

Introduction of KURARITY™ for solvent-free hot melt PSA

KURARITY business promotion dept.
Elastomer Division

kuraray

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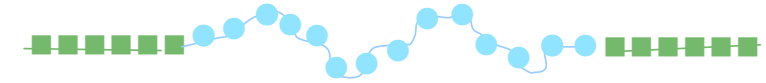
1. KURARITY™ general information and feature

KURARITY™ general introduction

KURARITY™

“MAM type” All acrylic block copolymer

Made by controlled living anionic polymerization



Methyl methacrylate

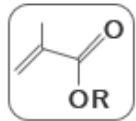
Methyl methacrylate

Acrylate

LA grades : n-Butyl acrylate

LK grades : n-Butyl acrylate / 2-Ethylhexyl acrylate

Features of KURARITY™



All acrylic structure

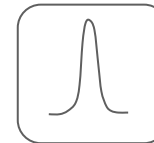
Optically clear, Weather resistance



Self-assembly physical crosslink

(No functional group)

No aging process



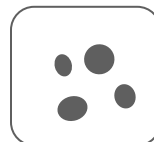
Narrow Molecular Weight Distribution
(Mw/Mn)

Low viscosity, Good removability,
Low residual monomer and oligomer

Acid
free

Acid free

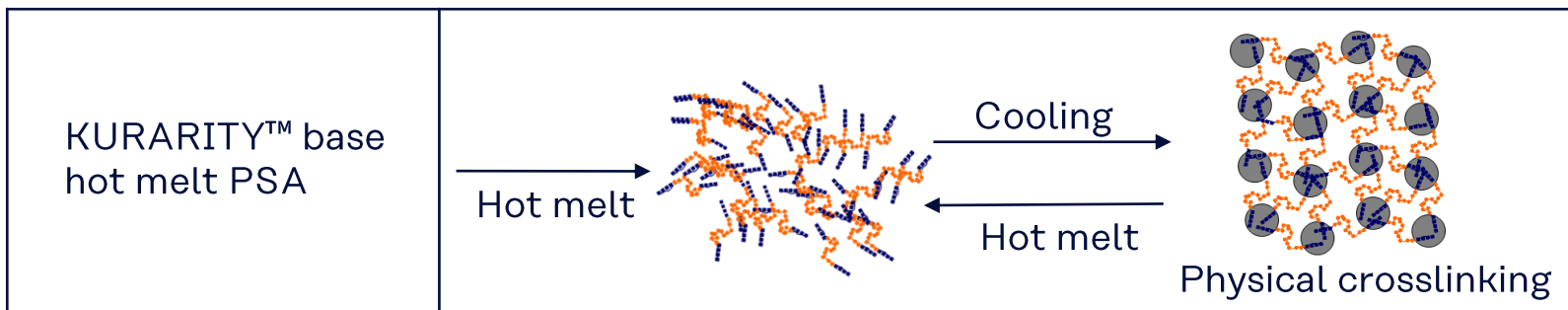
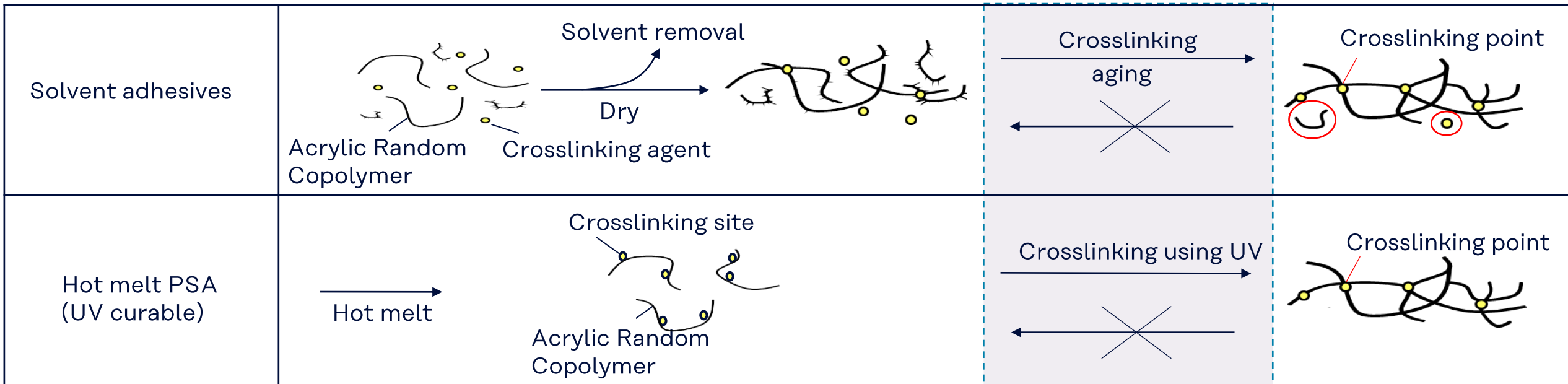
Corrosion resistance to metal, Low reactivity



Good dispersity

Good dispersity of highly value-added functional additive, which
leads to stable performance

The features of KURARITY™ base hot melt PSA

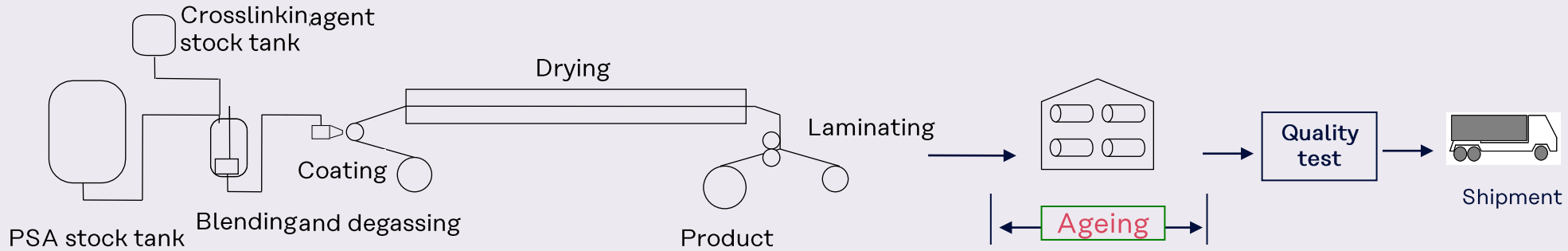


- Important processes that affect performance
- Sensitive to conditions

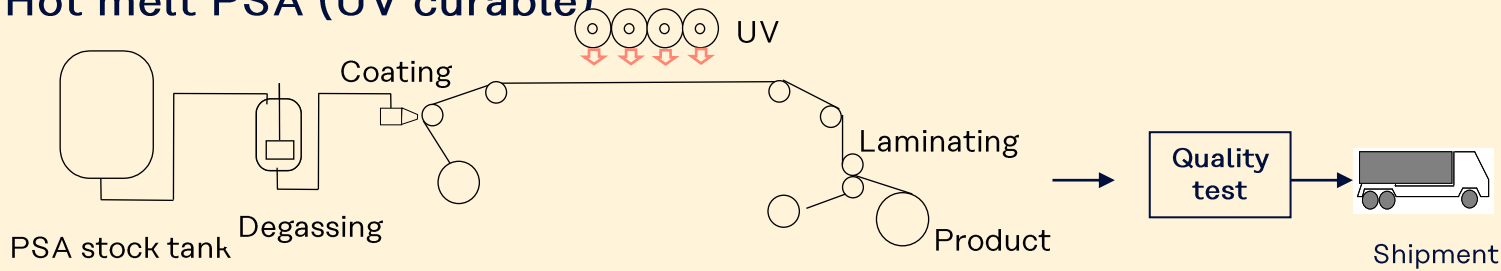
- Simple and environmentally friendly process
- Easy to get stable performance

The features of KURARITY™ base hot melt adhesive

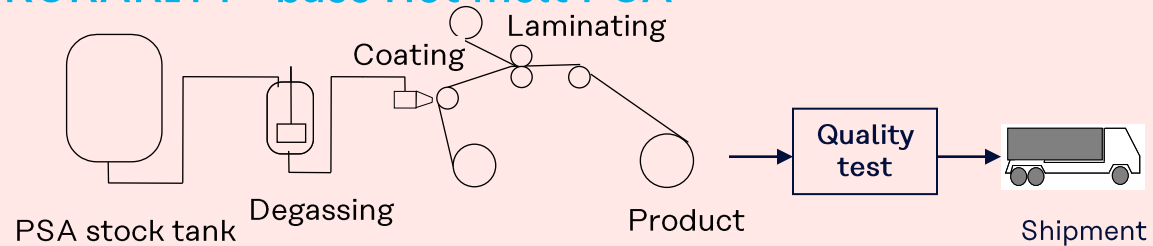
Solvent adhesives



Hot melt PSA (UV curable)



KURARITY™ base Hot melt PSA



- +No UV curing process
- +Simplified process without drying process
- +Minimal VOCs and odor

Recommend applications

KURARITY™ have been recommended for the manufacture of high-quality, removable adhesive specialty products for construction, automotive, food or beverage applications.

