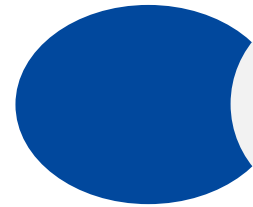




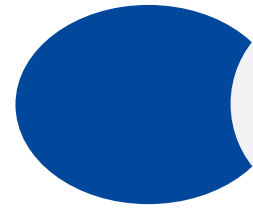
Wanhua water-based wood coating solution

*Wanhua Chemical
Emerging Technology Business Group
Feb., 2021*



C ONTENT

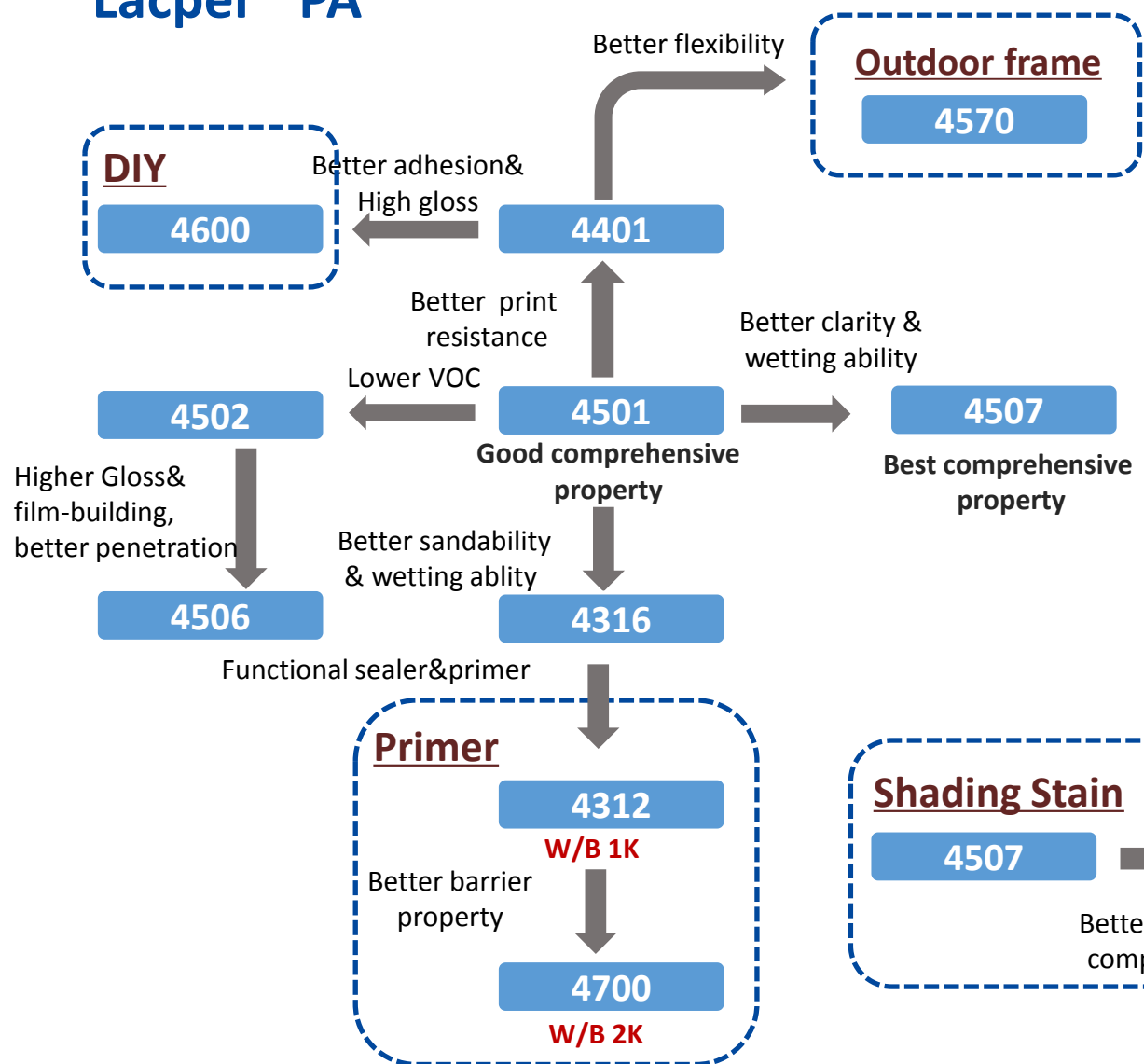
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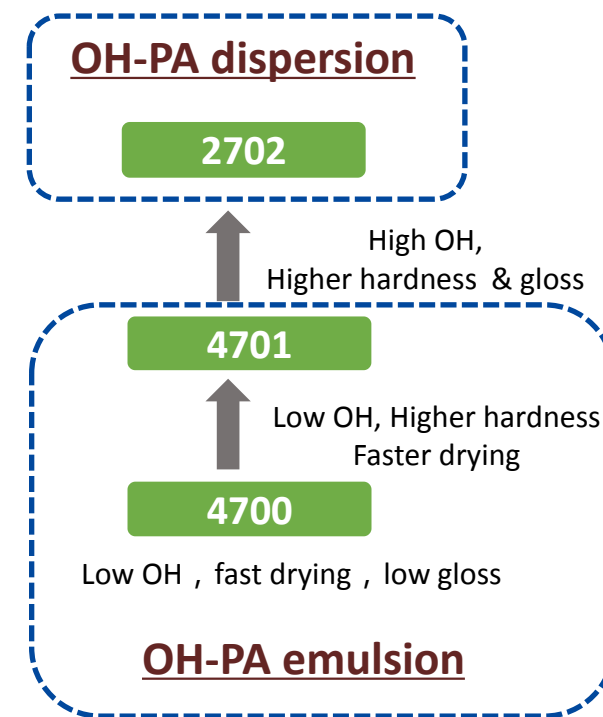
Lacper® PA



Lacper® PUD/PUA



Hydroxyl PA



Product	Type	Solids, %	MFFT, °C	Features
Lacper® 4211	PUD (Aliphatic)	40	47	Solvent free, excellent film-building, good Flexibility, good adhesion.
^{NEW} Lacper® 4219	PUA (Aliphatic)	40	48	Fast hardness development and high hardness, good print resistance
^{NEW} Lacper® 4101	Oil modified PUD	35	49	Good wetting ability on wood substrates, fast film hardness development, good compatibility with alcohol



WB PA Products overview



Product	Type	Solids, %	MFFT, °C	Features
NEW Lacper® 4507	Acrylic emulsion	40	35	Good clarity, good wood warming, good chemical resistance, good ethanol compatibility
NEW Lacper® 4506	SA copolymer emulsion	45	44	High gloss, good film building, good blocking resistance, good adhesion to heat transfer paper
Lacper® 4501	Acrylic emulsion	40	32	Good chemical resistance, good sandability and blocking resistance. Good comprehensive property
Lacper® 4502	SA copolymer emulsion	45	21	Low odor, good sandability, good anti-blocking ability.
Lacper® 4055	Acrylic emulsion	45	21	Good flexibility, excellent water whitening resistance, good weather resistance
Lacper® 4316	SA copolymer emulsion	40	60	Excellent penetration ability, good tannin blocking ability, good anti-blocking and print resistance ability
Lacper® 4312	Acrylic emulsion	40	10	Low MFFT, excellent tannin blocking ability, good formula stability with ZnO.
Lacper® 4401	Acrylic emulsion	41	46	Fast film hardness development speed, excellent anti-blocking and print resistance, good film clarity, good chemical resistance.
Lacper® 4570	Acrylic emulsion	42	5	Excellent flexibility, good blocking resistance, good weather resistance, good water whitening resistance.

Type	Product	Solids, %	OH/NCO, %	Features
OH-PA emulsion	Lacper® 4700	40	1.5	Fast drying speed, good sandability, good film clarity
	NEW Lacper® 4701	43	1.6	Fast hardness development and high hardness, good chemical resistance
OH-PA dispersion	NEW Antkote 2702	46	3.6	No 100# solvent oil, used in 2K bright white/varnish system, high gloss, building up, hardness
Hardener	NEW Aquolin® 168	100	15.7-16.7	Best transparency, high cost-effective, long pot life
	Aquolin® 268	100	20-21	High gloss, high hardness, good compatibility
	Aquolin® 269	100	18.8-19.8	High gloss, good hand mixing, excellent water resistance
	Aquolin® 270	100	21-22	Good hand mixing ability, high gloss, high hardness
	Aquolin® 278	100	21-22	Matting effect, good hand mixing ability, fast drying speed.



Chinese style



American style



Cabinet



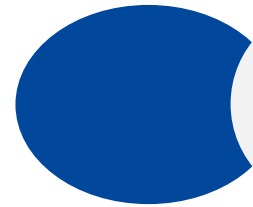
Outdoor



DIY



Flooring



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Lacper® 4211 could be used alone, or combined with PA emulsion.

Hardness, adhesion & chemical resistance of Lacper® 4211 will be greatly improved when adding small amount of hydrophilic modified HDI hardener.

