Introduction of LUMIPLAS

Light diffusion materials

Nov. 2019



Introduction

What`s light diffusion material?

• Material with the ability to efficiently diffuse the light from the backside light source

- Uniform brightness
- Anti-glare
- > Aesthetic appearance



Method for providing light diffusion function

	Method of light diffution	Remarks
Surface molding	$ \begin{array}{c} & & & & & & & & & & & & & & & & & & &$	 High transmittance Limited light diffusivity Sensitive to surface scratches
Material	Transparent resin + Light diffuser	 Adjustable light diffusibility [High transmittance ↔ High diffusion] Easy processing



The needs of light diffusion material is increasing with the growth of LED industry





- Characteristics of LED light
 - LED will replace conventional lamp due to lots of its benefits



Environment	Energy saving Eco-friendly Energy efficiency Long lifetime Various color Design flexibility		Efficiency (Im/W)	Incand.(20)/Fluor.(80)/ LED(100)
			Eco-friendly	Mercury-free
			Lifetime (hr)	Incand.(1,000)/Fluor.(10,000) LED(80,000)
			Various color	LED: All color available Incand./Fluro : very limited
			Design flex.	Curved surface & Slim lighting device (Small size of light source)

Strong light from small size of light source -> Light diffusion cover is required



Function of light diffusion material

- Even Brightness
- Lower dazzling (prevent eye damage)
- Elegant appearance



The required properties of light diffusion material





Optical property of Light diffution materials (Light transmittance vs. light diffusibility)

- Transmissivity and diffusion performance are in conflict
- Possible to cause difference in optical characteristics due to additional characteristics (flame retardancy, ..)



-> Comparison of light diffusing materials : Need to review both transmittance and diffusivity



Introduction of LUMIPLAS

LUMIPLAS

- Light diffusion material of LG Chem for LED lighting and signboard
- LUMIPLAS has excellent Optical properties
 - Optimized optical properties [Transmittance and Diffusion of light]
 - Various kinds of optical grades





Introduction of LUMIPLAS

Grade : This grade is developed but not mass producing.

Products of LUMIPLAS

- LD7000 series (PC based) : Excellent optical, thermal and impact properties (Flame Retardancy)
- LD8000 series (PC based) : Excellent optical, thermal and impact properties (Weatherability), RTI 120°C, UL 746C F1



Comparison of light diffusion materials

Comparison of PC based light diffusion materials of several company





Optical properties of PC based LUMIPLAS

Transmittance (Tt), Haze , Half angle (HA)

- Tt & Haze : measured by Hazemeter
- HA : measured by Goniophotometer

: This grade is developed but not mass producing. Grade

Group	General grade	UV resistant grade	(1	Flammability						
			Tt (%)	Haze (%)	HA	UL				
_	LD7890H	LD8890H-W1017J	89	68.3	1.5					
	LD7890	LD8890-W1017J	89	94.5	12.7					
	LD7850	LD8850-W1017J	87	95.5	10.1					
	LD7820(E)	LD8820-W1516J	82	97.0	15.3					
	LD7800(I)	LD8800-W1020J	80	98.5	20.4					
	LD7750	LD8750-W1020J	75	99.2	26.6	V-2 (0.8mm)				
	LD7700	LD8700-W1052J	70	99.4	33.6					
	LD7650 <mark>(I)</mark>	LD8650-W1052J	65	99.5	45.9					
DC hasa	LD7600	LD8600-W1052J	60	99.7	54.3					
C Dase	LD7550(I)	LD8550-W1181J	58	99.8	57.9					
	LD7530	LD8530-W1181J	54	99.5	60.1					
	-	LD7000FS-WxxxxJ	85	72.6	7.1					
	-	LD7000FT-W1284J	80	94.4	11.0	V 0 (1 cmm)				
	-	LD7000FB-W1020J	75	96.9	11.5	v-u (1.011111)				
	-	LD7000FH-W1020J	65	99.4	37.8					
	-	LD7701FA-W1020J	68	99.3	30.8					
	-	LD7701F-W1020J	64	99.4	35.3	V-0 (1.0mm)				
	-	LD7701FD-WxxxxJ	56	99.6	58.5					





PC

Transmittance (Tt), Haze , Half angle (HA)

