

Introduction of KURARITY™ KL-LH8156

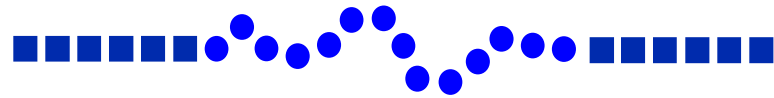
KURARITY business promotion dept.
Elastomer Division

kuraray

What is KURARITY™ KL-LH8156

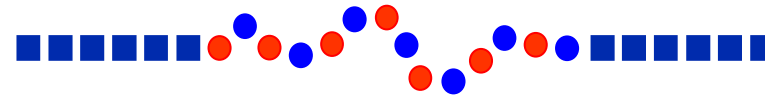
Molecular structure image

<KURARITY™ LA grades>



PMMA-*b*-PnBA-*b*-PMMA

<KURARITY™ KL-LH8156>



PMMA-*b*-P(MA/nBA)-*b*-PMMA

Compared with KURARITY™ LA grades, KURARITY™ KL-LH8156 shows

- Higher polarity and T_g
- Better oil resistance
- Lower stickiness with keeping flexibility
(Soft-Poly Vinyl Chloride like touch feeling)
- Better compatibility with polar material
- Better adhesion to polar substrate

Recommend application of KURARITY™ KL-LH8156

<Base polymer >

KURARITY™
KL-LH8156

<Solution and key words>

Base polymer of transparent compound (CPD)

- Good transparency and oil resistance
- Higher damping properties than aliphatic thermoplastic polyurethane (TPU)
- Good adhesion to polar resin



Base polymer of filler compound

- Light shielding application (Additive: TiO₂)
- Flame retardant (Additive: Phosphate type)



Hot melt adhesive film

- Better flowability at low temperature than TPU
- Good workability thanks to low tackiness
- Soft texture and good adhesive performance