Properties	Lacper 4211	Lacper 4211 + 5% Aquolin 268(in MPA 80% solids)	Lacper 4211 + 5% Aquolin 268
Hand mixing	-	5	3
Dry film transparency	5	5	5
Gloss 20/60,%	59.6/82	63.5/84.5	67.8/86.2
Particle size in 2K, nm	-	109.3	111.4
Pencil hardness	B	F	F
Water resistance, 24h	5	5	5
Alcohol resistance 50%, 1h	3	5	5
Acetic acid resistance 30%, 1h	3	5	5
NaHCO ₃ resistance, 5%, 1h	5	5	5

Case: Add 5% hardener(80% Aquolin® 268 in MPA) to Lacper® 4211 lacquer.

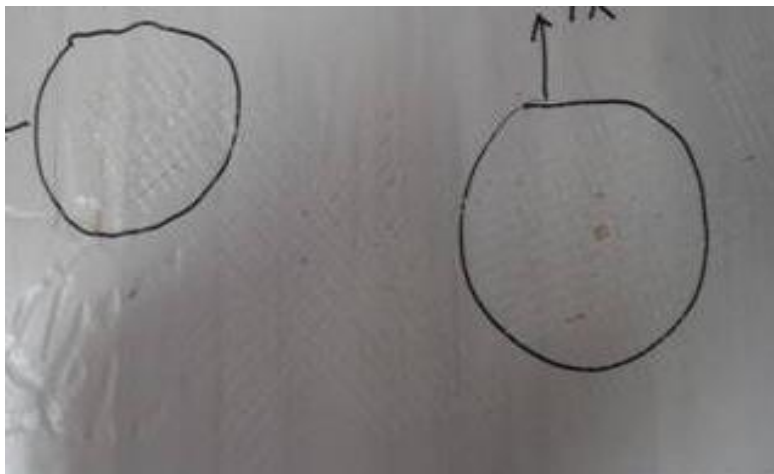
Water immersion test(till adhesion test failed) at RT is increased from 5 days to 7 days on wood-plastic panel.

Good adhesion

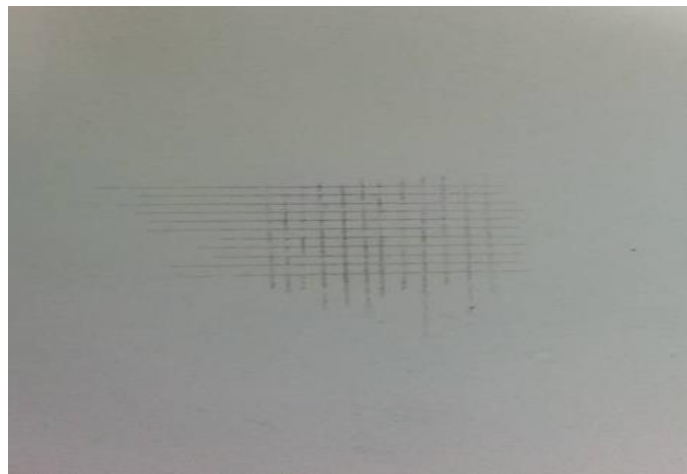
On Wood

On Carbon Steel/Tinplate/Aluminum

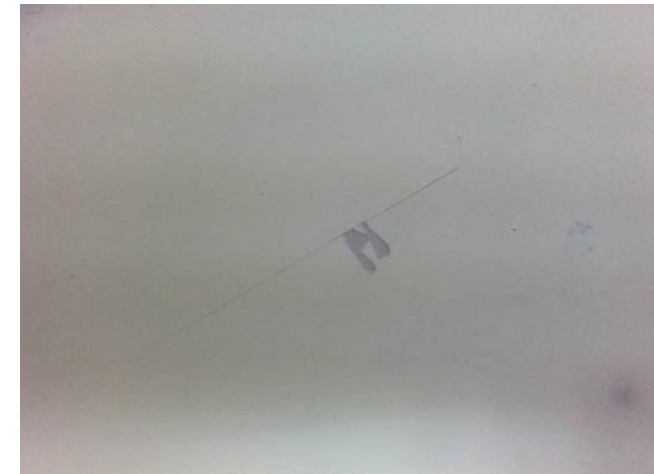
On PU/PVC/Melamine



**On pine + PU, Lacper® 4211
Aquolin 268 could improve the early
adhesion**



**On PVC, white top
Lacper® 4211 + Aquolin® 268
(2% to binder)**

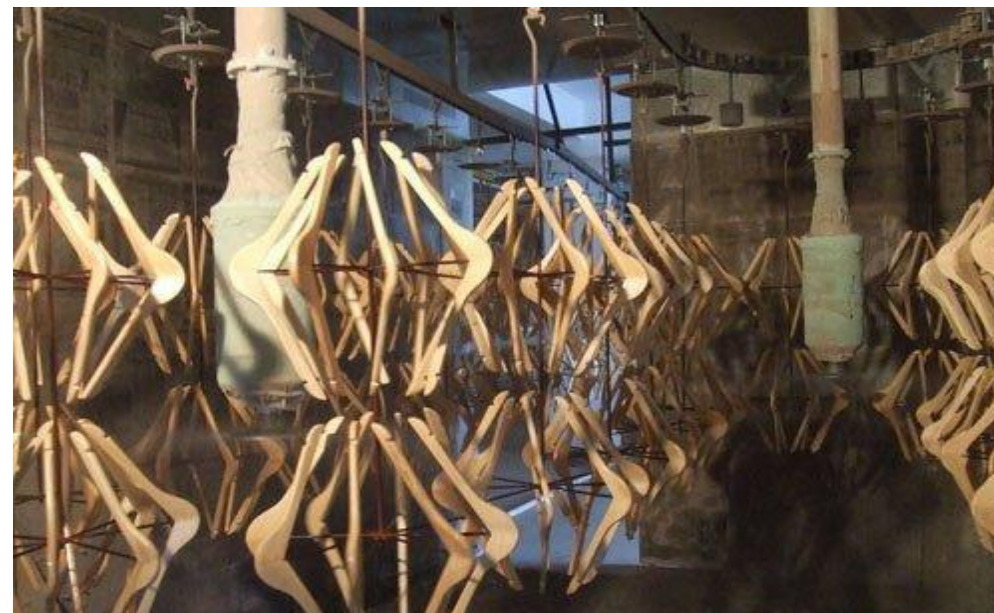


**On melamine, Lacper® 4211
+ Z-6040
(4% to recipe)**

- ✓ Aquolin® 268 could improve the adhesion on PVC/PU/ Plastic-wood.
- ✓ Silane coupling agent Z-6040 could improve the adhesion on melamine.

Excellent workability

- Lacper® 4211 has long open time and fast hardness development
- Lacper® 4211 has excellent wetting and penetration ability
- In WB 1K PA emulsion coating formula, the addition of Lacper® 4211 will obviously improve the workability in high temperature & low humidity environment
- For electrostatic spraying, Lacper® 4211 can obviously enhance spraying effective and improve film-building. It works well in both W/B 1K and 2K coatings.



Lacper 4219 is an acrylic modified polyurethane dispersion specially designed for W/B 1K or 2K clear or pigmented coatings.

Due to its fast film hardness development, Lacper 4219 plays an important role in assembly line which has high demand in short drying and packing time.