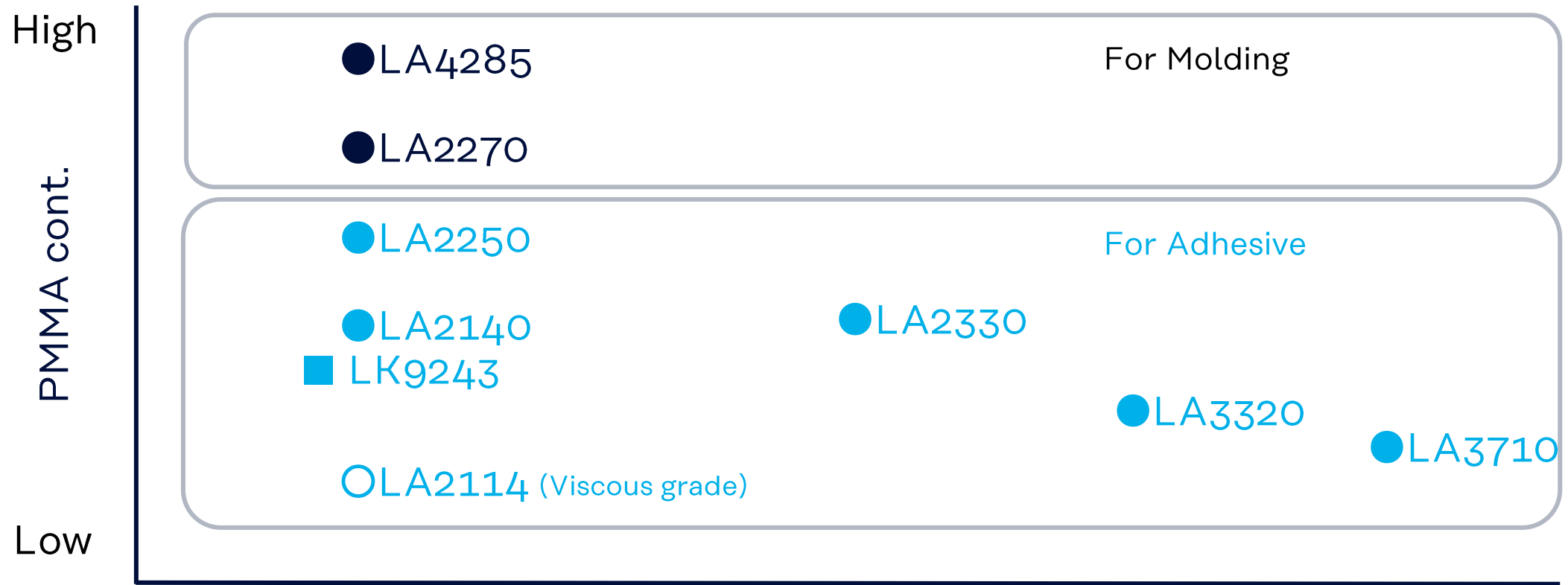




2. KURARITY™

technical information

Grade map



Low



O: Viscous grade

Molecular Weight



●, ■: Pellet grade

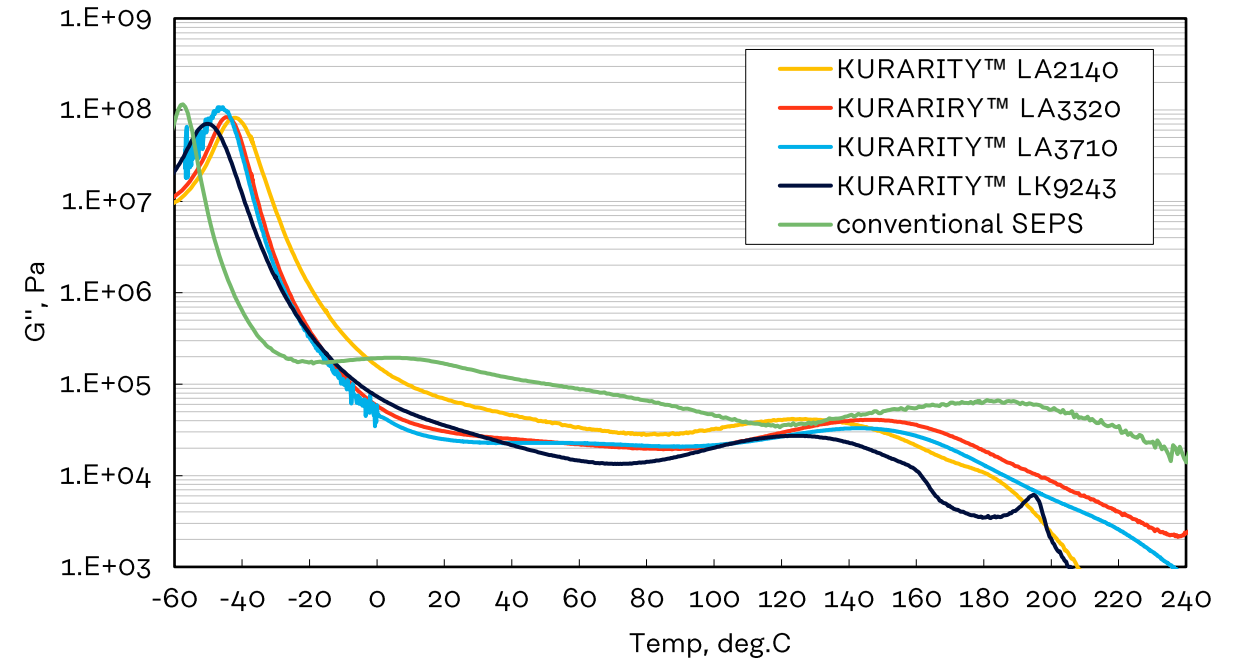
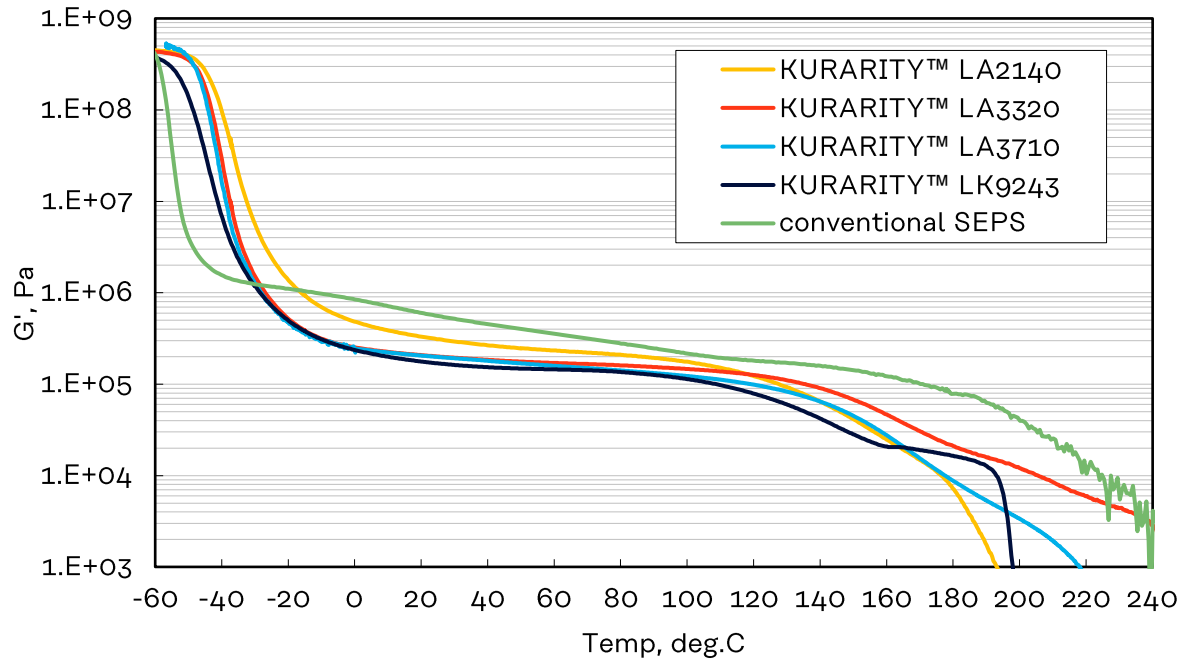
High