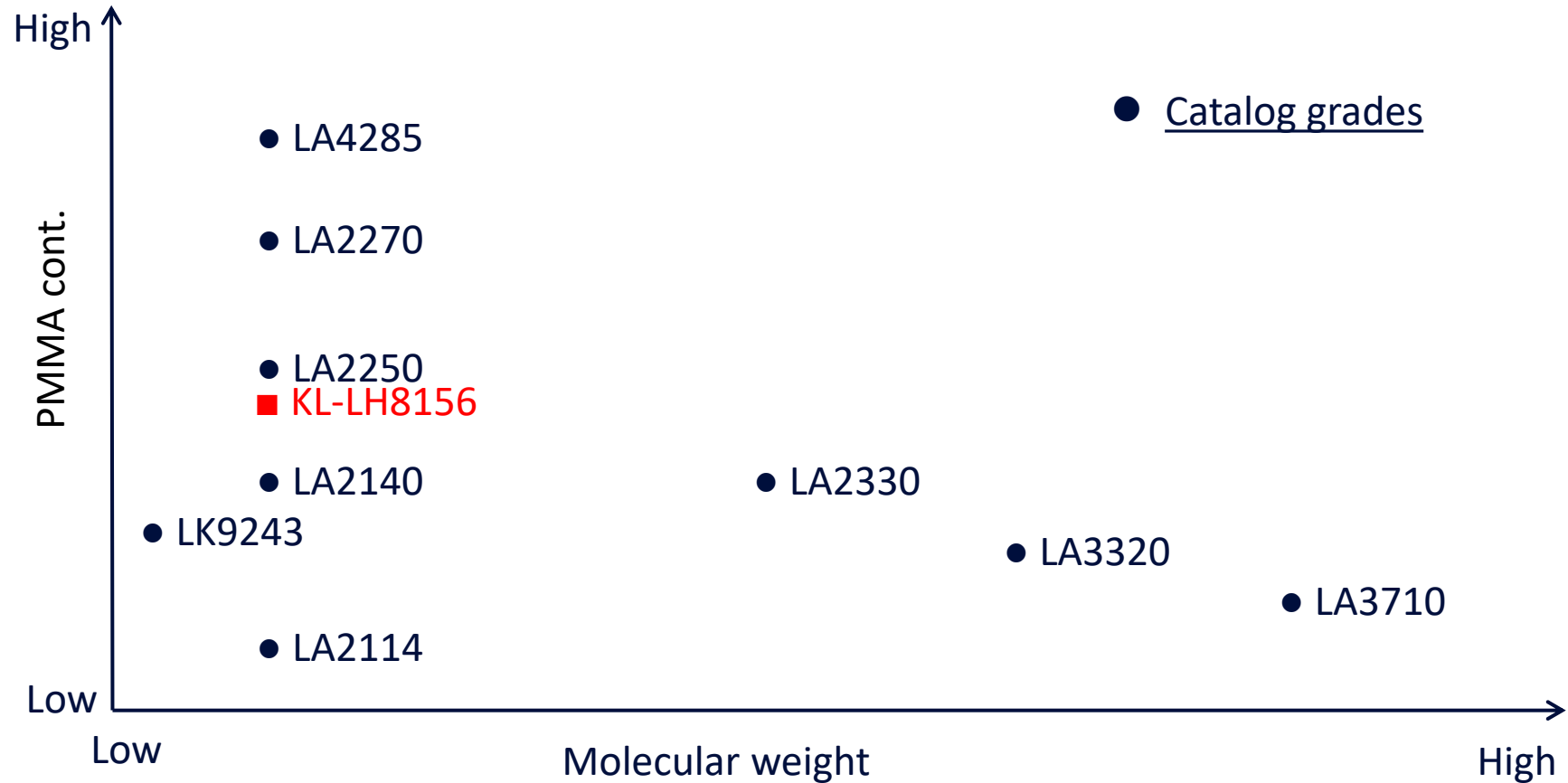


* If you need film sheet sample, please contact us. We will send test sample (A4 size).
Test sample of film sheet : 50, 100, 150, 200, 300 μmt



Basic properties of KURARITY™ KL-LH8156

KURARITY™ grade map



✓ KURARITY™ KL-LH8156 has the similar molecular design to KURARITY™ LA2250.

Basic properties

Items	Methods	Conditions	Units	KURARITY™ LA4285	KURAIRTY™ LA2270	KURARITY™ LA2250	KURARITY™ KL-LH8156
Hardness type A	ISO 7619-1	After 15 sec	(-)	90	68	55	51
Specific Gravity	ISO 1183	-	(-)	1.12	1.10	1.08	1.10