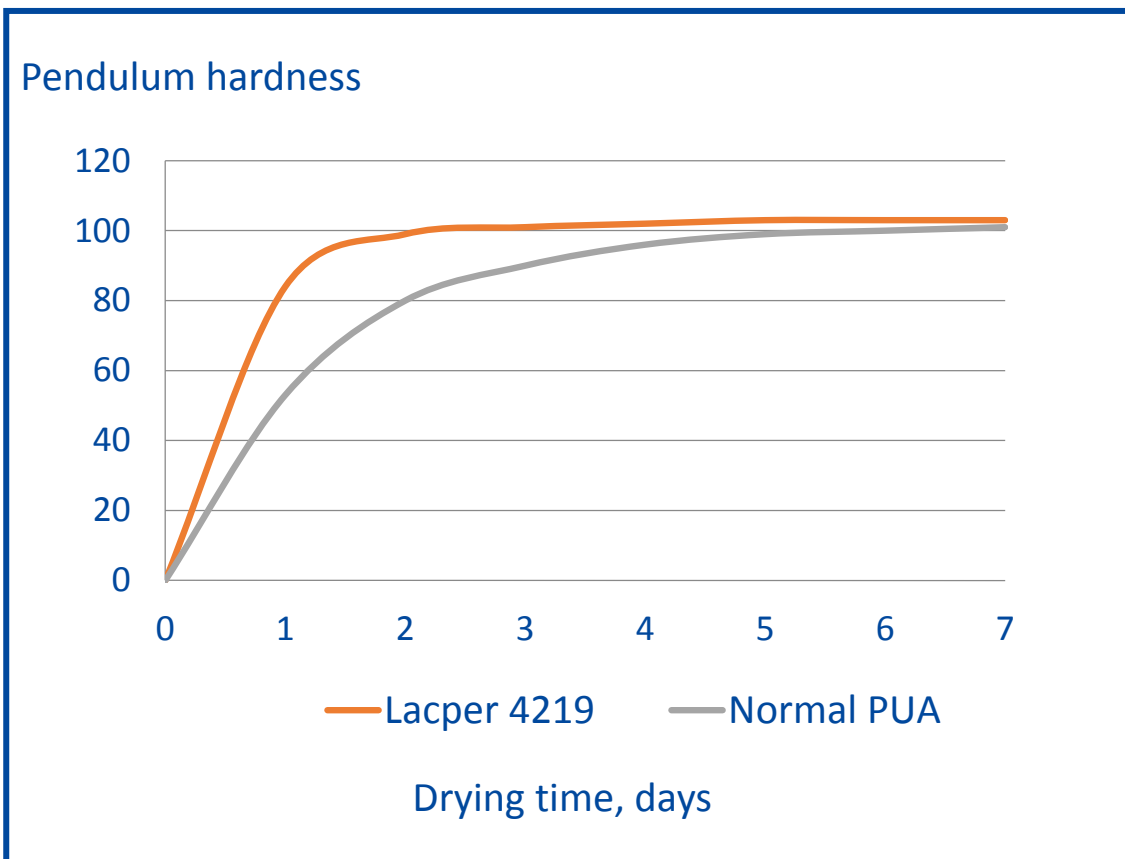
Features

- Fastest hardness development.
- Best print & blocking resistance.
- Highest film hardness.
- Chemical resistance and film hardness can be greatly improved when combine with aziridine, silane, or polyisocynate

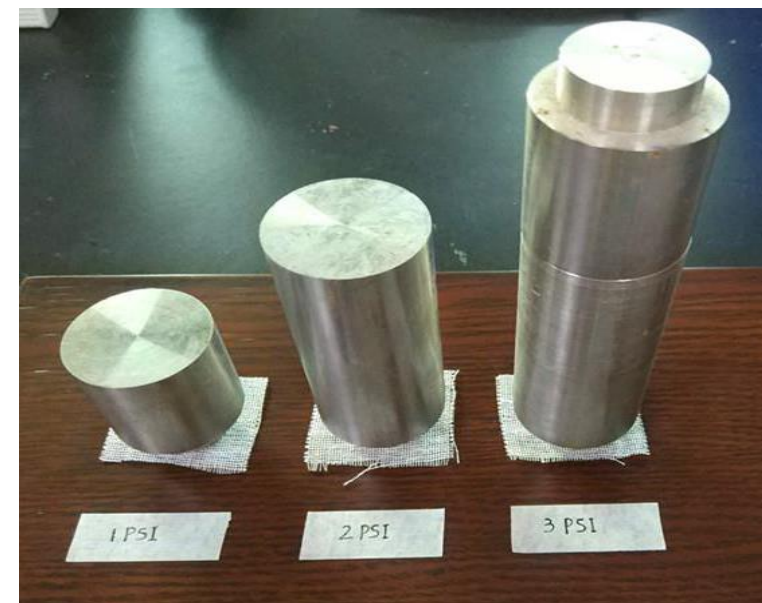


Features

- Fastest hardness development.

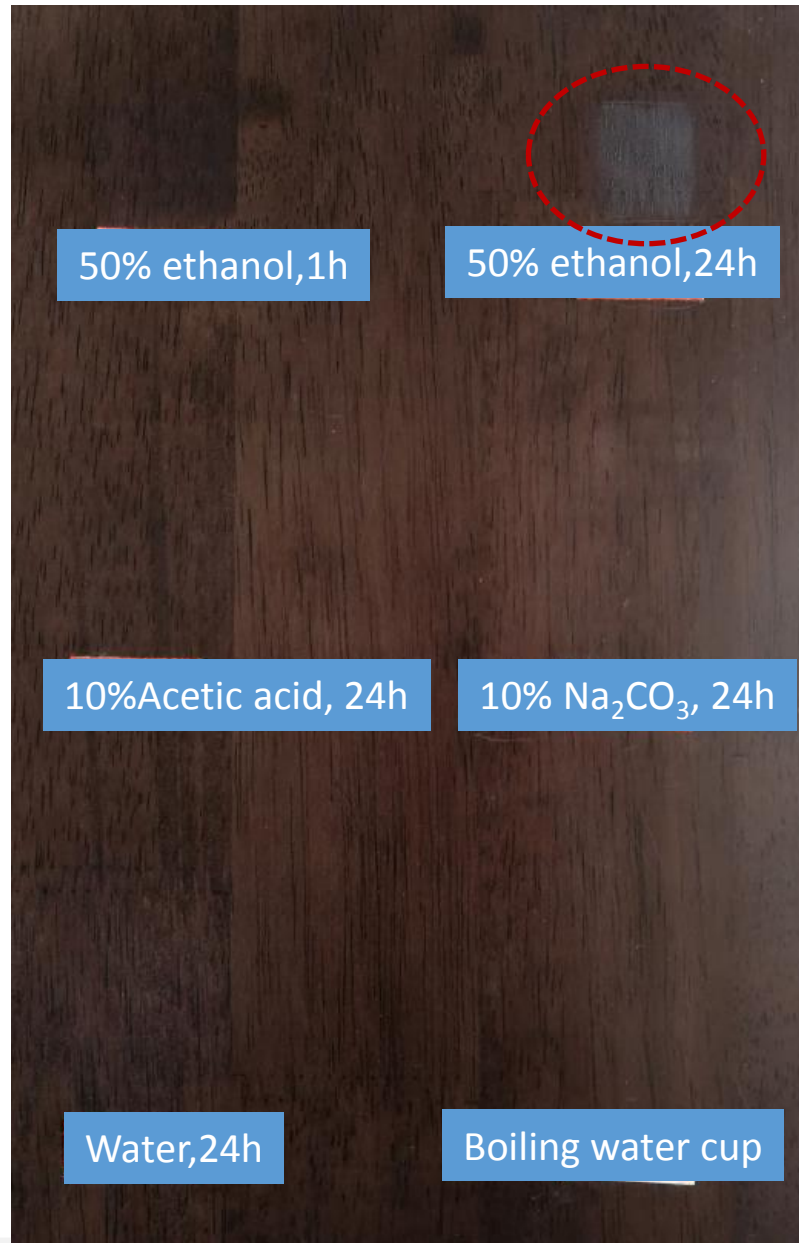


- Good print resistance



Items		Lacper® 4219	Normal PUA
Early print resistance*	1PSI	Pass	Pass
	2PSI	Pass	Fail
	3PSI	Pass	Fail

Early print resistance*: WFT 100um, RT 10min, 40'C baking 1.5h, cooling 10mins, Testing time 16h



←
1K

→
2K



Items		Lacper® 4219	Normal PUA	Hard PA emulsion	High clarity PA emulsion
Wet film		translucent, 4	translucent,4	milky white,2	Best clarity,5
Film building		Good, STD, 4	similar,4	Worse,3	similar,4
Drying speed (20°C, 50-55%RH)	Touch dry	15-20min	15-20min	15-20min	25-30min
	Hard dry	40-45min	50-55min	60-65min	65-70min
Early print resistance*	1PSI	Pass	Pass	Pass	Pass
	2PSI	Pass	Fail	Fail	Fail
	3PSI	Pass	Fail	Fail	Fail
Blocking resistance*		MM: A-0	MM: B-0	MM: B-0	MM: D-2
Mitsubishi pencil Hardness(on glass)		F	HB	B	2B
Scratch resistance		4,STD	4,similar	3+,worse	2,worse
Sandability*		4,no sticky	4,no sticky	3+,slight sticky	3,slight sticky
Penetration		4,STD	3,worse	3,worse	4,worse
Wood warming		4,STD	3,worse	2,worse	5, better
Yellowing resistance*,ΔE		< 1	< 1	< 1	< 1
Chemical resistance*	Water,24h	5, no mark	4, slightly whitening	5, no mark	5, no mark
	Boiling water, 2h	4, slightly whitening, recoverable	3, obviously whitening, recoverable	4, slightly whitening, unrecoverable	3,whitening, unrecoverable
	10% Acetic acid, 24h	4, gloss change	4, gloss change	4,gloss change	4,gloss change
	10% Soda, 24h	4, gloss change	4, gloss change	4,gloss change	2-,turn black
	50% Ethanol, 1h	2, whitening, recoverable	2, whitening, recoverable	3, whitening, recoverable	2, whitening, recoverable

Early print resistance*: WFT 100um,RT 10min,40°C baking 1.5h,cooling 10mins,Testing time 16h

Blocking resistance*: Pressure 1.4T/m², 55°C, Testing time 5h, test method of Chinese Standard

Sandability*: WFT 100-120um,RT 10mins, ,40°C baking 40mins,320# sanding

Yellowing*: UVA340,Testing time 168h

Chemical resistance*: Mahogany veneer, clear lacquer 3 times, WFT 100um for each layer,50°C baking 48h