Basic adhesive properties of KURARITY™

		Unit	nBA grade				2EHA/nBA grade
			KURARITY™ LA2330	KURARITY™ LA3320	KURARITY™ LA3710	KURARITY™ LA2140	KURARITY™ LK9243
Features			SAFT	Tack	Tack, holding power	Low melt viscosity	Low Tg, low melt viscosity
Tg [peak top temp. of G'' at 1Hz]		deg.C	-44	-44	-46	-42	-50
180° Peel adhesion [ISO 29862-2007] (after 24 hr @23 deg.C, 50 %RH)	to SUS to PE to PMMA	N / 25 mm	17 0.7 16	14 1.0 15	13 0.7 13	15 0.4 17	7.4 0.6 15
SAFT [ASTM D4498] (0.5 kgf, 0.5 deg.C / min)	to SUS	deg.C	<u>170</u>	163	153	145	137
Loop tack [ASTM D6195] (23deg.C, 50%RH)	to PMMA	N	11	<u>14</u>	<u>16</u>	4.2	11
Adhesion at 90 degrees and constant stress [In-house method] (200 gf, 23 deg.C, 50 %RH 15 mm width,100 mm length after 60 min)	to PMMA	mm	40	33	<u>28</u>	83	27 min↓*
MFR [ISO 1133] (190 deg.C, 2.16 kgf)		g / 10 min	3.7	6.2	11	<u>31</u>	<u>93</u>
Solution viscosity [20 wt% in toluene, 30 deg.C]		mPa·s	35	46	80	18	13
Hardness (Type A) [ISO 7619-1]		-	32	13	9	32	17

※ Toluene solution coating to PET film, adhesive layer : 25 μm, base layer : PET 50 μm, * Time to failure

Viscoelasticity of KURARITY™ with 1 mmt compression molded sheet

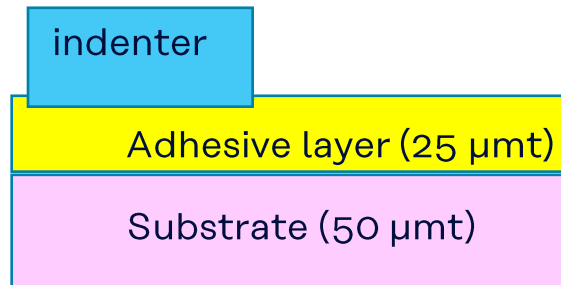


※ 1 mmt compression molded sheet, diameter 8.0 mm parallel plates, 6.28 rad / sec, 2 deg.C / min

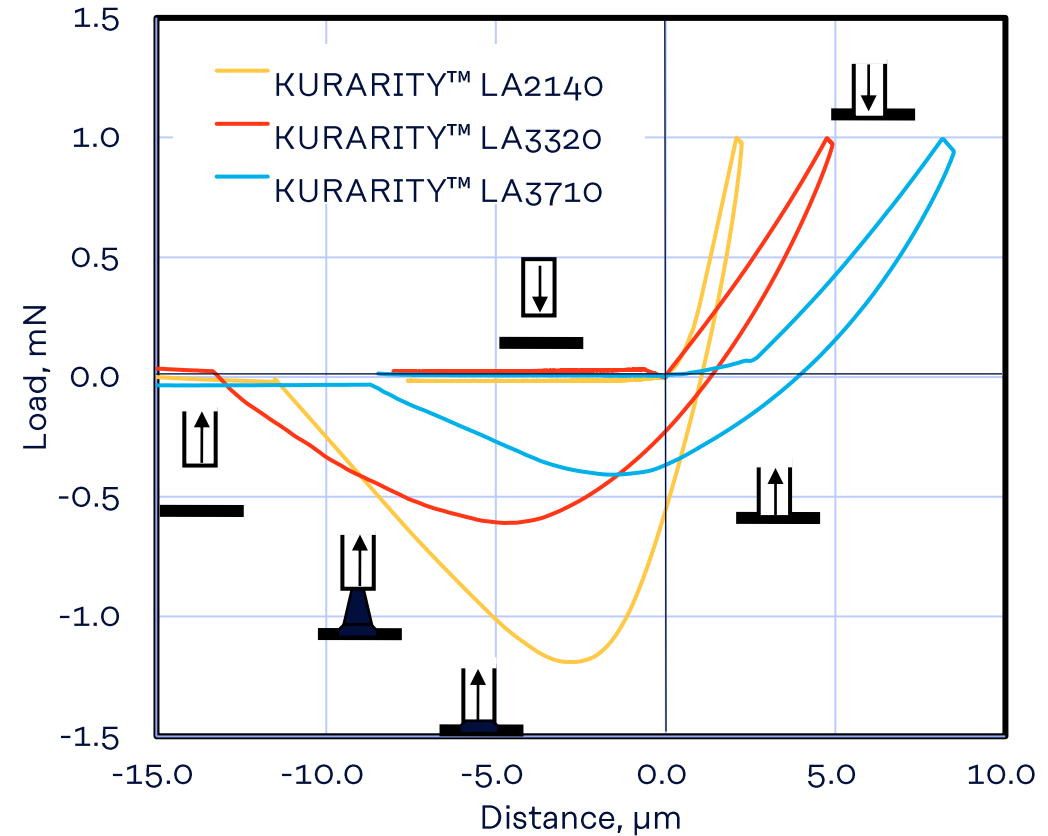
- ✓ KURARITY™ show lower storage modulus (G') than that of conventional SEPS.
- ✓ LA grade having lower PMMA content and higher molecular weight shows lower G' .
- ✓ LK9243 shows lower T_g than that of LA grade.

Force curves of KURARITY™ with 25 μmt layer using nano indenter

- Pull-off mode
apply 1 mN in 2 seconds
hold for 1 sec



<Pull-off mode>



※ Toluene solution coating to PET film, adhesive layer : 25 μmt, base layer : PET 50 μmt

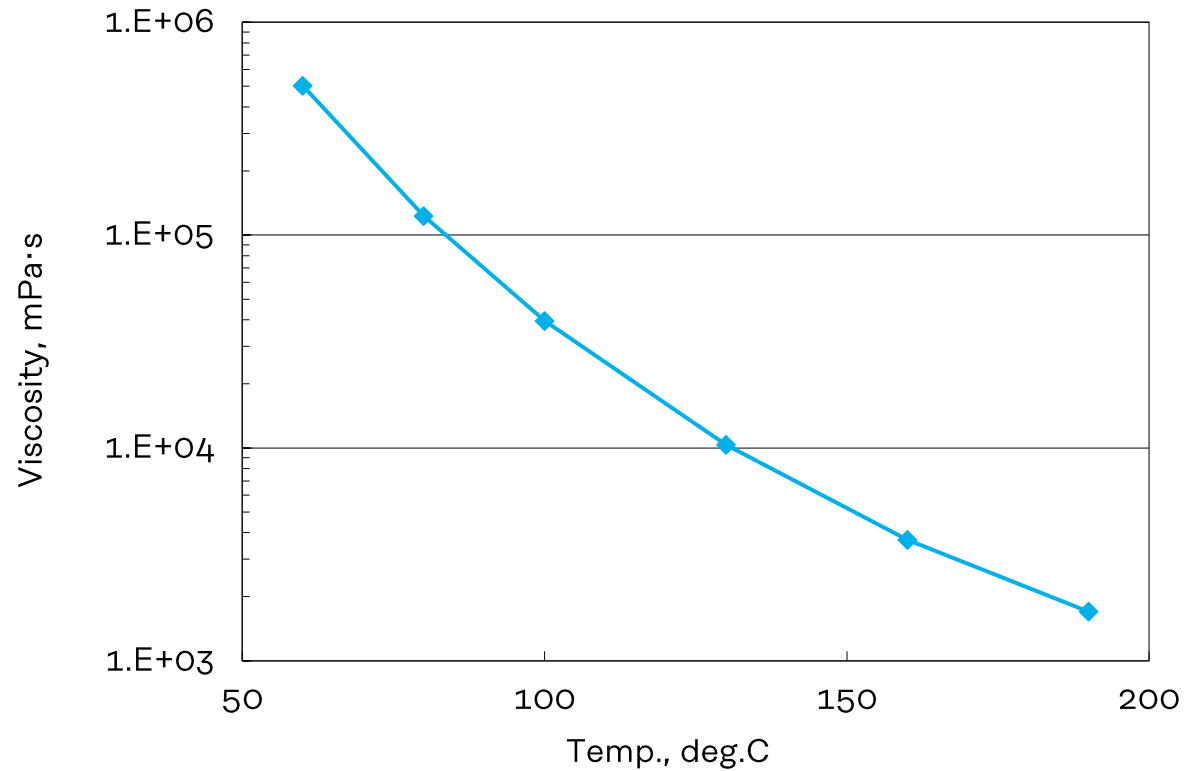
- ✓ KURARITY™ LA3710 can be pushed deeper with the same load.
- ✓ During peeling of KURARITY™ LA3710, the change in peeling force is small.

