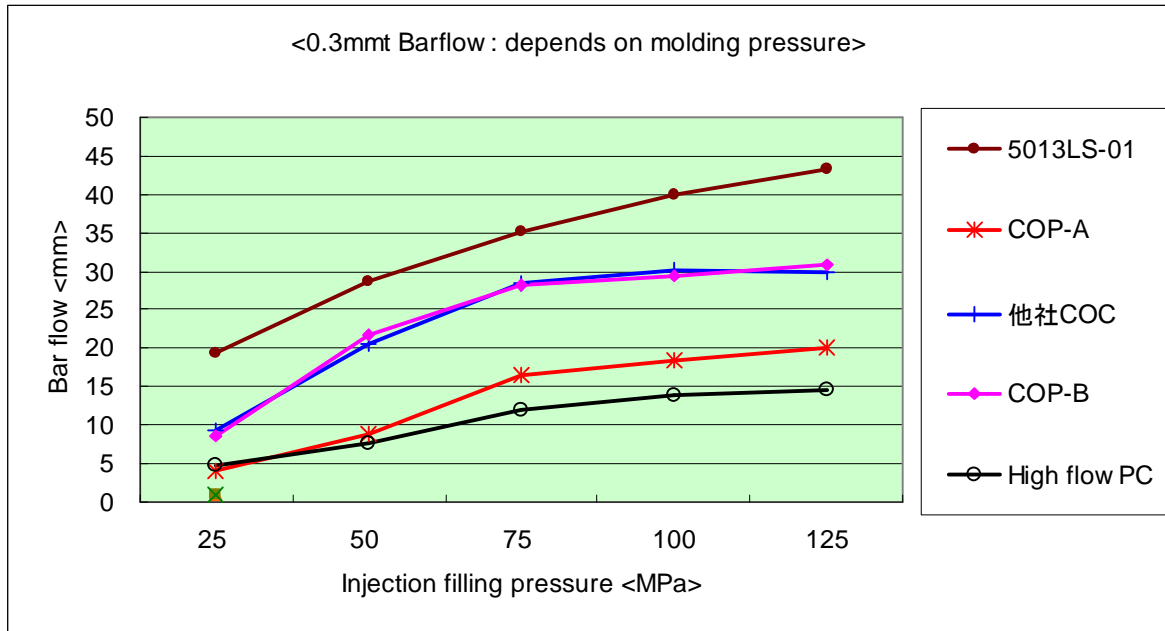
Graph-1



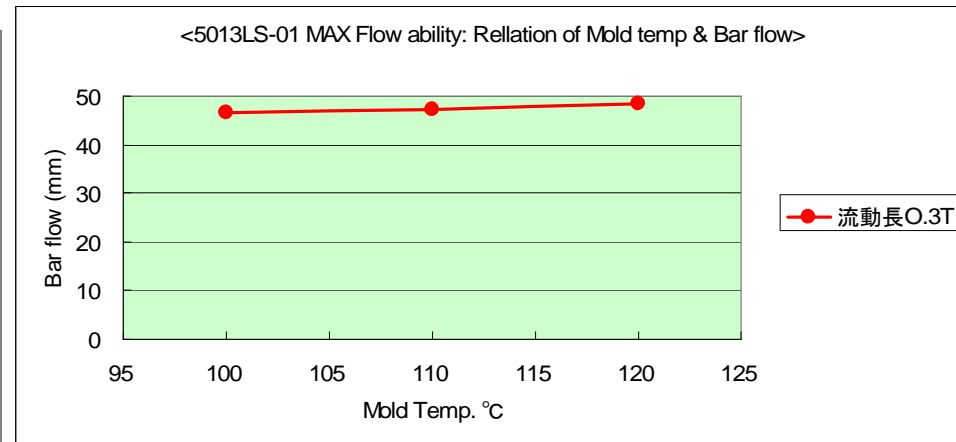
TOPAS® 5013LS-01 has a flowability more than 3 times as much as that of COP in the actual injection molding and can realize very high-precision productivity.