Melt flow rate (MFR)	ISO 1133	190 deg. C, 2.16 kgf	(g / 10 min)	1.5	4.4	25	32
Tensile strength at break	ISO 37	500 mm / min	(MPa)	19	15	8.8	14
Tensile elongation at break			(%)	200	290	470	570
Transmittance	ISO 13468-1	3 mmt	(%)	91<	91<	91<	91<
Haze	ISO 14782	3 mmt	(%)	<2.0	<2.0	2.0-6.0	2.0-6.0
Touch feeling	In-house method	By hand	(-)	no stickiness	low stickiness	stickiness	low stickiness

✓ Compared with KURARITY™ LA2250,

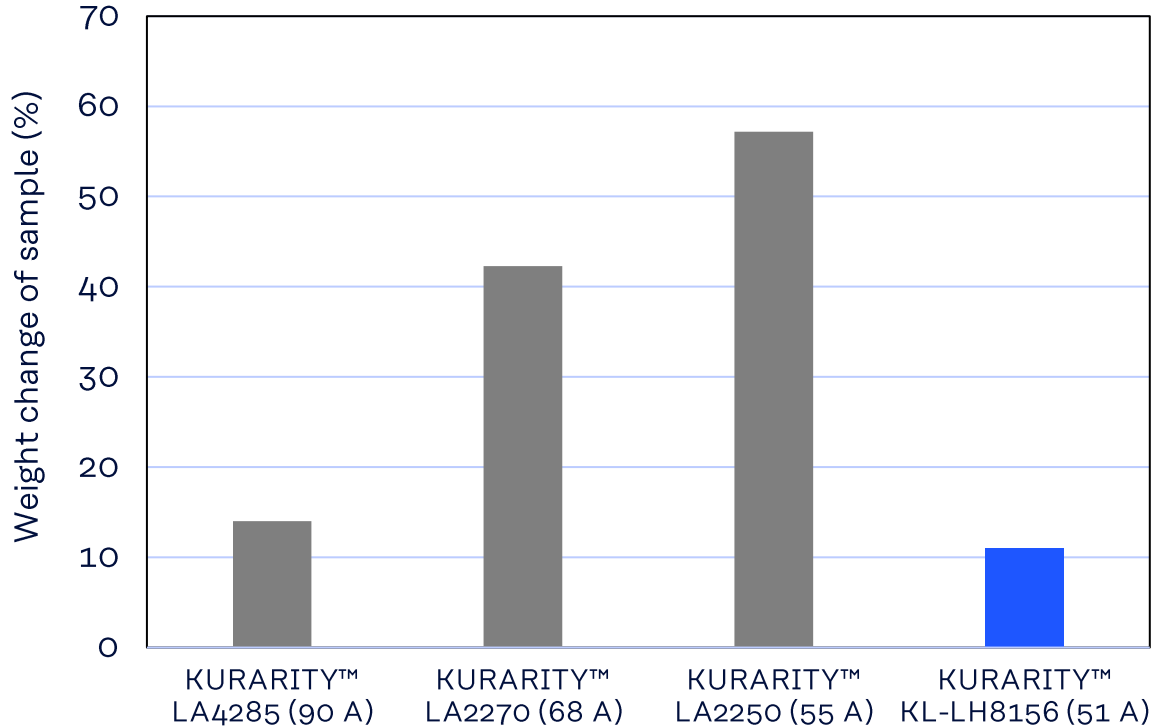
KURARITY™ KL-LH8156 shows lower stickiness **while it has better tensile strength and elongation.**