KURARITY™ LA2114 (Viscous grade)



Viscous liquid

High viscosity at room temperature.
By heating, the viscosity is going down.
In combination with pellet grades, the viscosity and performance can be adjusted.





3. KURARITY™

formulations for hot melt PSA

Adhesive properties of hot melt PSA formulations using KURARITY™ LA grades

Formulation			Ref.1	Entry1	Entry2	Entry3	Ref.2	Entry4	Entry5	Entry6	
KURARITY™	KURARITY™ LA2140		100	100	100	100					
	KURARITY™ LA3320						100	100	100	100	
	KURARITY™ LA2114			50	100	200		50	100	200	
Methods		Conditions	Units								
180° Peel adhesion [ISO 29862-2007]	to SUS to PE to PMMA	after 24 hr, 23 deg.C, 50 %RH	N /25 mm	15 0.4 17	16 1.1 16	13 2.1 12	13 2.3 11	14 1.0 15	17 1.9 17	13 3.4 14	11 4.8 11
Loop tack [ASTM D6195]	to PMMA	23 deg.C, 50 %RH	N	4.2	17	15	14	14	19	19	17
SAFT [ASTM D4498]	to SUS	0.5 kgf, 0.5 deg.C / min	deg. C	145	128	121	105	163	144	133	114
Shear adhesion [ASTM D3654M]	to SUS	1.0 kgf, 1000 min, 70 deg. C	mm	<0.1	0.2	0.3	740 min↓*	<0.1	<0.1	<0.1	600 min↓*
Melt viscosity [ASTM D3236]	180 deg. C		mPa·s	805,000	124,700	32,200	8,400	>3,300,000	2,860,000	402,000	29,400
	160 deg. C		mPa·s	>3,300,000	851,000	163,000	22,500	-	>3,300,000	2,490,000	121,000
	140 deg. C		mPa·s	-	>3,300,000	1,770,000	94,600	-	-	>3,300,000	1,190,000

※ Toluene solution coating to PET film, adhesive layer : 25 μmt, base layer : PET 50 μmt
 * Time to failure

✓ Tackiness is improved and melt viscosity is decreased while maintaining shear adhesion up to 100 phr addition of KURARITY™ LA2114.

Adhesive properties of hot melt formulations using KURARITY™ LK grade

Formulation				Ref.1	Entry1	Entry2	Entry3	Entry4
KURARITY™	KURARITY™ LK9243			100	100	100	100	100
	KURARITY™ LA2114				50	100	200	400
Methods		Conditions	Units					
180° Peel adhesion [ISO 29862-2007]	to SUS to PE to PMMA	after 24 hr 23 deg.C, 50 %RH	N /25 mm	7.4 0.6 15	13 1.6 11	11 2.6 12	7.2 7.3 7.4	5.5 5.2 5.8
Loop tack [ASTM D6195]	to PMMA	23 deg.C, 50 %RH	N	11	16	21	23	16
SAFT [ASTM D4498]	to SUS	0.5 kgf, 0.5 deg.C / min	deg. C	137	103	93.6	43	<40
Shear adhesion [ASTM D3654M]	to SUS	1.0 kgf, 1000 min, 70 deg.C	mm	<0.1	<0.1	7.8 min↓*	0 min↓*	0 min↓*
Melt viscosity [ASTM D3236]		180 deg.C	mPa·s	>8,610,000	26,700	13,800	6,500	3,600
		160 deg.C	mPa·s	-	147,000	40,200	12,500	6,800

※ Toluene solution coating to PET film, adhesive layer : 25 μm, base layer : PET 50 μm
* Time to failure

- ✓ Melt viscosity is decreased by adding KURARITY™ LA2114 to LK grades than LA grades.
- ✓ When KURARITY™ LA2114 added more than 100 phr , shear adhesion and SAFT tend to be low.

Compatibility of KURARITY™ LA grades with various tackifiers (TF)

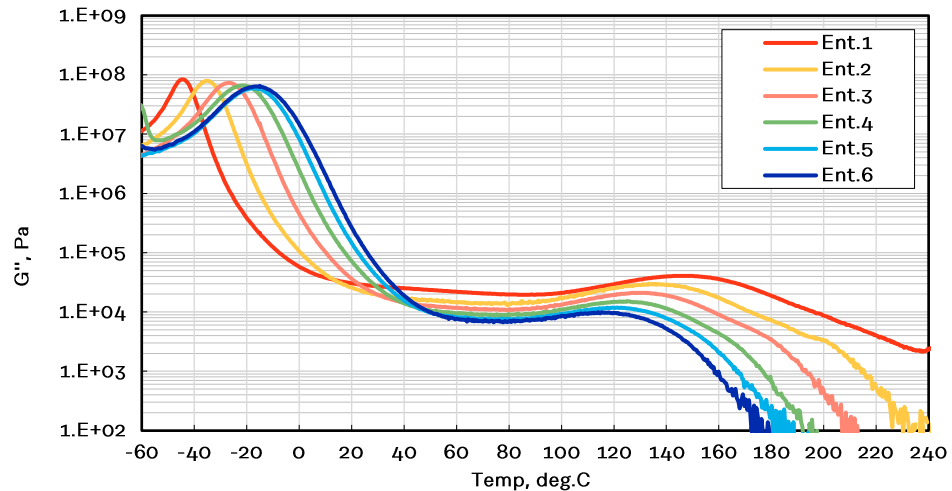
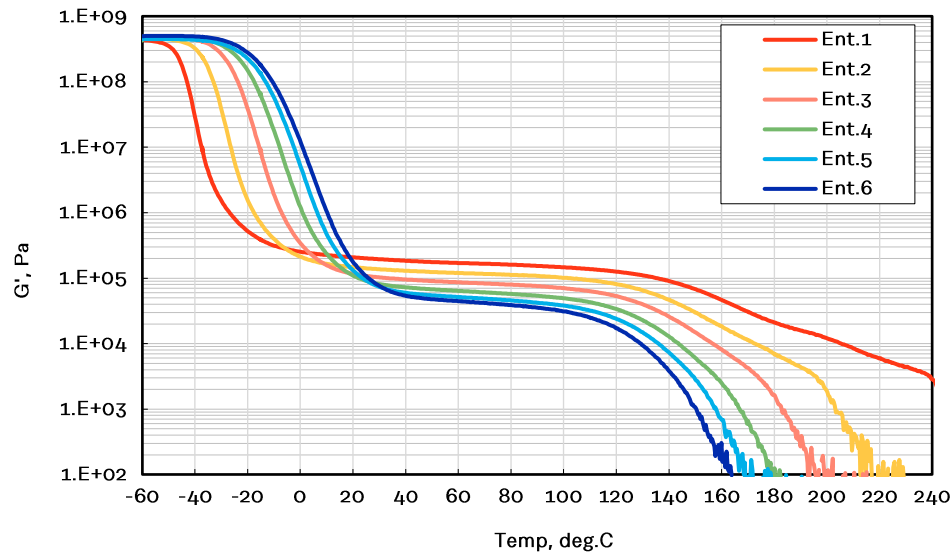
Tackifier	Description	Additive amount to KURARITY™ LA grades (phr)								
		0	10	20	30	40	50	100	200	
Rosin ester	Hydrogenated glycerol ester of rosin	Compatible	Compatible	Compatible	Compatible	Compatible	Compatible	Compatible	Compatible	Compatible
	Glycerol ester of rosin	Compatible	Compatible	Compatible	Compatible	Compatible	Compatible	Compatible	Compatible	Compatible
Rosin acid	Hydrogenated rosin acid Acid value 165	Compatible	Compatible	Compatible	Compatible	Compatible	Compatible	Compatible	Compatible	Compatible
Terpene phenolic		Compatible	Compatible	Compatible	Compatible	Compatible	Compatible	Compatible	Compatible	Compatible
Polyterpene	Aromatic modified	Partially compatible	Partially compatible	Partially compatible	Partially compatible	Partially compatible	Partially compatible	Partially compatible	Partially compatible	Partially compatible
	Hydrogenated	Partially compatible	Partially compatible	Partially compatible	Partially compatible	Partially compatible	Partially compatible	Partially compatible	Partially compatible	Partially compatible
	Hydrogenated aromatic modified	Partially compatible	Partially compatible	Partially compatible	Partially compatible	Partially compatible	Partially compatible	Partially compatible	Partially compatible	Partially compatible
Styrene polymer		Compatible	Compatible	Compatible	Compatible	Compatible	Compatible	Compatible	Compatible	Compatible
C5 resin	Aliphatic hydrocarbon resin	Compatible	Compatible	Compatible	Compatible	Compatible	Compatible	Compatible	Compatible	Compatible
C5 / C9 resin	Hydrogenated hydrocarbon resin	Compatible	Compatible	Compatible	Compatible	Compatible	Compatible	Compatible	Compatible	Compatible
C9 resin	Partially hydrogenated hydrocarbon resin	Compatible	Compatible	Compatible	Compatible	Compatible	Compatible	Compatible	Compatible	Compatible
	Hydrogenated hydrocarbon resin	Compatible	Compatible	Compatible	Compatible	Compatible	Compatible	Compatible	Compatible	Compatible

KURARITY™ has different compatibility with tackifier (TF) from styrenic TPE.