Flowability of TOPAS® 5013LS-01

Graph-2



Graph-3



n TOPAS® 5013LS-01 can be molded thinner optical parts with lower molding pressure.

n TOPAS® 5013LS-01 exhibits excellent flowability even at low mold temperature.

Properties of TOPAS® 5013LS-01

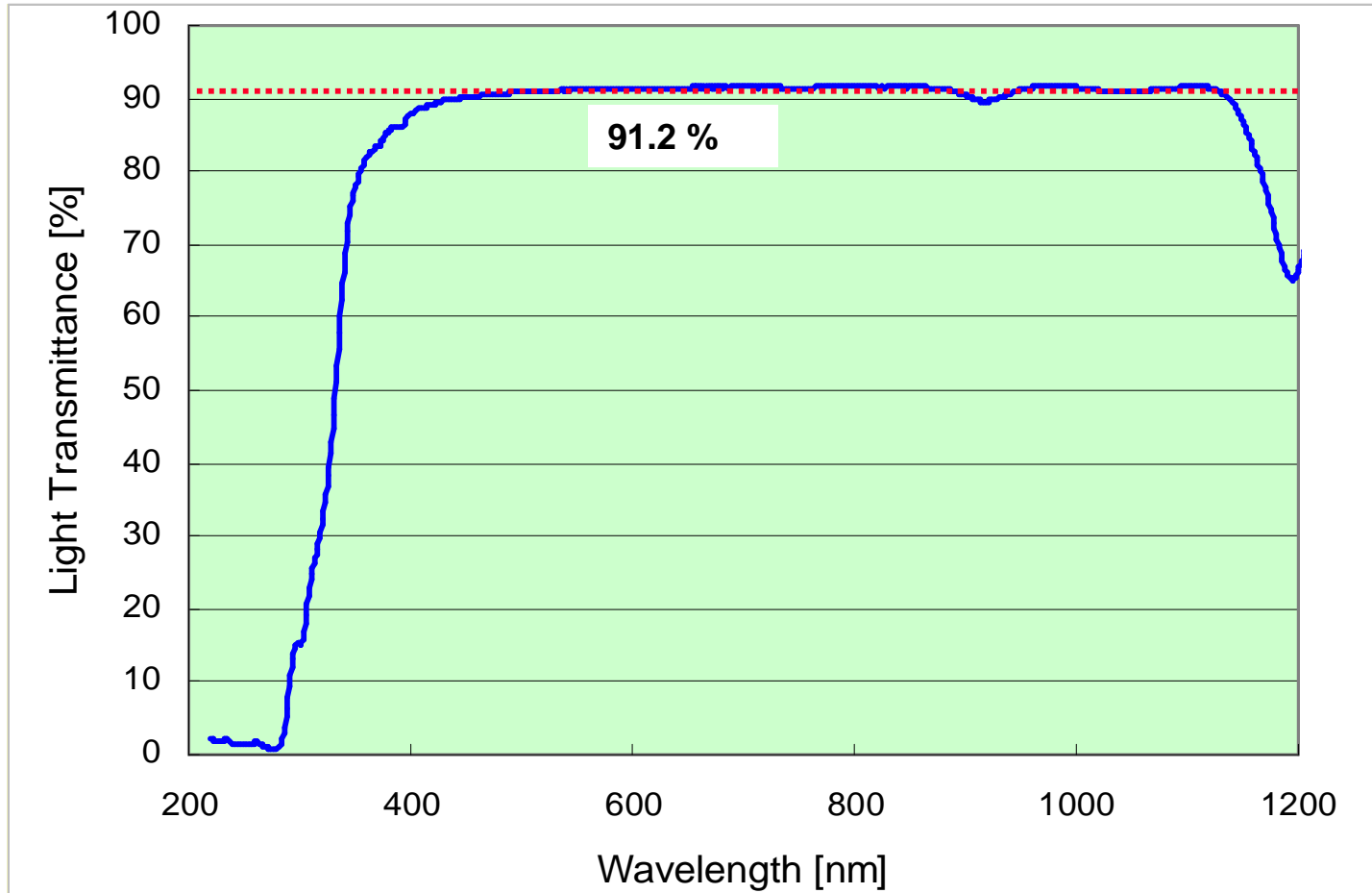
Table-2

Property	Testing method	Unit	TOPAS® 5013LS-01
Light transmittance (2mmt)	ISO13468-1	%	91.2
Refractive Index	ISO489	—	1.533
Yellowness Index (2mmt)	-	—	1.3
Haze (2mmt)	-	%	0.3
Melt Index	(260°C)	g/10min	54
Glass transition temperature	ISO11375-2	°C	128
Tensile strength	ISO527	MPa	45
Tensile elongation	ISO527	%	2.0
Flexible modulus	ISO527	MPa	3,310
Mold shrinkage	Mold Temp:60°C	(%)	0.4-0.7

- Above value of both grades are actual measurement values by Polyplastics.