Oil resistance and dynamic viscoelasticity

Immersion test in oleic acid

Test condition

Sample size : 25 mmφ × 1 mmt, (Temp., Time) : (23 deg.C, 24 hr)



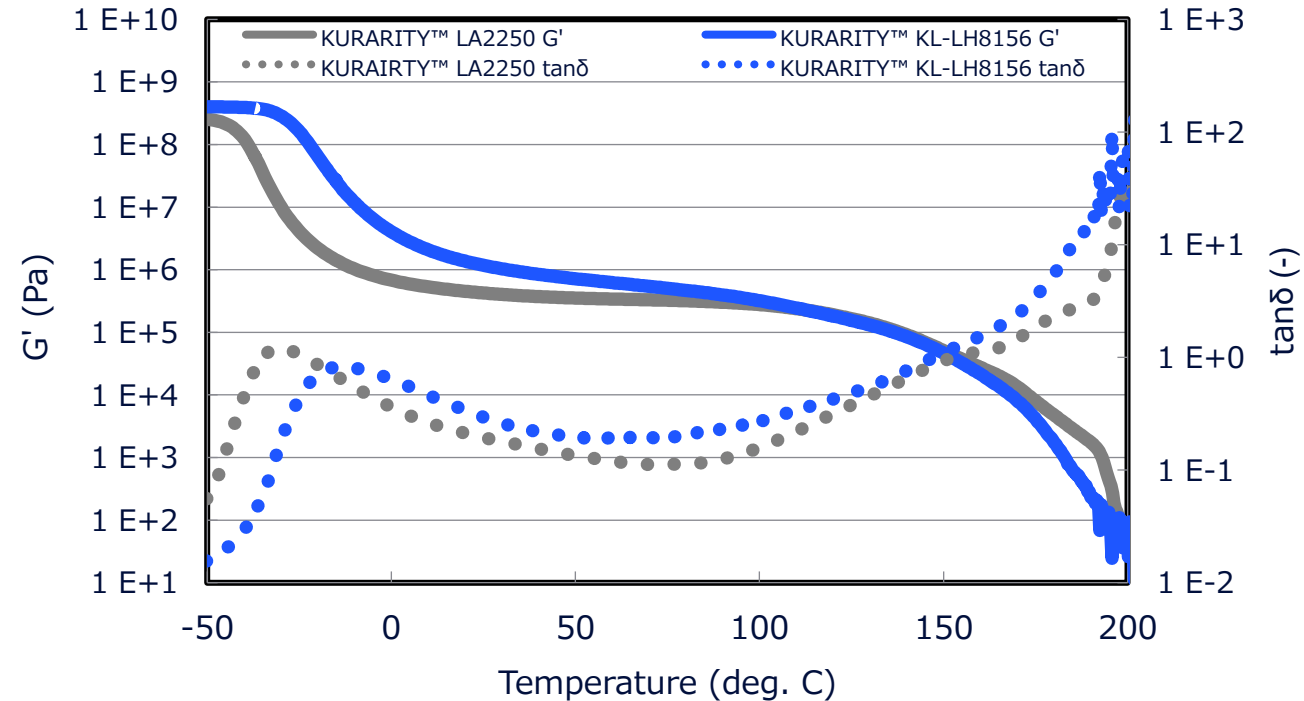
- ✓ KURARITY™ KL-LH8156 shows **better oleic acid resistance than LA series** that has close hardness.
- ✓ Compared with KURARITY™ LA2250, KURARITY™ KL-LH8156 shows **lower stickiness** due to higher G' below 100 deg.C.