Items		Lacper® 4219+10% hardener*	Normal PUA +10% hardener*	Low OH-PA+10%hardener*
Wet film appearance		Clear,4	Clear,4	milky white,3
Dry film clarity		Clear,5	Clear,5	4+,Worse
Film building		Good,4	Worse,4-	Worse,4-
Pot-life,35°C		> 3h	> 3h	> 3h
Drying speed* 20°C, 50-55%RH	Touch dry	25-30min	25-30min	25-30min
	Hard dry	60-65min	70-75min	80-85min
Early print resistance*	0.5 PSI	Pass	Pass	Pass
	1 PSI	Pass	Fail	Fail
	2 PSI	Pass	Fail	Fail
Pencil hardness* (Mitsubish, on glass)		F-H	F	F
Scratch resistance		4, STD	4-, slight worse than STD	4, similar
Sandability*		4, STD	3, worse than STD	3, slight worse than STD
Penetration		4, STD	3, worse than STD	4, similar
Chemical resistance*	Water,24h	5, no mark	5, no mark	5, no mark
	Boiling water,2h	5, no mark	5, no mark	4, slight mark
	10%Acetic acid, 24h	4, slight mark	4, slight mark	4, slight mark
	10%Soda,24h	5, no mark	5, no mark	5, no mark
	50%ethanol,1h	4, slight mark	4, slight mark	4, slight mark

10% hardener*: 75% Aquolin 268 in PMA

Early print resistance*: WFT 100um,RT drying 10minutes,40°C baking 1.5h,cooling 10minutes, Testing tim 16h

Sandability*: WFT 100-120um, RT drying 10min,40°C baking 40 minutes, 320# sanding
Chemical resistance*: Mahogany veneer,W/B 2K clear-W/B 2K matt clear topcoat,
WFT 100um for each layer 50°C baking for 48h

- Good wetting, film build up, film clarity & wood warming
- Fast film hardness development
- Good adhesion on different substrates, such as PU/PE/UV/melamine
- Good stability and compatibility with ethanol and dyes, suitable for shading stain

Characteristic data*

Property	Value	Unit
Appearance	Translucent to milky white liquid	
Non-volatile content	34~36	wt %
pH	7.0-9.0	
MFFT	49	°C
Viscosity, 25 °C	10-500	mPa·s

*Property values represent typical results only and are not to be considered as specifications, subject to specific COA.



Lacper® 4101 - used in full-open clear coating system



- Substrates: Mahogany
- Coating procedure: water-based shading/water-based primer/water-based glaze/water-based clear primer x 2/water-based shading/water-based clear topcoat

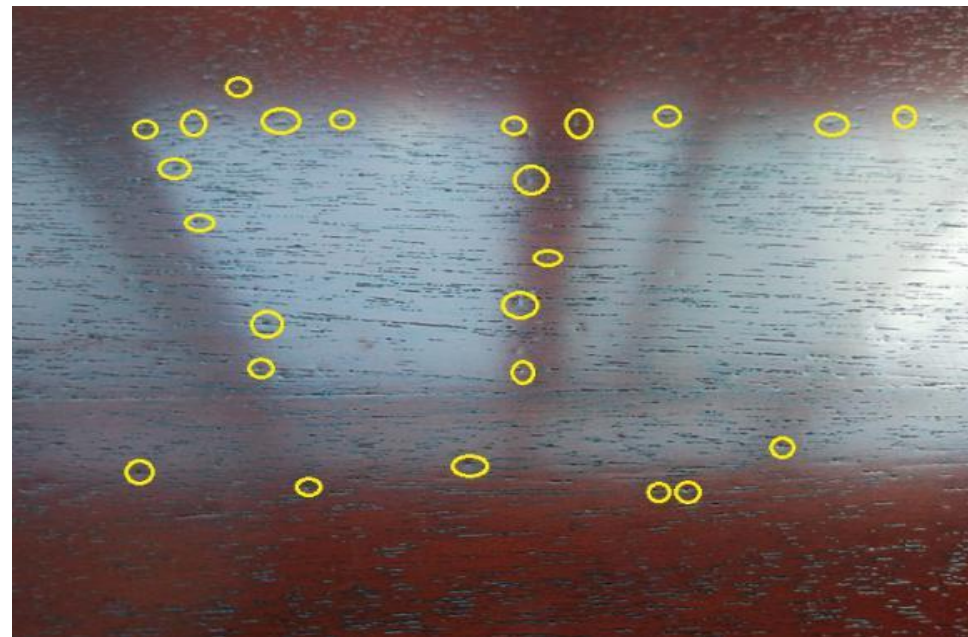
Properties		Lacper 4101 primer/topcoat	Lacper 4101 primer/topcoat+1% Aziridine
Open effect		Good, no dot or crater	Good, no dot or crater
Sandability, RT 1h		Good	Good
Print resistance, 27°C, 55%RH	RT, 4h	2 PSI, Pass	2 PSI, Pass
	RT, 18h	4 PSI, Pass	4 PSI, Pass
Adhesion		5B	5B
Pencil hardness		2B	2B-B
Thermal-cold cycling, 10 times		Pass	Pass
50°C, 85%RH, 24h		Slightly whitening, recoverable	No obvious change
Water resistance, 24h		No obvious change	No obvious change
Boiling water cup resistance, 4h		Slightly whitening	No obvious change
10% acetic acid resistance, 24h		Slightly gloss increase	No obvious change
10% Na ₂ CO ₃ resistance, 24h		No obvious change	No obvious change
50% alcohol resistance	1h	Slightly whitening, recoverable	No obvious change
	24h	Obviously whitening, film crack	No obvious change

Features:

- Good wetting on mahogany, good wood warming effect
- Fast drying, good sandability
- Good early print resistance
- Good application property, slow touch dry, fast hard dry
- Good film build up, good scratch resistance



Lacper® 4101 on mahogany substrate
Excellent penetration without 'crater'



Normal emulsion on mahogany substrate
Lots of 'craters' on the surface

Lacper® 4101 - recommended formula



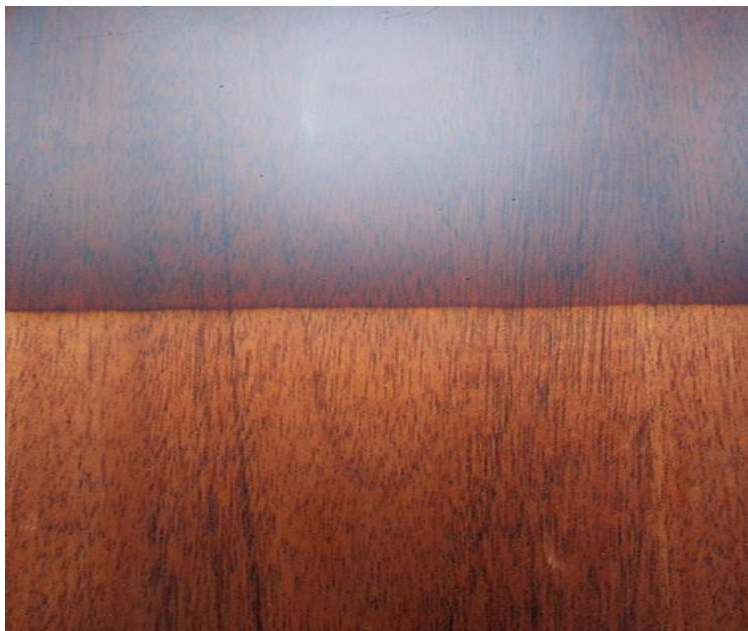
No.	Materials	Weight, %		Functions	Supplier
		Clear primer	Clear topcoat		
1	Lacper® 4101	83	76	PUD resin	Wanhua
2	DI water	4.8	8.1		
3	DPNB	6	6	Coalescent	
4	DPM	3	3	Coalescent	
5	Tego 810	0.1	0.1	Defoamer	Evonik
6	Tego 902w	/	0.1	Defoamer	Evonik
7	BYK- 7420ES	0.1	0.1	Anti-settling agent	BYK
8	Aquacer 539	/	3	Wax dispersion	BYK
9	Tego 410	/	0.3	Leveling agent	Evonik
10	Neptune 5223NR	/	1.8	WB wax powder	SHAMROCK
11	Syloid ED-30	/	0.4	Matting agent	Grace
12	Zinc stearate slurry	2.0	/	Sanding additive	
13	Tego 4100	0.4	0.4	Wetting agent	Evonik
14	Vesmody U300	0.2	0.3	Thickener	Wanhua
15	Vesmody U604	0.2	0.2	Thickener	Wanhua
16	Vesmody U902	0.2	0.2	Thickener	Wanhua
	Total	100	100		

- Substrates: Mahogany
- Coating procedure: water-based clear filler /water-based 2k clear primer, WFT 200~250um x3/water-based shading/water-based 2k clear matt topcoat