- Please do not use for specification.

Light transmittance of TOPAS® 5013LS-01

Graph-4



TOPAS® 5013LS-01 Variation of Refractive Index

Table-3

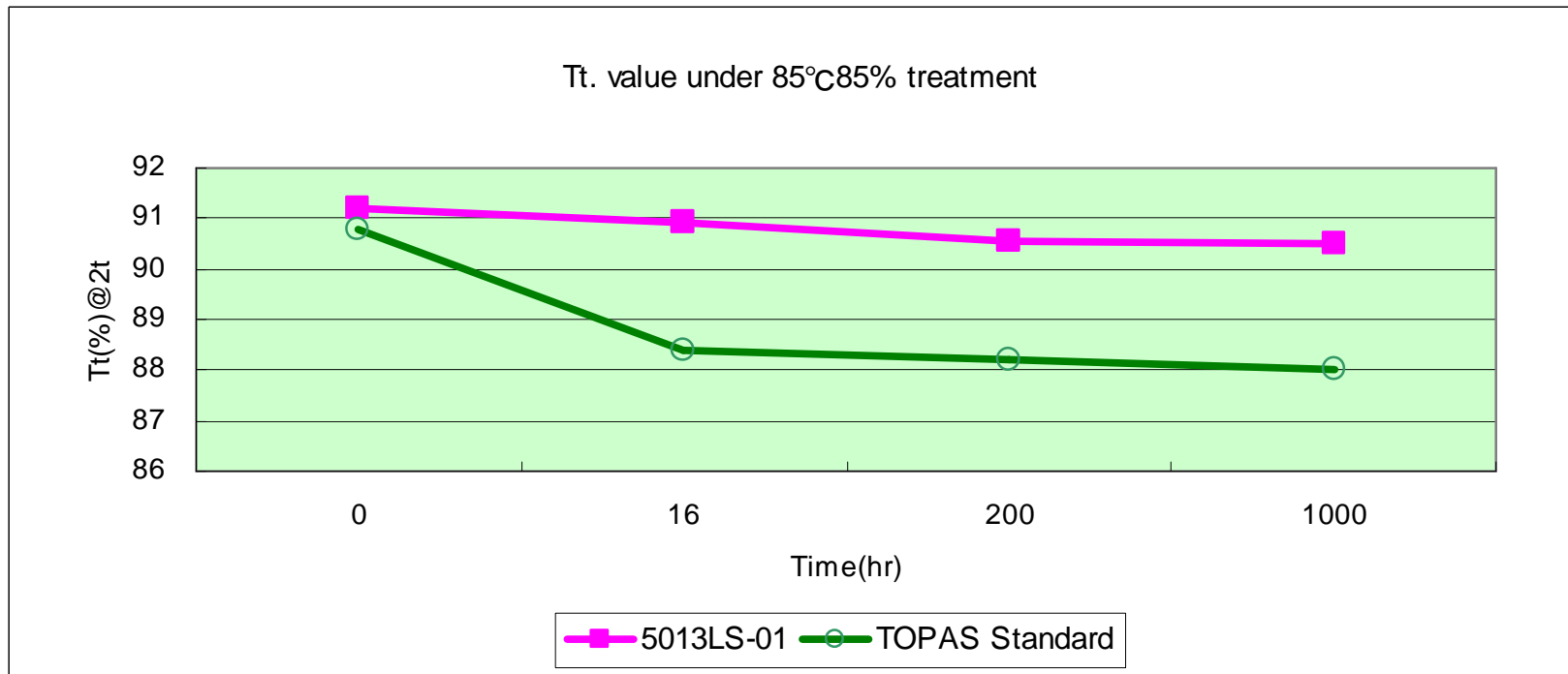
Temp. deg C	g Line	F Line	e Line	d Line	C Line	LD Line
	435.8nm	486.1nm	546.1nm	587.6nm	656.3nm	780nm
-40	1.5505	1.5453	1.5407	1.5386	1.5357	1.5323
-20	1.5488	1.5436	1.5390	1.5369	1.5340	1.5306
-10	1.5480	1.5427	1.5382	1.5360	1.5332	1.5298
0	1.5471	1.5419	1.5374	1.5352	1.5323	1.5290
10	1.5461	1.5409	1.5364	1.5341	1.5313	1.5280
25	1.5451	1.5399	1.5354	1.5332	1.5304	1.5270
40	1.5439	1.5386	1.5342	1.5318	1.5290	1.5258
60	1.5423	1.5369	1.5325	1.5301	1.5274	1.5241
80	1.5403	1.5350	1.5306	1.5283	1.5255	1.5222