Dynamic mechanical analysis (DMA) spectrum

Test specimen

Sample size : 8.0 mmφ parallel plate,

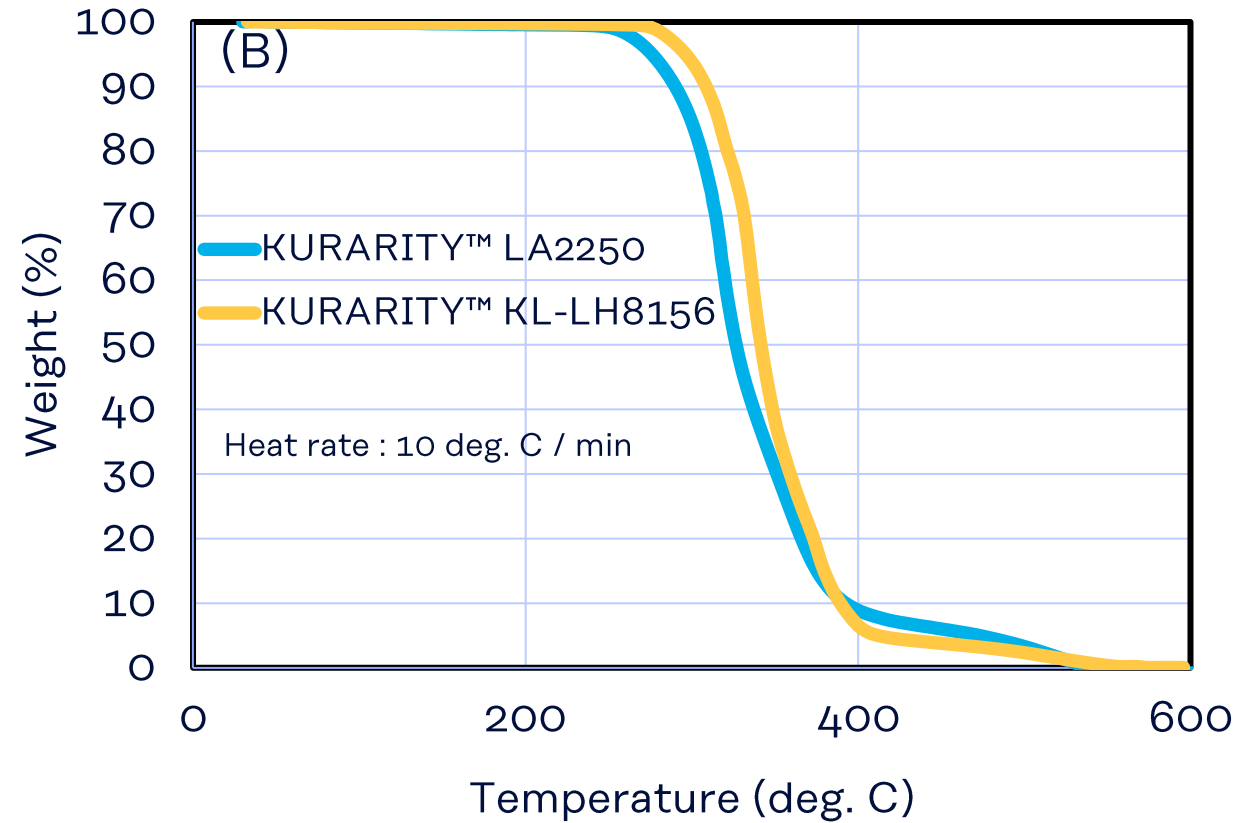
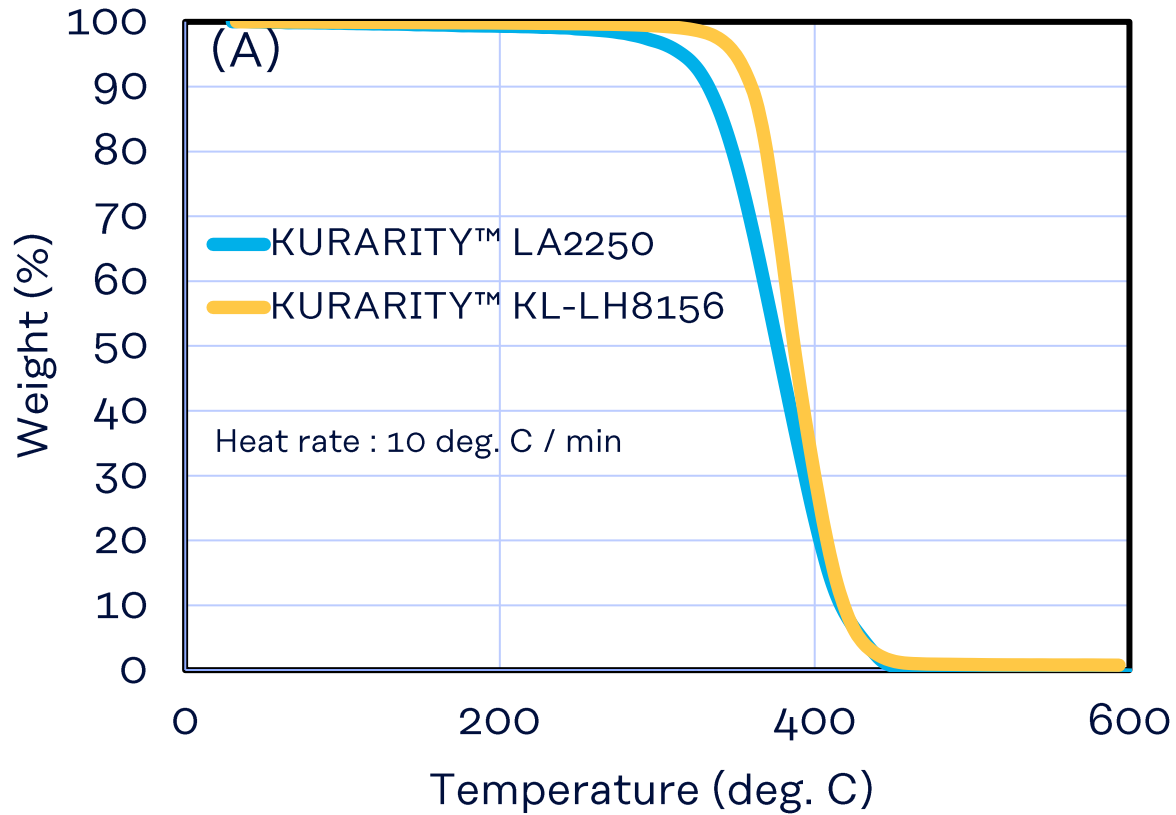
Frequency : 6.28 rad / s, Heating rate : 2 deg.C / min