- Good compatibility with rosin ester, hydrogenated rosin ester, rosin acid, terpene phenol-based, and styrene-based TF.
- Within the KURARITY™ LA grade, compatibility is almost the same.
- KURARITY™ LK grade shows similar compatibility with KURARITY™ LA grade
- The compatibility of KURARITY™ LK grade with petroleum resin is slightly improved.

Effect of TF (Hydrogenated rosin ester, Softening point: 85 deg.C)

Adhesive properties of compounds



※ 1 mm compression molded sheet, 8.0 mm parallel plates, 6.28 rad / s, 2 deg.C/ min

		180 degrees Peel adhesion to PMMA [N / 25 mm]	SAFT [deg.C]	Loop tack to PMMA [N]
Ent.1	KURARITY™ LA3320	15	163	14
Ent.2	KURARITY™ LA3320 / TF = 100 / 20	15	147	21
Ent.3	KURARITY™ LA3320 / TF = 100 / 40	17	138	18
Ent.4	KURARITY™ LA3320 / TF = 100 / 60	20	132	17
Ent.5	KURARITY™ LA3320 / TF = 100 / 80	27 ss*, T**	128	10
Ent.6	KURARITY™ LA3320 / TF = 100 / 100	25 ss*, T**	124	7

※ Toluene solution coating to PET film, adhesive layer : 25 μm, base layer : PET 50 μm

* : stick slip ** : transfer

When 60 parts or more of TF is added to KURARITY™ LA3320,

- The shift of G' reduces in the low temperature around 0 deg.C
- The value of G'' around room temperature becomes high
- Rubbery plateau becomes short
- The adhesive force becomes remarkably large
- SAFT decreases according to the amount of addition
- Tack tends to decrease when the amount of the TF exceeds 60 - 80 parts.

Compatibility of KURARITY™ LA grades with various plasticizers

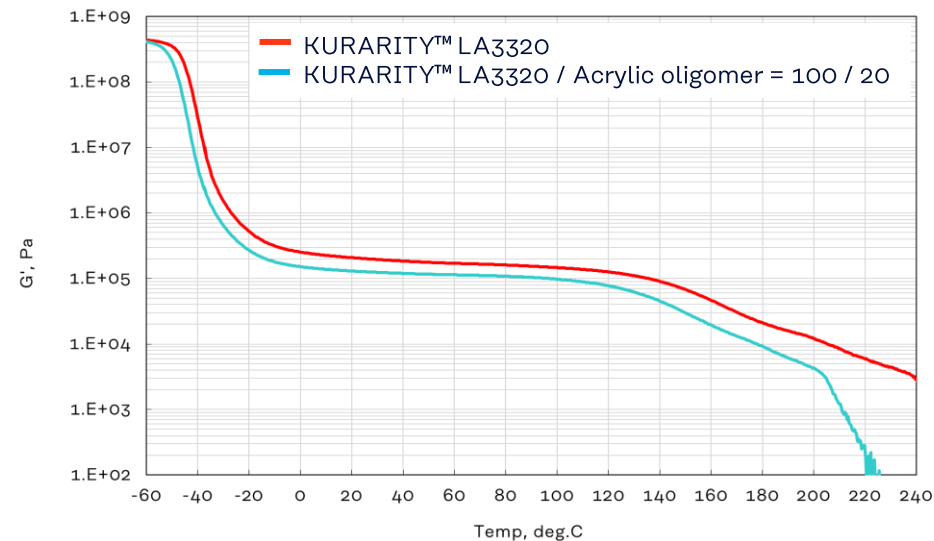
Plasticizer	Description	Additive amount to KURARITY™ LA grades (phr)							
		0	10	20	30	40	50	100	
Acrylic oligomer	Poly butyl acrylate Mw: 11,000								
	Mw: 3,000 Tg: -77 deg.C								
Dibasic or tribasic acid ester	Bis (2-ethylhexyl) sebacate								
	Bis (2-ethylhexyl) adipate								
	Diisodecyl phthalate								
	Acetyl tributyl citrate								
	Dipropylene glycol dibenzoate								
Epoxidized oil	Epoxidized soybean oil								
	Epoxidized linseed oil								
polyol	Polypropylene glycol								
Process oil	Naphthenic oil								
Liquid rubber	Liquid isoprene rubber								
	Liquid butadiene rubber								

Compatibility with Plasticizer

KURARITY™ has good compatibility with acrylic oligomer, dibasic acid ester and tribasic acid ester. Each KURARITY™ LA grades show similar compatibility. Similar tendency is shown in KURARITY™ LK grade.

Effect of Plasticizer

Addition of acrylic oligomer (Mw: 3,000, Tg = -77 deg.C) ➔ Tg of the PnBA block shifts to a lower temperature



Formulation guidelines

			Affect			Viscosity
Material	Parameter	Direction	Tack	Adhesion	Cohesion	
KURARITY™	PMMA ratio	low	↗	↘	↘	↘
	Molecular weight	high	→	↗	↗	↗
	KURARITY™ LA2114 ratio	high	↗	↘	↘	↘
Tackifier	Amount	High	↘	↘	↘	↘
	Softening point	High	↘	↘	↗	↗
Plasticizer	Amount	High	↗	↘	↘	↘

KURARITY™ based hot melt PSA formulations for masking tape

Formulation			Ref.1	Ex.1	Ref.2	
KURARITY™	KURARITY™ LA3320		100	100	100	
Tackifier	Styrene type polymer (Softening point: 85 deg.C)			25	15	
	Styrene type polymer (Softening point: 100 deg.C)		35			
Plasticizer	Diocetyl sebacate		35	40	50	
	Acrylic oligomer A ¹⁾			35	25	
Methods		Conditions	Units			
180° Peel adhesion [ISO 29862-2007]	to SUS to PE	after 24 hr 23 deg.C, 50 %RH / after 168hr, 60 deg.C	N / 25 mm	2.6 / 12 0.20 / 1.3	2.2 / 8.4 0.14 / 0.40	2.1 / 5.5 0.10 / 0.30
Loop tack [ASTM D6195]	to PMMA	23 deg.C, 50 %RH	N	4.1	2.4	2.1
SAFT [ASTM D4498]	to SUS	0.5 kgf, 0.5 deg.C / min	deg.C	102	104	107
Shear adhesion [ASTM D3654M]	to SUS	1.0 kgf, 1000 min, 60 deg.C	mm	0.3	0.1	0
Adhesion at 90° angle and constant stress [In-house method]	to PMMA	20 gf, 23 deg.C, 50%RH, 15mm width,100mm length after 60 min	mm	2	5 min↓*	2 min↓*
Melt viscosity [ASTM D3236]	180 deg. C		mPa·s	16,800	9,500	12,900
	160 deg. C		mPa·s	75,600	49,700	79,600
	140 deg. C		mPa·s	477,000	376,000	738,000

1) Tg: -45 deg.C, visc. 20,000-50,000 mPa·s

※ Toluene solution coating to PET film, adhesive layer : 25 μmt, base layer : PET 50 μmt
* Time to failure