The value of below 10 degree is the value calculated by Polyplastics.

Evaluation of TOPAS® 5013LS-01 durability

q High temp high humidity resistance 85deg C, 85% Rh, 1000hr

Graph-5



n TOPAS® 5013LS-01 has been drastically improved in terms of durability in environmental test compared to conventional grades.

Mold condition of TOPAS® 5013LS-01 for lens

n Cylinder Temp	:270°C	
n Mold Temp	:105 to 115 degC	
n Screw Rotation in Metering	:100 to 150 rpm	
n Back pressure	:5MPa	
n Injection/ Holding Pressure :	: 35MPa	(Depends on optical parts)
n Injection Speed	:30 to 40mm/sec	(Depends on optical parts)
n Pre-Drying Condition	:100 degC × 6hours	
n Nitrogen purge	:Must	
n Others	: TOPAS lens should be protected against sebum and lubricant	

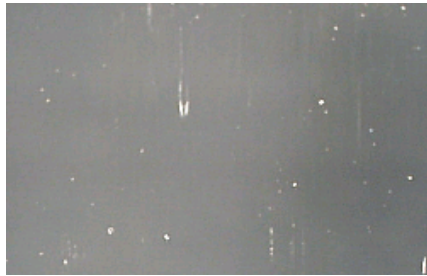
Notes

1. Above molding conditions are those used in the molding test for our optical lens mold.
2. Since TOPAS®5013LS-01 is a high flow material, it's evaluation is to be started at lower mold temperature, lower molding pressure and low injection speed.

Notes concerning injection mold of TOPAS® 5013LS-01

- q **Do not excessively lower the screw rotation speed.**
 - ∅ Low rotation speeds may not assure high-transparency molded parts. 100 to 150 rpm is recommended for popular optical screws, which may vary depends on screw design.

I Example of a molded product with 30rpm Screw rotation speed.



←Same splay mark can be observed over the surface at the flow end of the 70mm², 1mm flat-plate test piece.

(Gel have been generated during plasticization.)

- q **Control the mold temperature at between 105 to 115 deg C by actual measurement.**
 - ∅ Highly transparent molded products may be impossible below 100 deg C.
 - ∅ Cooling time will take longer at over 120 deg C.
- q **Seal and purge the hopper with Nitrogen.**
 - ∅ Prolong molding may cause burns and black spots.
Also short-time molding may discolor molding products yellow a little without Nitrogen purge & seal.
- q **Clean the screw as often as possible when replacing the material.**
 - ∅ Clean start after cleaning the screw is recommended to prevent contamination.
 - ∅ When screw cleaning is impossible, it is recommended to purge the screw once using a highly viscous COC material such as TOPAS®6013S-04

Notes

- q Property values shown in this information include those actually measured at our company or typical ones in accordance with various standards and testing methods.