Thermal stability

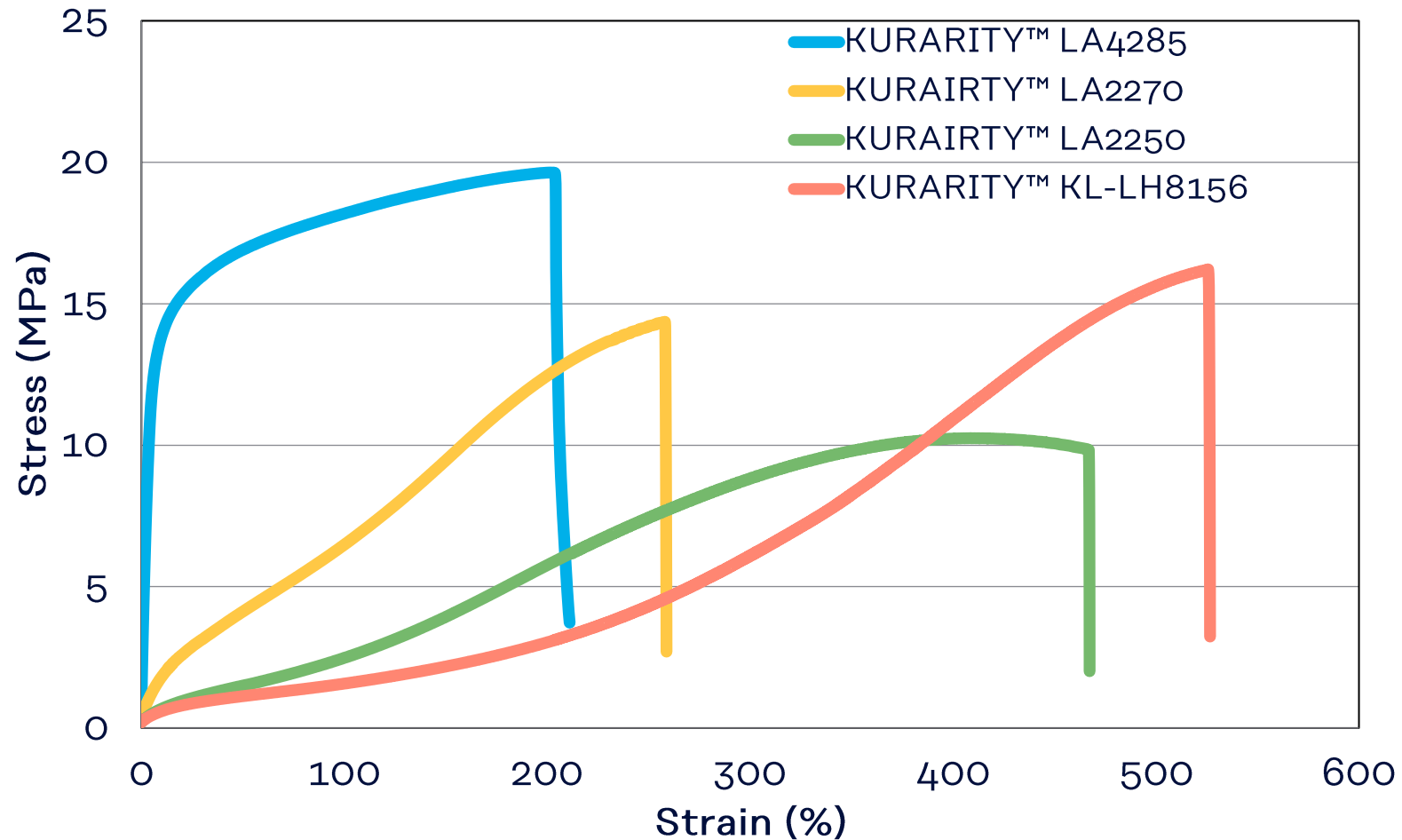
Fig. Thermogravimetric analysis

(A) N₂ condition (B) Air condition



✓ KURARITY™ KL-LH8156 shows similar thermal stability to KURARITY™ LA2250.

Tensile properties



Test method

Dumbbell: 1 mmt press sheet

Tensile test speed : 500 mm / min

✓ KURARITY™ KL-LH8156 shows good balance tensile strength and elongation at break point.

Base polymer of transparent CPD

- with KURARITY™ LA grades
- with Hydrogenated Styrenic Block Co-polymer (HSBC)

Overviewing of the concept

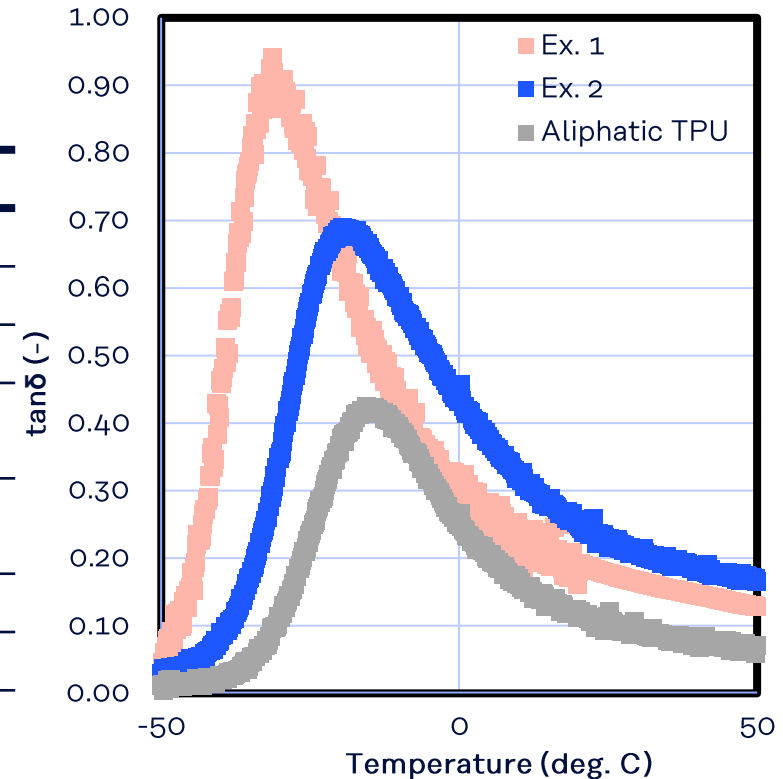
	KURARITY™ (LA grades CPD)	KURARITY™ (LA grades / KL-LH8156 CPD)	HSBC / KURARITY™ CPD	TPU
Transparency	++	++	+	+
Haptic (Rubber like)	-	-	+	-
Adhesion to polar resin	++	++	+	++
Oleic acid resistance	-	+-	+	++
Weatherability	++	++	+	-
Cost	-	-	+	++

- ✓ KURARITY™ LA grades / KURARITY™ KL-LH8156 CPD is improved in **oil resistance** compared to LA grades CPD.
- ✓ HSBC / KURARITY™ is **balanced** transparency, haptic, adhesion to polar resin, oil resistance, weatherability and cost.