Higher adhesion hot melt PSA formulations using KURARITY™ LA3710

Formulation		Ref.1	Ex.1	Ref.2	Ex.2	Ref.3	Ex.3		
KURARITY™	KURARITY™ LA3320	100		100		100			
	KURARITY™ LA3710		100		100		100		
Tackifier	Styrene type polymer (SP=100 deg.C)	35	35	110	110	25	25		
Plasticizer	DOS (Dioctyl sebacate)			40	40				
	Acrylic oligomer A ¹⁾	15	15			75	75		
Methods		Conditions	Units						
180° Peel adhesion [ISO 29862-2007]	to SUS	after 24 hr @23 deg.C, 50 %RH	N	18	14	20	16	8.9	11
	to PE		/ 25 mm	4.9	8.7	4.7	5.1	5.7	5.8
	to PMMA			19	17	15	14	11	9.8
Loop tack [ASTM D6195]	to PMMA	23 deg.C, 50 %RH	N	18	21	18	17	15	14
Ball tack [JIS Z0237]		23 deg.C, 50 %RH		4	6	5	5	3	5
SAFT [ASTM D4498]	to SUS	0.5 kgf, 0.5 deg.C / min	deg.C	131	120	92	68	124	109
Adhesion at 90° angle and constant stress [In-house method] ²⁾	to PMMA	200 gf	mm	51	31	-	-	-	-
		100 gf		-	-	54 min↓*	9	-	-
		40 gf		-	-	-	-	78 min↓*	64
Melt viscosity [ASTM D3236]		180 deg. C	mPa·s	384,000	144,000	4,200	4,300	72,500	38,000
		160 deg. C	mPa·s	>3,300,000	634,000	13,600	6,400	449,000	148,000
		140 deg. C	mPa·s	>3,300,000	>3,300,000	68,500	16,200	>3,300,000	855,000

1) Tg: -45 deg.C, visc. 20,000-50,000 mPa·s

2) 23 deg.C, 50%RH, 15mm width, 100mm length after 60 min

※ Toluene solution coating to PET film, adhesive layer : 25 μm, base layer : PET 50 μm

* Time to failure

KURARITY™ LA3710 base formulations show **better adhesive performances.**

KURARITY™ hot melt PSA formulations for high, middle, and low adhesion

Formulation				Ex.1	Ex.2	Ex.3	Ex.4	Ex.5
KURARITY™	KURARITY™ LA2140			70				
	KURARITY™ LA3320			30	100	100	100	100
Tackifier	Rosin ester A (Softening point: 88 deg.C)			35		35		
	Rosin ester B (Softening point: 57 deg.C)						60	60
	Styrene (St) type polymer (Softening point: 100 deg.C)				115			
Plasticizer	DOS (Dioctyl sebacate)				40			
	DOTP (Dioctyl terephthalate)						15	
	Acrylic oligomer B ¹⁾			20		90		48
Methods		Conditions		Units				
180° Peel adhesion [ISO 29862-2007]	to SUS	after 24 hr, 23 deg.C, 50 %RH	N / 25 mm	11	13 ^{cf}	5.9	14.9	6.0
	to PE			9.4	5.5 ^{ss}	5.4	4.6	5.7
Ball tack [JIS Z0237]		23 deg.C, 50 %RH		4	5	7	8	8
SAFT [ASTM D4498]	to SUS	0.5 kgf, 0.5 deg.C / min	deg.C	123	91	102	111	100
Shear adhesion [ASTM D3654M]	to SUS	1.0 kgf, 1000 min, 60 deg. C	mm	2.3	137 min↓*	73 min↓*	883 min↓*	78 min↓*
Melt viscosity [ASTM D3236]	180 deg. C		mPa·s	24,000	1,900	24,800	14,000	11,000
	160 deg. C		mPa·s	148,000	4,800	166,000	70,000	51,000
	140 deg. C		mPa·s	1,610,000	19,000	1,890,000	590,000	400,000

1) Tg: -45 deg.C ss: stick slip cf: cohesion failure ※ Toluene solution coating to PET film, adhesive layer : 25 μmt, base layer : PET 50 μmt

* Time to failure

KURARITY™ hot melt PSA formulations using KURARITY™ LA2114

Formulation			Ref.1	Ref.2	Ex.1	Ex.2	
KURARITY™	KURARITY™ LA2140		100		100	100	
	KURARITY™ LA2330			100			
	KURARITY™ LA2114				150	150	
Tackifier	St oligomer (Softening point: 100 deg.C)				60	30	
	Hydrogenated rosin ester (Softening point: 85 deg.C)					30	
Methods		Conditions	Units				
180° Peel adhesion [ISO 29862-2007]	to SUS	after 24 hr @23 deg.C, 50 %RH	N / 25 mm	15	17	19	15
	to PE			0.4	0.7	2.7 ^{ss}	11
	to Glass			12	16	18	16
SAFT [ASTM D4498]	to SUS	0.5 kgf, 0.5 deg.C / min	deg.C	145	170	66	90
Loop tack [ASTM D6195]	to PMMA	23 deg.C, 50 %RH	N	4.8	11	21	18
Ball tack [JIS Z0237]		23 deg.C, 50 %RH		5	7	< 2	4

ss: stick slip

※ Toluene solution coating to PET film, adhesive layer : 25 μmt, base layer : PET 50 μmt

By using KURARITY™ LA2114 and hydrogenated rosin ester, adhesion to PE is improved.

Comparison KURARITY™ LA2114 with other acrylic oligomers as plasticizer

Formulation			Ref.1	Ex.1	Ex.2	Ex.3	
KURARITY™	KURARITY™ LK9243		100	100	100	100	
Tackifier	Hydrogenated Rosin ester (Softening point: 85 deg.C)			35	35	35	
Plasticizer	Acrylic oligomer A ¹⁾			50			
	Acrylic oligomer C ²⁾				50		
	KURARITY™ LA2114					50	
Methods		Conditions	Units				
180° Peel adhesion [ISO 29862-2007]	to SUS to PE	after 24 hr, 23 deg.C, 50 %RH	N / 25 mm	7.4 0.60	2.0 2.2	13 8.9	11 6.2
Loop tack [ASTM D6195]	to PMMA	23 deg.C, 50 %RH	N	11	8.2	10	15
SAFT [[ASTM D4498]	to SUS	0.5 kgf, 0.5 deg.C / min	deg.C	137	88	61	99
Shear adhesion [ASTM D3654M]	to SUS	1.0 kgf, 1000 min, 60 deg. C	mm	0.8	84 min↓*	3 min↓*	675 min↓*
Melt viscosity [ASTM D3236]	180 deg. C		mPa·s	>8,610,000	No data ³⁾	-	25,700
	160 deg. C		mPa·s	-	No data ³⁾	2,500	113,700
	140 deg. C		mPa·s	-	No data ³⁾	7,300	479,800

1) Tg: -45 deg.C, visc. 20,000-50,000 mPa·s at 23 deg.C,

2) Tg: -31 deg.C, visc. 4,500 mPa·s at 25 deg.C,

3) Plasticizer was separated from polymer.

※ Toluene solution coating to PET film, adhesive layer : 25 μmt, base layer : PET 50 μmt

* Time to failure

By using KURARITY™ LA2114 as plasticizer,

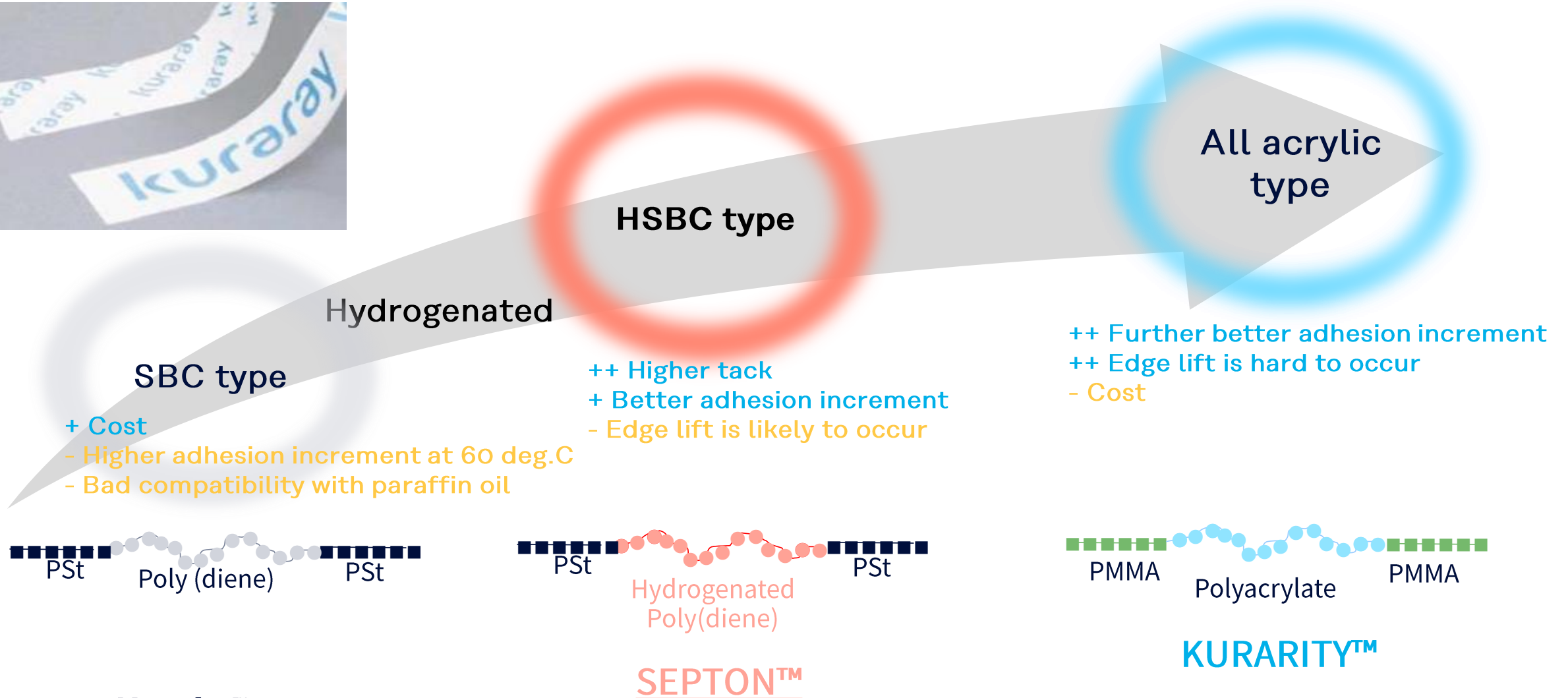
it is easy to control the balance of adhesive performance and heat resistance.