- q Data in this technical information neither guarantees quality nor the results evaluated by third parties

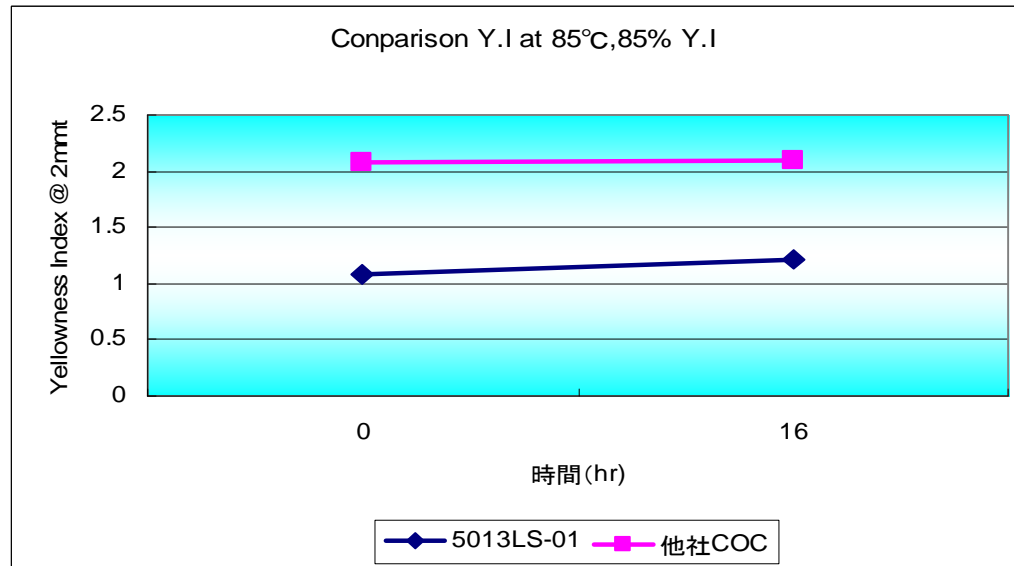
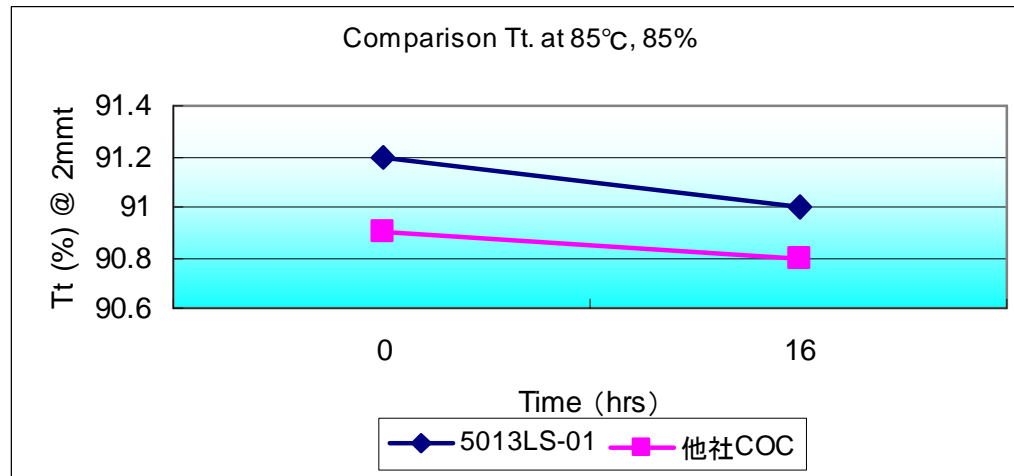
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Reference

TOPAS[®]5013LS-01 vs. other COC

Comparison of Optical property in environmental testing



n TOPAS[®] 5013LS-01 is superior to other COC in term of light transmittance rare after environmental testing.

n TOPAS[®] 5013LS-01 exhibits lower Yellowness Index compared to other COC and lower discoloration after the environmental test.

Flowability of TOPAS® 5013LS-01