- Tt & Haze : measured by Hazemeter
- HA : measured by Goniophotometer

 $\ensuremath{\mathbbmm{X}}$ Test methods: See attached file

Group	General grade UV resistant grade		Opt (2	Flammability		
			Tt (%)	Haze (%)	HA	UL
	LD7890H	LD7890H-W1017J	89	97.4	6.0	
	LD7890	LD7890-W1017J	85	98.2	21.6	
	LD7850	LD7850-W1017J	77	99.0	27.7	
PC base	LD7800	LD7800-W1020J	62	99.5	41.0	
	LD7750	LD7750-W1020J	56	99.6	48.6	V-2 (0.8mm)
	LD7700	LD7700-W1052J	53	99.5	52.9	
	LD7650	LD7650-W1052J	51	99.6	59.0	
	LD7600	LD7600-W1052J	49	99.8	61.4	
	LD7550	LD7550-W1019J	47	99.8	62.1	
	-	LD7000FB-W1020J	57	99.1	36.4	V-0 (1.6mm)

*)본 수치는 grade 선정의 참고를 위한 실험치로서 환경에 따라 다른 결과를 나타낼 수 있으며, 보증치가 아님



Transmittance (Tt), Haze , Half angle (HA)

- Tt & Haze : measured by Hazemeter
- HA : measured by Goniophotometer

 $\ensuremath{\mathbbmm{X}}$ Test methods: See attached file

Group	General grade	UV resistant grade	Optical properties (<mark>3</mark> mm thickness)			Flammability
	, , , , , , , , , , , , , , , , , , ,		Tt (%)	Haze (%)	HA	UL
PC base	LD7890	LD7890-W1017J	78	99.0	26.5	
	LD7850	LD7850-W1017J	63	99.4	46.4	
	LD7700	LD7700-W1052J	45	99.6	58.4	v-2 (0.8mm)
	LD7600	LD7600-W1052J	41	99.8	63.6	

*)본 수치는 grade 선정의 참고를 위한 실험치로서 환경에 따라 다른 결과를 나타낼 수 있으며, 보증치가 아님



Weather resistant properties

% QUV-test

- Test method : QUV (UVA, 0.77 W/m² at 340nm, 60°C)
- Samples: 1mm thickness specimens





Certification

UL

Polycarbonate (PC), "	LUMIPLAS", furnished a	is pellets					
					72222	2227	1000
1211210	Min Thk	Flame			RI	RH	RII
Color	(mm)	Class	HWI	HAI	Elec	Imp	Str
ALL	0.8	V-2	0.0	(H	80	80	80
	1.6-1.7	V-2	24	14	80	80	80
Cor	nparative Tracking Index (C	TI): -			Dimensiona	l Stability (%): -	
High-Volta	age Arc Tracking Rate (HVT	R): -		High Volt,	Low Current Arc	Resis (D495): -	
	Dielectric Strength (kV/m	m):		Ve	luma Recistivity (10 [×] obm.cm) : -	
(#) - May be follo AF303S, XR4	wed by optional suffix le 04T, XR407D, XR407E, HF3	tter from A-Z incl., exc 80X.	ept F, and excep	t Grades AF302	G, HT700B, XR40	01B, LI912A, AF:	303G,
(xx) - Indicates a t	wo digit number 50-90 in	cl. denoting the light t	ransmittance.				
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volycarbonate (PC), t	OMIPLAS, Turnished a	s peners					
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ALL	10	V.0	4	0	80	80	80
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High-Volta	ge Arc Tracking Rate (HVTF	R): -		High Volt,	Low Current Arc	Resis (D495): -	
	Dielectric Strength (kV/mr	n): -		Ve	olume Resistivity ((10 [×] ohm-cm) : -	
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Typical properties of LUMIPLAS

Property	Test Method	Unit	LD7700	LD7000FB	LD7701F
Mechanical properties					
Tensile strength		Kg/cm ²	630	630	630
Tensile elongation	ASTIM D030	Kg/cm ²	150	150	150
Flexural strength		Kg/cm ²	950	950	950
Flexural modulus	ASTM D790	Kg/cm ²	23,000	23,000	23,000
Impact strength (notched Izod)	ASTM D256	Kg∙cm/cm	80	80	80
Thermal properties					
Heat distortion temperature - 18.6kg/cm ²	ASTM D648	°C	130	125	125
Melt Flow Rate - 300°C/1.2kg	ASTM D1238	g / 10 min	11	5	5
Flammability	UL94		V-2 (0.8mm)	V-0 (1.6mm)	V-0 (1.0mm)



[Appendix] Test methods for optical properties

Test methods

- Total transmittance (Tt) : Total amount of transmitted light
- Haze, Diffusion Factor (DF) and Half Angle (HA): different kinds of methods for indicating the light diffusing ability



< Hazemeter >





• HA: angle at which half amount of light flux is measured



0 10 20 30 40 50 60 70 80 90 100



Optical materials should be selected by considering the structure of application product



* The suitable grade may differ from above examples due to the structure of final product.



Thank You!