4. Comparison with SBC base hot melt PSA

Introduction

Why SEPTON™ or KURARITY™ hot melt formulations for removable tape application?



Properties of SEPTON™ or KURARITY™ HM-PSA formulations

				Ref.1	Ref.2	Ex.1	Ex.2	Ex.3	Ex.4	Ex.5	Ex.6	
SEPTON™	SEPTON™ 2063					100						
	SEPTON™ 4033						100					
	SEPTON™ 8007							100				
SBC	Conventional SBS			100	100							
KURARITY™	KURARITY™ LA3710								100	100	100	
Tackifier	Hydrogenated C9 resin (Softening point: 90 deg.C)			100	100	150	250	200				
	St oligomer (Softening point: 85 deg.C)									20		
	St oligomer (Softening point: 141 deg.C)								60	40	40	
Oil	Paraffinic oil (visc. 90 mm ² / sec at 40 deg.C)					100	150	100				
	Naphthenic oil (visc. 100 mm ² / sec at 40 deg.C)			100								
	Naphthenic oil (visc. 68 mm ² / sec at 40 deg.C)				100							
	Diocetyl Sebacate (DOS)								40	40	40	
	Acrylic oligomer (Tg=-45 deg.C, visc. 20,000-50,000 mPa·s at 23 deg.C)								35	35	55	
Methods		Conditions		Units								
180° Peel adhesion [ISO 29862-2007]	to SUS	after 24 hr, 23 deg.C, 50 %RH		N / 25 mm	5.6	4.3	11	10	14	7.6	11	7.5
	to SUS	after 168hr, 60 deg.C		N / 25 mm	14 ^{tr}	15 ^{Bl}	18	20	17	11	12	8.7
	to PE	after 24 hr, 23 deg.C, 50 %RH		N / 25 mm	2.5	1.3	8.3	5.1	6.7	1.2	0.80	0.38
SAFT [ASTM D4498]	to SUS	0.5 kgf, 0.5 deg.C / min		deg.C	94	105	64	82	91	87	82	90
Loop tack [ASTM D6195]	to SUS	23 deg.C, 50 %RH		N	13	12	19	17	21	7.9	6.4	4.4
Adhesion at 90° and constant stress [In-house method]		50gf, 23 deg.C, 50%RH, 15mm width, 100mm length after 60 min		mm	18 min↓*	6 min↓*	9 min↓*	18 min↓*	17 min↓*	3	2	2
Melt viscosity [ASTM D3236]		160 deg.C		mPa·s	22,000	76,600	6,360	4,590	11,600	21,500	18,700	33,600
		140 deg.C		mPa·s	72,800	681,000	13,300	13,100	51,900	70,300	61,000	138,000

SEPTON™ HSBC base
+ Better adhesion increment

KURARITY™ base
++ Further better adhesion increment
++ Edge lift is hard to occur

tr: transfer mode
BL: Bleed out
* Time to failure

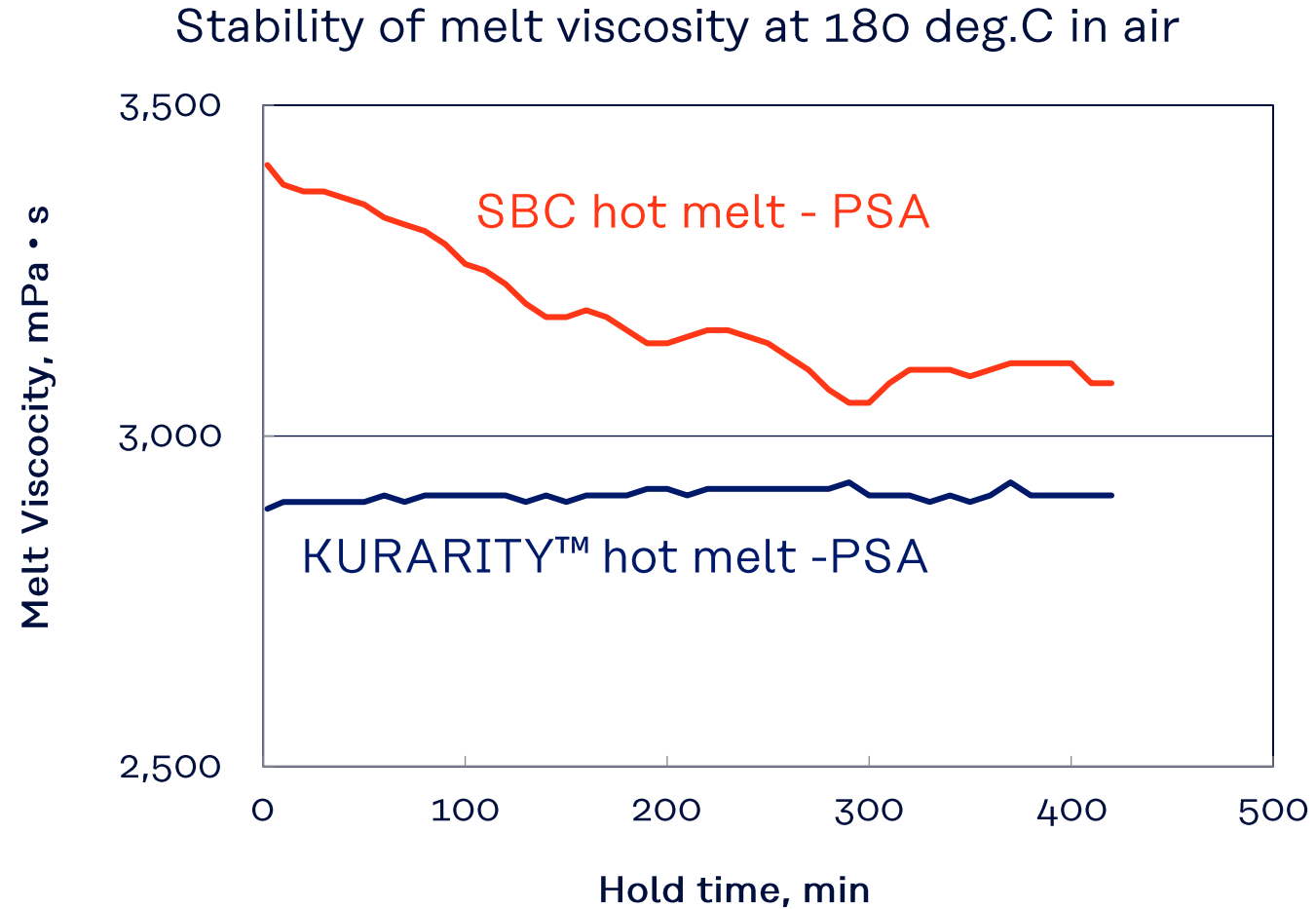
Toluene solution coating to PET film,
adhesive layer : 25 μmt,
base layer : PET 50 μmt

Thermal stability of KURARITY™ and KURARITY™ hot melt PSA formulations

Sample		Melt viscosity at 180 deg.C [mPa · s]	Exposed time [hr] at 180 deg.C					
			0	1	3	6	9	24
Pure KURARITY™	KURARITY™ LA2140	-						
KURARITY™ base hot melt PSA	KURARITY™ LA2140 / St oligomer (Softening point: 100 deg.C) = 100 / 40	4,100						
SBC base Hot melt PSA	Removable grade	3,500						
	Permanent grade	2,100						

KURARITY™: [Good thermal stability](#)
 Adhesive formulation using KURARITY™: [St oligomer, hydrogenated type resin is better](#)

Thermal stability of KURARITY™ hot melt PSA formulations









KURARITY™ hot melt -PSA showed excellent stable melt viscosity.