Properties		Lacper 4101 primer/topcoat+Aquolin® 268
Sealing effect		Good, smooth, no dot
Sandability, RT 2h		Good
Print resistance, 27'C, 55%RH	RT, 4h	2 PSI, Pass
	RT, 18h	4 PSI, Pass
Adhesion		5B
Pencil hardness		HB-F
Thermal-cold cycling, 10 times		Pass
50'C, 85%RH, 24h		No obvious change
Water resistance, 24h		No obvious change
Boiling water cup resistance, 4h		No obvious change
10% acetic acid resistance, 24h		No obvious change
10% Na ₂ CO ₃ resistance, 24h		No obvious change
50% alcohol resistance	1h	No obvious change
	24h	No obvious change

Features:

- Good sealing effect on wood vessels
- Fast drying, good sandability
- Good application property, slow touch dry, fast hard dry
- Good film build up, good scratch resistance
- Good film hardness



Lacper® 4101 WB 2K lacquer
Excellent sealing effect on wood vessels



Lacper® 4101 WB 2K lacquer
Excellent chemical resistance

Lacper® 4101- 2K clear primer recommended formula

No.	Materials	Weight, %	Functions	Supplier
<u>Preparation of component A</u>				
1	Lacper® 4101	88	PUD resin	Wanhua
2	DI water	1.8		
3	DPNB	3	Coalescent	
4	DPM	4	Coalescent	
5	Tego 810	0.1	Defoamer	Evonik
6	BYK- 7420ES	0.1	Anti-settling agent	BYK
7	Zinc stearate slurry	2.0	Sanding additive	
8	Tego 4100	0.4	Wetting agent	Evonik
9	Vesmody U300	0.2	Thickener	Wanhua
10	Vesmody U604	0.2	Thickener	Wanhua
11	Vesmody U902	0.2	Thickener	Wanhua
	Total	100		

No.	Materials	Weight, %	Function	Supplier
<u>Preparation of component B</u>				
1	Aquolin® 268	75	Hardener	Wanhua
2	DMM	25		
	Total	100		
Component A: Component B: H₂O=10: 1: 1				

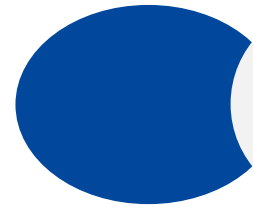


Lacper® 4101- 2K clear matt topcoat recommended formula

No.	Materials	Weight, %	Functions	Supplier
<u>Preparation of component A</u>				
1	Lacper 4101	85	PUD resin	Wanhua
2	DI water	1.1		
3	DPNB	3	Coalescent	
4	DPM	4	Coalescent	
5	Tego 810	0.1	Defoamer	Evonik
6	Tego 902w	0.1	Defoamer	Evonik
7	BYK- 7420ES	0.1	Anti-settling agent	BYK
8	Aquacer 539	3	Wax dispersion	BYK
9	Tego 410	0.3	Leveling agent	Evonik
10	Neptune 5223NR	1.8	WB wax powder	SHAMROCK
11	Syloid ED-30	0.4	Matting agent	Grace
13	Tego 4100	0.4	Wetting agent	Evonik
14	Vesmody U300	0.3	Thickener	Wanhua
15	Vesmody U604	0.2	Thickener	Wanhua
16	Vesmody U902	0.2	Thickener	Wanhua
	Total	100		

No.	Materials	Weight, %	Functions	Supplier
<u>Preparation of component B</u>				
1	Aquolin 268	75	Hardener	Wanhua
2	DMM	25		
	Total	100		
Component A: Component B: H ₂ O=10: 1: 1				





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-

Lacper® 4316

- Excellent wood pore penetration
- Good sandability and anti-blocking ability.
- Good tannin blocking property of white primer.

Application fields:

- Lacper 4316, used as clear sealer or white primer.
- Lacper 4312, combined with Lacper 4316, used as WB 1K white primer with good tannin blocking property.

Lacper® 4312

- Low MFFT, good film formation ability.
- Anion-Cation hybrid system, good tannin blocking
- Good formula stability with ZnO.





Initial tannin blocking
effect of 4312

Tannin blocking effect
after stored (50C, 14d)

Substrate: Red OAK Veneer

The upper part of the picture, application procedure:
Substrate - 4312 clear sealer* - WB 1K white primer.

The bottom half of the picture, application procedure:
Substrate - WB 1K white primer.

4312 clear sealer*: the sealer contains ZnO which act as tannin blocking agent.



Substrate: Solid Pine

The left half of the picture, application procedure:
Substrate - 4316+4312 WB 1K white primer.

The right half of the picture, application procedure:
Substrate - Normal WB 1K white primer.

4316+4312 white primer*: contains ZnO which act as tannin blocking agent.

Lacper® 4570

- Good flexibility.
- Good water whitening resistance.
- Excellent anti-blocking property.
- Good outdoor weather resistance.

Lacper® 4055

- Good flexibility.
- Excellent water whitening resistance.
- Excellent pigment&filler bearing capacity.
- Excellent weather resistance.



Lacper® 4570/ Lacper® 4055 Oxide-iron Red Matt Lacquer

No.	Component	%	Supplier
1	Lacper® 4570	65	WanHua
2	Lacper® 4055	20	WanHua
3	BYK 346	0.4	BYK
4	Tego 901w	0.1	Tego
5	PG	0.5	
6	DPM	2	
7	DPNB	3	
8	H ₂ O	5	
9	TS-100	1.5	Degussa
10	S-482	0.5	Rockwood
11	Tego 100	0.3	Tego
12	BYK 024	0.2	BYK
13	Oxide-iron Red color paste	0.5	
14	Vesmody® U505	1	WanHua
	total	100	

QUV Testing

△E<0.55 (On white tile, WFT 100um, light intensity 0.68w/m², temperature 60°C, exposure time 168hrs.)

Outdoor exposure testing

Substrate: Solid Pine.

Coating procedure: Brush, one layer, WFT 250-300um.

Exposure time: 6 months/12 months



4570



4570/4055



competitor



Outdoor exposure testing result:

- The upper half of the panel is exposure area; The bottom half is covered from sunlight and moisture, as controlled STD.
- After 2 months testing, the exposure area have no visible color difference, no visible film crack or gloss loss.
- After 12 months testing, 4570/4055 red lacquer have best appearance, no mustiness, no film crack, only slight gloss loss.

Lacper® 4501

- Good comprehensive properties:
- Sandability
- Stackability
- Low co-solvent demand
- Good clarity
- Good chemical resistance.



Substrate: Pine

Coatings system: Lacper 4502 clear sealer *2 + Lacper 4501 clear matting topcoat*1

Lacper® 4502

- Low odour, low VOC.
- Good sandability.
- Good blocking resistance.
- High gloss.

Testing items	Result
Appearance	smooth, no fibre raising.
Sandability	easy for sanding, no sticking
Pencil hardness	B
Water resistance, 24h	5
Alcohol resistance 50%, 1h	4
Acetic acid resistance 30%, 1h	5
NaHCO ₃ resistance, 5%, 1h	5

Chemical resistance: 5 is best, 1 is worst.

Lacper® 4507, self-crosslinking & surfactant-free, high performance, best comprehensive properties.

- Fine particle size, good clarity.
- Excellent wood warming effect
- Excellent penetration ability.
- Fast hardness development, good print resistance.
- Good adhesion to UV/PU/PE and melamine substrate.
- Good stability with alcohol.
- Good compatibility with PUD&PUA.
- Good stain resistance.
- Good compatibility with W/B hardener.
- Good chemical resistance.



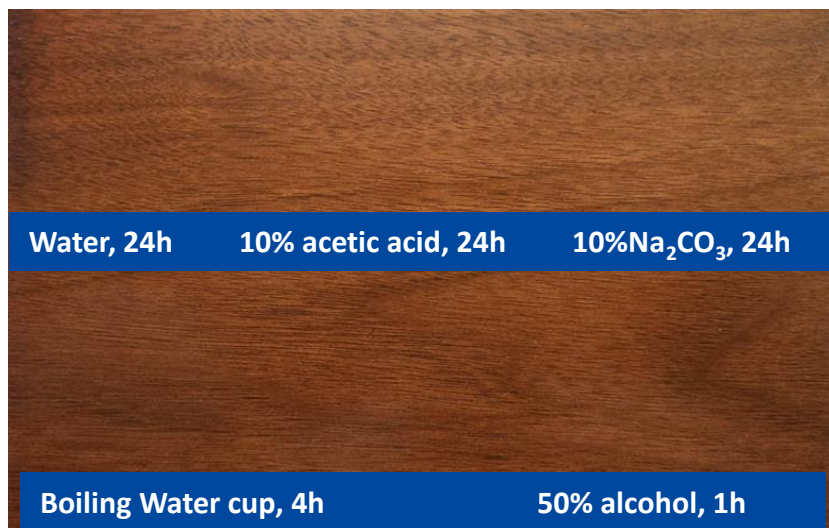
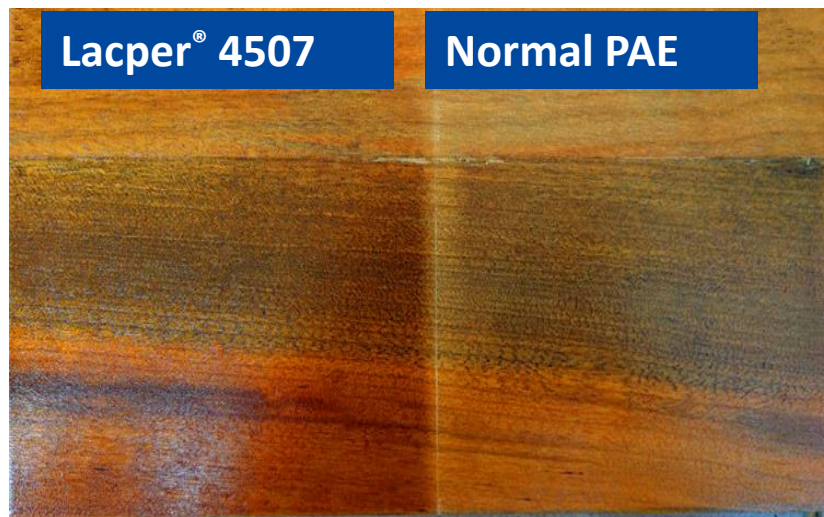
Application: American style furniture, solid wood furniture, wooden door, plate furniture and so on.