Compounding with KURARITY™ LA grades

				Ex.1 LA grades CPD	Ex.2 LA / LH CPD	Aliphatic TPU
				40	40	
				50		
					50	-
				10	10	
Items	Methods	Conditions	Units			
Hardness type A	ISO 7619-1	After 15 sec	(-)	80	80	84
Specific Gravity	ISO 1183	-	(-)	1.10	1.12	1.15
MFR	ISO 1133	200 deg. C, 2.16 kgf	(g / 10 min)	11	12	2.7
Tensile strength at break	ISO 37	500 mm / min	(MPa)	13	15	69
Tensile Elongation at break	ISO 37		(%)	250	280	500
Transmittance	ISO 13468-1	3 mmt	(%)	92	92	88
Haze	ISO 14782	3 mmt	(%)	3.7	1.9	6.7
Chemical resistance in oleic acid	In-house method	Immersed at 23 deg.C, 168 hr, 25 mm ϕ × 1 mmt	(Δ wt%)	90	50	<1.0

Fig. DMA spectrum (tan δ)



- ✓ Ex.2 shows better oleic acid resistance and haze value than Ex.1.
- ✓ Ex.2 shows higher damping properties due to higher tan δ than aliphatic TPU under wide temperature range.

Compounding with HSBC

				Ex.2 (LA / LH CPD)	Ex.3 (KURARITY™ / HSBC)
Acrylic polymer	KURARITY™ LA4285			40	40
	KURARITY™ KL-LH8156			50	50
	PMMA (MFR = 15, GF1000, KURARAY)			10	10
HSBC	SEPTON™ 4055				20
Plasticizer	Paraffinic oil (visc. 90 mm ² /sec at 40 deg.C)				40
Additive	KRISTALEX™ 5140 (PSt-r-αMSt)				10
	PELESTAT™ 300 (Modified polyolefin-PEG block copolymer)				5
Items	Methods	Conditions	Units		
Hardness type A	ISO 7619-1	After 0 sec	(-)	87	75
Transmittance	ISO 13468-1	1 mmt	(%)	93	93
Haze	ISO14782	1 mmt	(%)	1.0	44
Tensile strength at break	ISO37	500 mm / min	(MPa)	15	6.4
Tensile elongation at break			(%)	280	220
Adhesion to resin (Molding at 230 deg. C)	In-house method	To PC	(N / 25 mm)	89*	61*
		To ABS		99*	64*
		To PMMA		92*	62*
Chemical resistance in oleic acid	In-house method	Immersed at 23 deg.C, 168 hr	(Δ wt%)	50	19
Chemical resistance in IRM903				-	7.7

*KRISTALEX is a registered trademark of Eastman chemical resins inc..

*PELESTAT is a registered trademark of Sanyo Chemical Industries, Ltd.

* Material break

✓ Ex.3 shows lower hardness and better oil resistance than Ex.2 and rubber-like touch.



Base polymer of filler CPD

- Light shielding application
- Flame retardant formulation

Light shielding application by compounding with KURARITY™ and TiO₂

				Ref.1	Ex.1	Ex.2	Ex.3
Base polymer	Random Polypropylene			100			
	KURARITY™ LA2270				100		
	KURARITY™ LA2250					100	
	KURARITY™ LK-LH8156						100
Additive	TiO ₂ (0.25 μm)			18	18	18	18
Items	Methods	Conditions	Units				
Light shielding rate*	ISO 13468-1	50 μmt	(%)	18	13	15	15
		200 μmt		7	5	5	5
Tensile strength at break	In-house method	500 mm / min, 1 mmt	(MPa)	-	13	10	15
Tensile elongation at break			(%)	-	270	450	540

* (Light shielding rate) = 1 – (Transmittance)

- ✓ KURARITY™ shows better light shielding property than Ref.1 thanks to good dispersity of TiO₂.
- ✓ Ex3. shows better tensile strength and elongation than Ex.1 and Ex.2.