5. KURARITY™ recommended antioxidant prescription

Antioxidant prescription

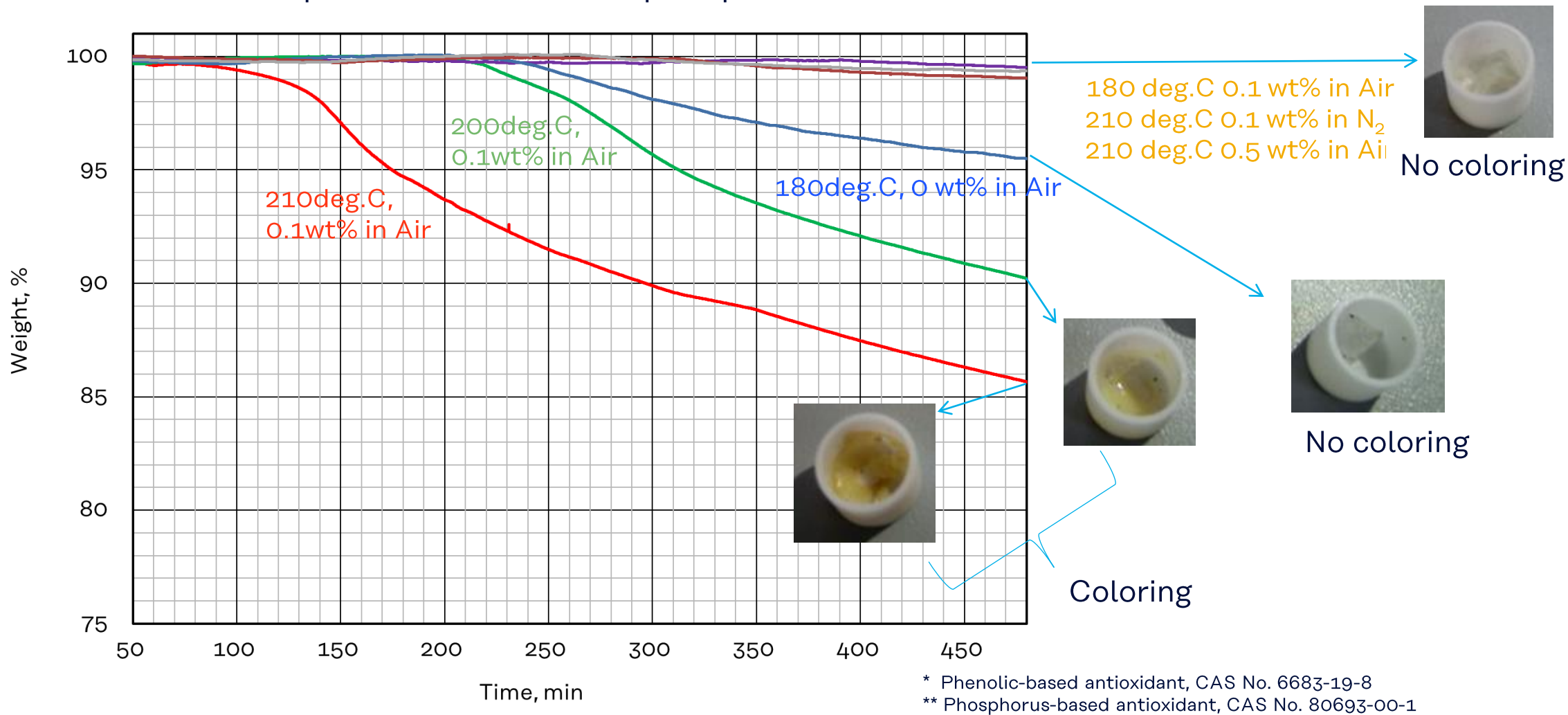
	Without any antioxidant	Phenolic-based/ Phosphorus 0.05 phr each	Phenolic-based/ Phosphorus 0.10 phr each
Initial			
Final (190 deg.C, 15 hrs)			

Phenolic-based antioxidant, CAS No. 6683-19-8
Phosphorus-based antioxidant, CAS No. 80693-00-1

The combination of phenolic-based (primary) and phosphorus-based (secondary) antioxidant is preferable.

Thermogravimetric analysis of KURARITY™ LK9243

- Effect of addition of phenolic-based* and phosphorus-based** antioxidant



The combination of phenolic-and phosphorus-based antioxidant is preferable, especially below 200 deg.C .



6. KURARITY™ recommended kneading and washing method

Kneading method of acrylic hot melt adhesives / washing of hot melt melter

<Recommended kneading method>

- Kneading system with open batch or closed pressurized batch
- Continuous extrusion type such as twin-screw extruder

<Kneading example condition using open batch>

Example formulation:

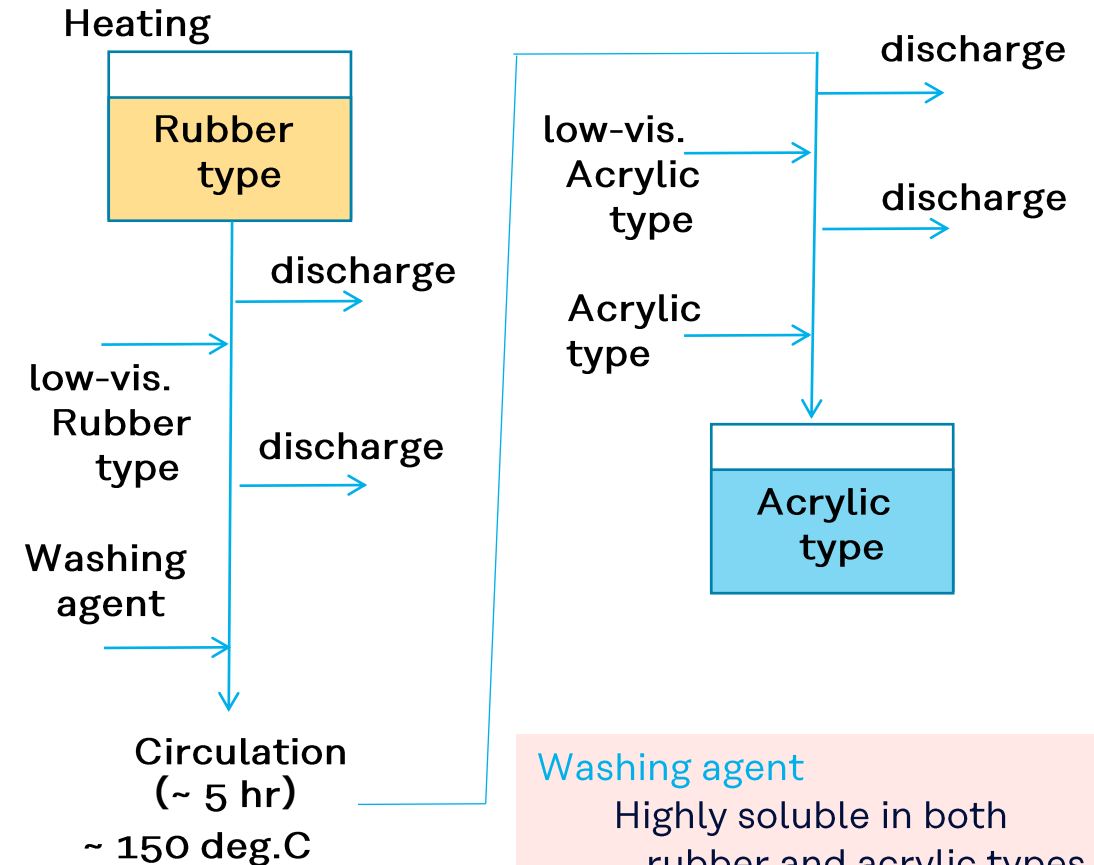
KURARITY™ LA2140 / KURARITY™ LA2114 / tackifier = 100 / 250 / 60

1. Melting KURARITY™ LA2140 (160 deg.C)
2. Adding KURARITY™ LA2114 (145 deg.C)
3. Adding Tackifier / Plasticizer (130 deg.C)



↓
Defoaming

<Recommended washing method>



Washing agent

Highly soluble in both rubber and acrylic types

- Bis (2-butoxyethyl) phthalate
- Hydrogenated rosin ester

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