Items		Lacper® 4507	Competitor PA-A	Competitor PA-B	Competitor PA-C
Particle size, nm		70-80nm	100-110nm	60-70nm	60-70nm
MFFT, 'C		35	42	40	36
Penetration ability*		4.5, STD	Worse than STD, 3	Slight worse than STD, 4	Slight worse than STD, 4
Drying speed	Touch dry	Slowest, best, 5	Fastest, worst, 2	Slight faster than STD, 4	Slight faster than STD, 4
	Hard dry	Fast, STD, 4	similar, 4	fastest, best, 4.5	similar, 4
Print resistance	Normal humidity	2PSI, pass	2PSI, pass	2PSI, pass	1PSI, pass
	High humidity	1PSI, pass	1PSI, pass	1PSI, pass	0.5PSI, failed
	dry-film	3PSI, pass	3PSI, pass	3PSI, pass	3PSI, pass
Wood warming effect		Good, STD	slight worse	similar	similar
Sandability		Good, STD	similar	similar	similar
Film hardness		B+	B	B-	B-
Adhesion	UV sealer	5B	2-3B	5B	2-3B
	PU sealer	5B	1-2B	5B	1-2B
	PE sealer	5B	2-3B	5B	2-3B
	Melamine	5B	2-3B	5B	2-3B
Stability with ethanol*		Pass	Pass	Failed, gel	Failed, gel
Chemical resistance		Good, 4.5, STD	Similar, 4.5	Worse, 3	Worse, 3
Stain resistance		Good, 4.5, STD	Worse, 2	Worse, 3	Worse, 3
Reactiveness with crossliker		Best, 5, STD	Similar, 5	Worse, 3	Worse, 3

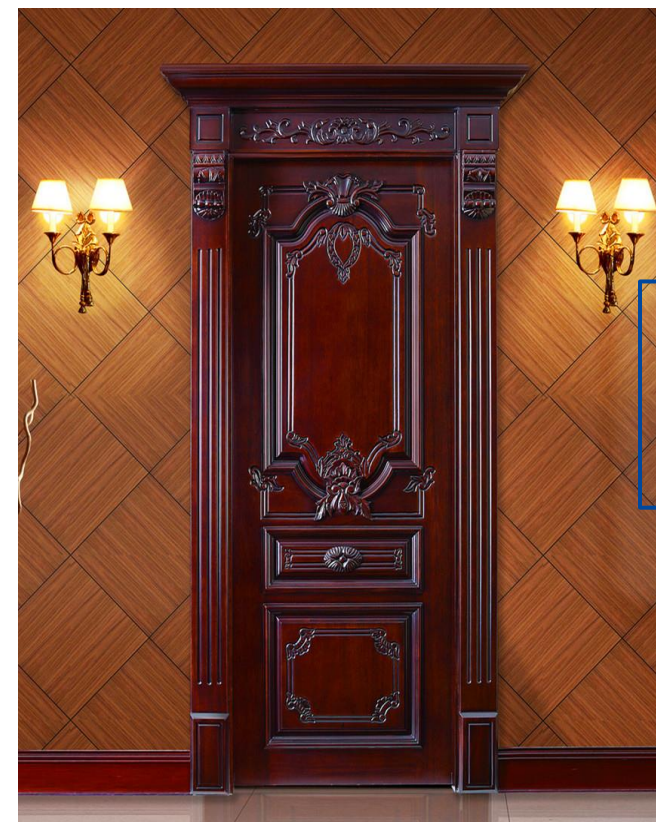
Compared with the best-selling commercialized acrylic emulsion/dispersion, 4507 has the best comprehensive performance.

Lacper[®] 4507 – 1K PA emulsion

Lacper 4507 has excellent wood warming effect/film clarity and chemical resistance



Lacper 4507 has excellent adhesion to S/B UV/PU/PE sealer, so it can be used in W/B coatings for wooden door, clapboard etc..



The topcoat has good adhesion to UV/PU/PE clear sealer

Coating system: S/B UV sealer+4507 Shading stain+4507 W/B 1K clear matt topcoat.

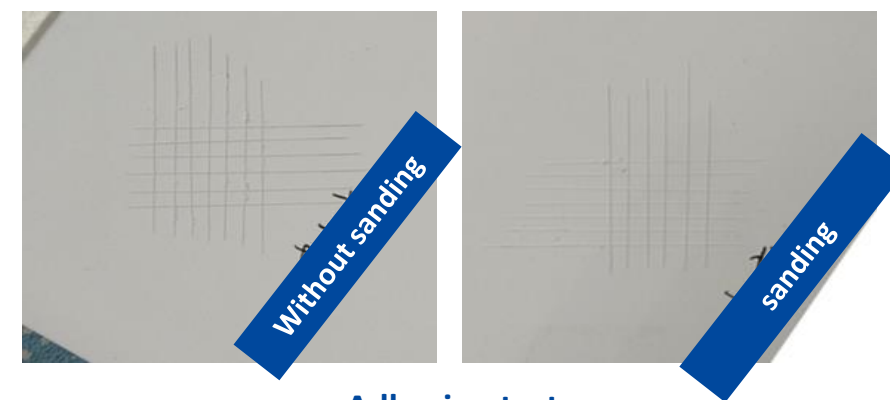
Lacper® 4507 – Used in W/B white topcoat for melamine

- Substrate: MDF+Melamine Veneer
- Coating system:
Substrate +Lacper 4507 matt white topcoat, 100-120um.

Properties		Lacper 4507 white topcoat	Competitor white topcoat
Appearance		Good	Good
Gloss, 60°		21.2	22.5
Early print resistance (27°C, 55%RH)	RT 8h	0.5PSI, pass	0.5PSI, failed
	RT 18h	2PSI, pass	1PSI, pass
Adhesion, cross	Substrate sanded	5B	5B
	No sanding	5B	5B
Hardness, Mitsubishi		HB-F	2B-B
Stain resistance	Black tea(10%), 1h	Slight mark, 4.5	Slight mark, 4.5
	Red wine, 1h	No mark, 4.8	No mark, 4.8
	Coffee(10%), 1h	Slight mark, 4	Slight mark, 4
	Vinegar(6%), 1h	Slight mark, 4.8	Slight mark, 4.8
	Soy sauce, 1h	No mark, 5	No mark, 5



Stain resistance test (1h)



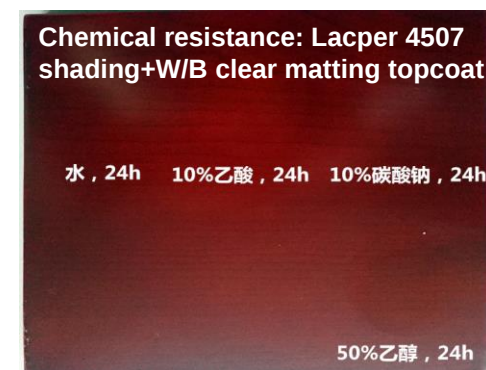
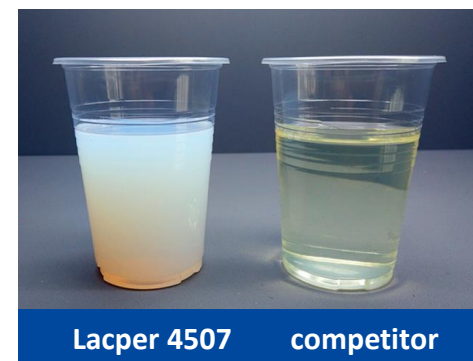
Adhesion test

Lacper® 4507 – Used in fast-drying shading stain

- Good stability with ethanol.
- Good compatibility with dye.
- Good chemical resistance.
- Good compatibility with topcoat.
- Good adhesion to UV/PU/PE.