Flame retardant formulation

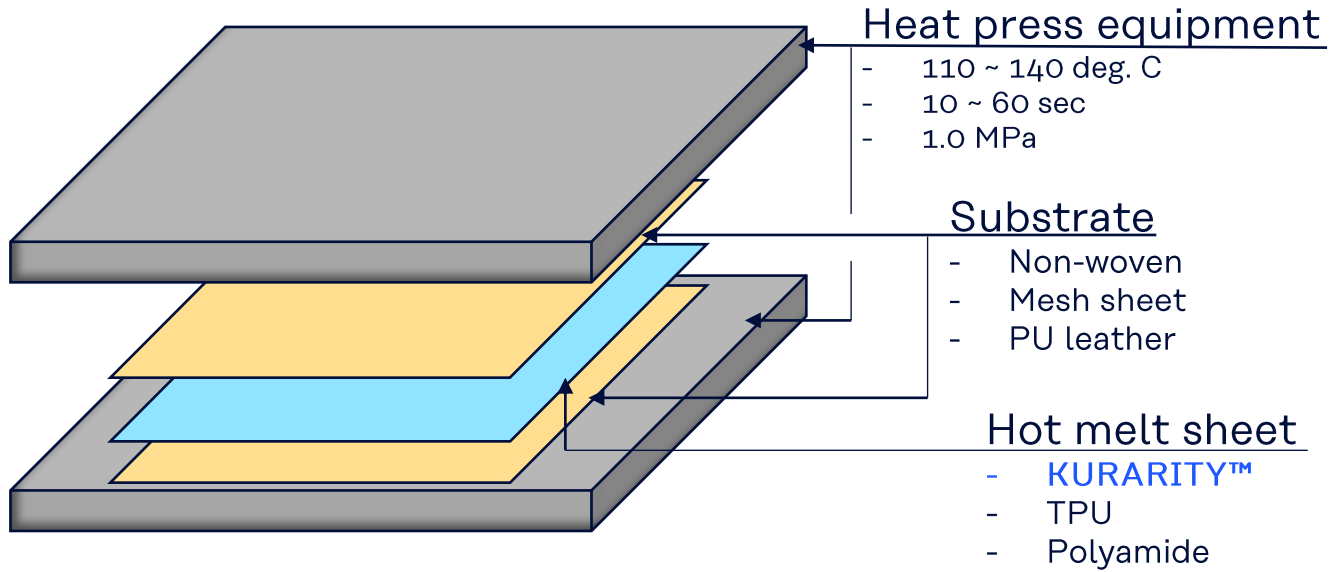
				Ex.1	Ex.2	Ex.3	Ex.4	Ex.5	Ex.6
Base polymer	KURARITY™ LA2250			69.5	54.5				
	KURARITY™ LA4285					69.5	54.5		
	KURARITY™ KL-LH8156							69.5	54.5
Flame retardant	Phosphate type			30	45	30	45	30	45
Anti dripping agent	PTFE			0.5	0.5	0.5	0.5	0.5	0.5
Items	Methods	Conditions	Units						
UL94V	ASTM D3801	2 mmt	(-)	Out of classification	V-1	Out of classification	V-0	Out of classification	V-0
		3 mmt		V-0	V-0	V-1	V-0		
Hardness type A	ISO 7619-1	After 15 sec	(-)	70	81	95	96	63	74
MFR	ISO14782	190 deg. C, 2.16 kgf	(%)	6.3	0.28	-	-	9.7	1.1
		230 deg. C, 2.16 kgf		-	-	4.9	0.25	-	-
Tensile strength at break	ISO 37	500 mm / min	(MPa)	6.5	6.1	16	17	8.6	6.8
Tensile elongation at break	ISO 37	500 mm / min	(%)	330	210	36	22	540	290
Adhesion to resin (Molding at 230 deg. C)	In-house method	To PC	(N/25 mm)	100	82	36	22	112	85
		To ABS		94	75	43	22	121	92
		To PMMA		87	72	42	20	117	90

- ✓ Ex.5, 6 show better flame retardant properties, flexibility and adhesion to polar resin due to high polarity of KURARITY™ KL-LH8156.



Hot melt adhesive film

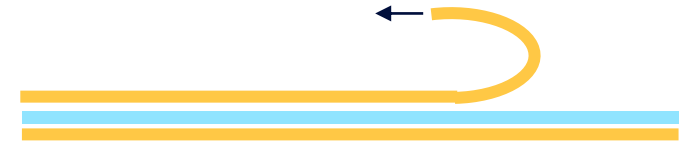
Test method






After hot melt press,

1. Storage these samples under 23 deg.C, 50 %RH, 24 hr
2. Check the adhesive force between substrate and hot melt sheet by peeling off with hand

Test image



Hot melt adhesive properties

Sheet sample (100 μmt)		KURARITY™ LA2250	KURARITY™ KL-LH8156	TPU (polyester type)	Polyamide
	Touch feeling	stickiness	low stickiness	no stickiness	no stickiness
Substrate	Hot melt temp. (deg. C)				
Non-woven*2 (Polyester type)	 110	+	+	-	+
	130	++	++	+ -	++
Mesh sheet*2 (Polyester type)	 110	+	+	-	+
	130	++	++	+ -	++
PU Leather sheet*3	 140	+ -	+	++	-
The texture of hot melt sheet		soft	soft	soft	rough and hard

*1 Adhesive evaluation : ++ Excellent, + good, +- Poor, - Not adhesive to substrate

*2 Press condition : 10 sec, 1.0 MPa, upper side only heated *3 Test condition : 60 sec, 1.0 MPa

- ✓ KURARITY™ show better adhesive performance than TPU in short time and low temperature.
- ✓ The hot melt sheet using KURARITY™ show soft feeling contrary to Polyamide that makes substrate rough and hard.

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