Comparison of Lacper 4507 & ethanol soluble acrylic in shading stain

Items		Lacper® 4507 shading stain	Competitor shading stain
Appearance		Translucent	clear
odor		slight odor	pungent
VOC		Low	High
Storage 14d, 50°C		No change, pass	No change, pass
Compatibility with dye		Good	Good
Color development*		Good, STD	Slight worse
Shading effect		Good, STD	Slight worse
Adhesion		Good, 5B	Good, 5B
Drying speed	Touch dry	Slow	Fast
	Hard dry	Fast	Slow
Compatibility with W/B clear matt topcoat		Excellent	Bad



Color development* : Add dye to shading stain base, compare the color development of the two samples.

Adhesion* : on UV/PU/PE substrate.

Lacper® 4507 – recommended formula



Materials	Weight, %		Description
	Clear sealer	Clear topcoat	
Lacper® 4507	43.00	42.00	Wanhua, PA emulsion
Lacper® 4101	34.00	30.00	Wanhua, Oil-modified PUD
BYK-190	0.60	0.60	BYK, Dispersant
DI water	12.10	12.00	
DPnB	3.20	3.00	DOW, co-solvent
DPM	3.60	3.60	DOW, co-solvent
Tego 825	0.15	0.20	TEGO, defoamer
Tego 902W	0.10	0.15	TEGO, defoamer
BYK-7420ES	0.15	0.15	BYK, anti-setting agent
Aquacer 539	/	4.00	BYK, wax emulsion
Tego 410	/	0.30	TEGO, slip agent
Neptune 5223NR	/	0.80	SHAMROCK, wax powder
Syloid C805	/	1.00	Grace, matting agent
Sanding Paste	2.00		
Tego 4100	0.40	0.40	TEGO, wetting agent
Surfynol 104E		1.00	TEGO, wetting agent
Vesmody® U300	0.20	0.30	Wanhua, thickener
Vesmody® U604	0.40	0.40	Wanhua, thickener
Vesmody® U902	0.10	0.10	Wanhua, thickener
Total	100.00	100.00	

Lacper 4506 is a styrene-acrylic copolymer emulsion specially designed for cost-effective WB wood coatings. It has excellent comprehensive performance.

- High gloss, high film-building.
- Excellent blocking resistance, especially hot blocking resistance.
- Good print resistance.
- Good adhesion on thermal transfer paper.
- Excellent application ability. Suitable for electrostatic spraying, manual spraying, rolling spraying application etc..
- Good chemical resistance. Pass GB/T 23999-2009.
- Good water resistance

Recommended applications: WB coatings for wooden toys, Rubber wood furniture etc..



Features:

- Good adhesion and drop resistance
- Good print resistance
- Fast drying speed and excellent hot blocking resistance
- Good water resistance
- Good adhesion to thermal transfer paper.



Finished toy products

Lacper 4506- clear coat for rolling application

	Raw Material	%	Supplier
1	Lacper 4506	83	Wanhua
2	AMP-95	0.1	DOW
3	BYK-190	0.3	BYK
4	Tego 810	0.1	TEGO
5	Michem ML190S	8	Michelman
6	Tego 410	0.4	TEGO
7	Water	1.4	
8	DPNB	3	DOW
9	DPM	3	DOW
10	Tego 270	0.3	BYK
11	Vesmody U505	0.1	Wanhua
11	Vesmody U300	0.3	Wanhua
Total		100	

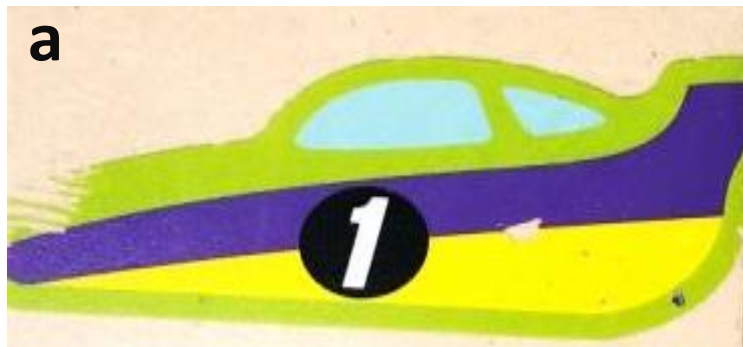
Substrate : MDF

Coating procedure:

- Apply varnish twice, and dry at room temperature for 7 days, and then apply thermal transfer pattern

Thermal transfer condition:

- Conventional thermal transfer paper
- 180°C for 1 second



Benchmark

Lacper® 4506

Substrate: Rubber wood

Coating system: Lacper® 4506 clear sealer × 2.

Appearance: Smooth surface, no grain-puffing.



Substrate: Rubber wood

Coating system: Normal W/B clear sealer × 2.

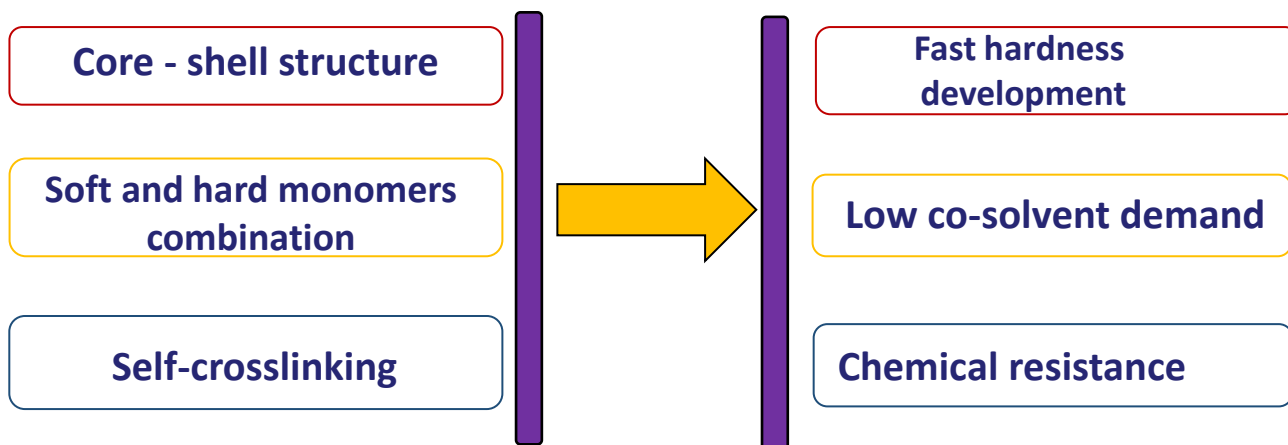
Appearance: Rough surface, lots of grain-puffing.



Lacper® 4506 --W/B clear sealer for Rubber Wood

RM	Weight, %	Description
Lacper® 4506	80.00	Wanhua, PA emulsion
BYK-190	0.80	BYK, dispersion agent
DI.Water	6.10	
DPnB	3.00	DOW, co-solvent
DPM	3.00	DOW, co-solvent
Tego 810	0.15	TEGO, defoamer
Tego 902W	0.10	TEGO, defoamer
BYK-7420ES	0.15	BYK, anti-settling agent
Zinc Stearate Slurry	6.00	
Tego 270	0.30	TEGO, wetting agent
Vesmody® U300	0.20	Wanhua, thickener
Vesmody® U604	0.30	Wanhua, thickener
Vesmody® U902	0.20	Wanhua, thickener
Total	100.00	

Application areas: American style furniture, Chinese furniture, solid wood furniture etc..

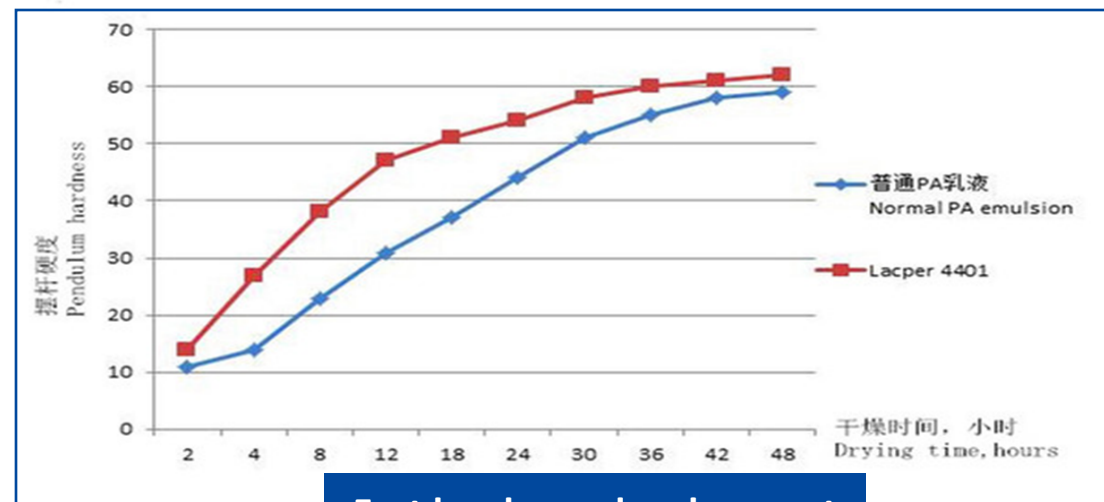


Key words: Lacper® 4401 has the below features among all the acrylic emulsions for wood coatings.

- Highest film hardness.
- Best blocking resistance in high temperature.
- Best print resistance.
- Best chemical resistance with specific formula.
- Combine with soft acrylic emulsion Lacper 4501&4502 to improve hardness, blocking & print resistance.
- Combine with high clarity emulsions Lacper 4507&4508 to improve alkali resistance.

Basic performance

Property	Lacper® 4401
MFFT, °C	46
Non-volatile content	41
Pencil hardness, 7d	B+
Water resistance, 24h	4+
Alcohol resistance 50%, 1h	4+
Acetic acid resistance 30%, 1h	4
NaHCO ₃ resistance, 5%, 1h	4+



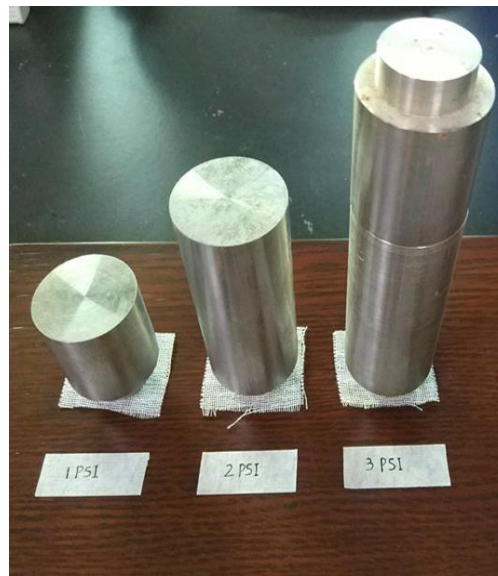
Fast hardness development

Excellent blocking&print resistance



Anti-blocking test method

1. Substrate: Mahogany veneer.
2. Spray 4401 clear lacquer, WFT 120-150um, RT drying for 4h, then test anti-blocking ability.
3. Clear film face to face. Testing pressure is 3.2t/m^2 . Testing time is 18hrs.



Print resistance test

1. Substrate: Oak veneer.
2. Coating procedure: N.G.R stain - 4401 clear sealer - WB Glaze - 4401 clear sealer $\times 2$ - 4509 shading stain - 4401 clear topcoat
3. Test the print resistance after drying for different time.

Testing Items		Testing Results
Anti-blocking property		Seperate the panel easily, there is no film destroyed.
Print resistance*	4401 clear topcoat RT drying for 6hrs.	
	1 PSI*	No print mark, pass.
	2 PSI	Very slight print mark.
	3 PSI	Slight print mark.
	4401 clear topcoat RT drying for 18hrs.	
	1 PSI	No print mark, pass
	2 PSI	No print mark, pass
	3 PSI	No print mark, pass

* PSI, means Pound/Square inch, is equivalent to 703Kg/m^2 .

* Print resistance:

Place medical gauze on film surface, put specific weight on it lasting for 16 hrs, then check the print mark on the film surface. The way is normally used to measure the drying speed of the coating film or the ability of film resisting the weight pressure when transportation. In general, the dry film passing 3PSI print testing at RT, is considered more than enough to avoid any print mark issue.

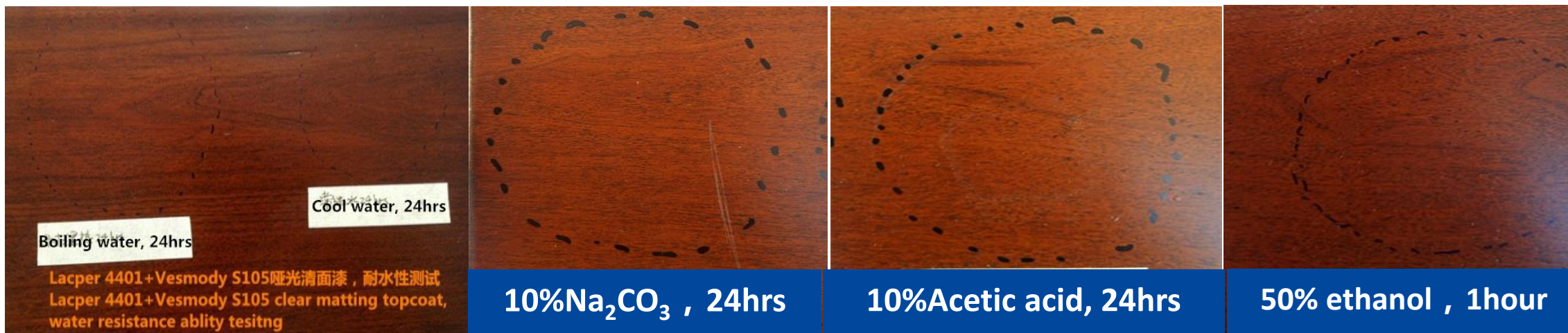
Excellent chemical resistance

1. *Substrate: Cherry Veneer.*

2. Coating procedure : N.G.R stain - 4401 clear sealer
- WB Glaze - 4401 clear sealer × 2 - 4509 shading stain
- 4401matting clear topcoat(use PMMA powder as matting agent).
3. Test the chemical resistance after the finished color panel RT drying for at least 2 weeks.

Testing items	Testing results*
Cool water, 24hrs	5
Boiling water, 24hrs	4+
10%Na ₂ CO ₃ , 24hrs	4+
10%Acetic acid, 24hrs	4+
50% ethanol, 1hour	4+

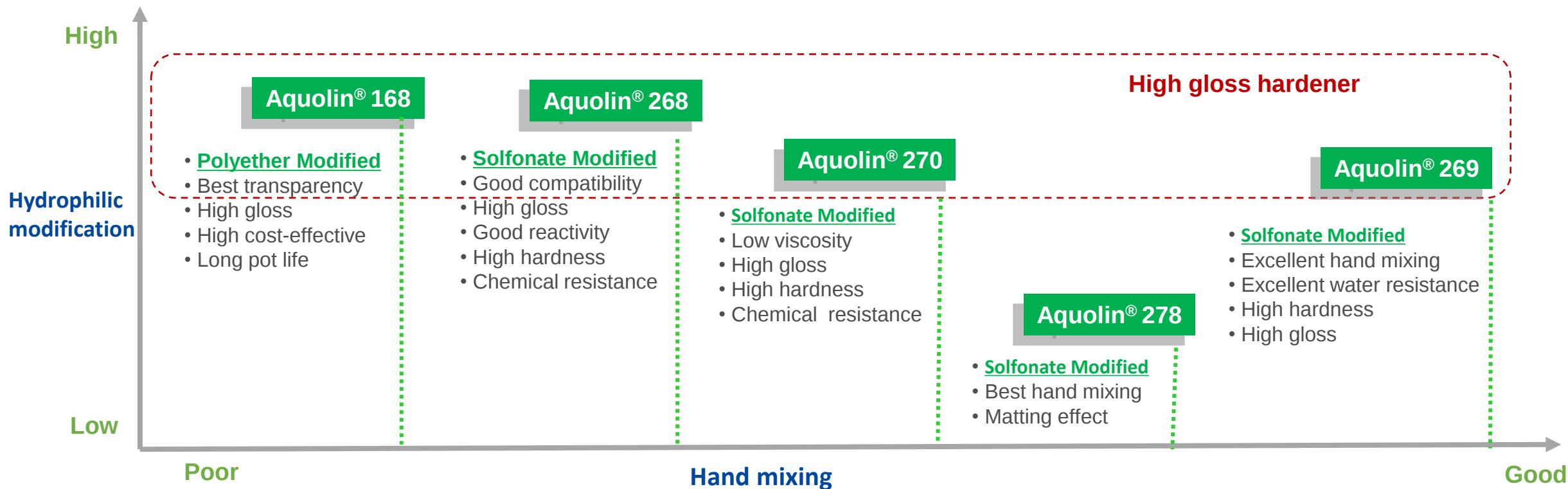
1, Worst , film dissolved or destroyed completely.
2, Film discolored or destroyed seriously.
3, Film whitening obviously.
4, Slight gloss change without any film discolor or whitening.
5, Best, without any testing trace.



CONTENT

- 1 Overview
 - 2 PUD/PUA solution
 - 3 PA solution
 - 4 2K PU solution
-

Type	Product	Solids, %	OH/NCO, %	Features
OH-PA emulsion	Lacper® 4700	40	1.5	Fast drying speed, good sandability, good film clarity
	NEW Lacper® 4701	43	1.6	Fast hardness development and high hardness, good chemical resistance
OH-PA dispersion	NEW Antkote 2702	46	3.6	No 100# solvent oil, used in 2K bright white/varnish system, high gloss, building up, hardness
Hardener	NEW Aquolin® 168	100	15.7-16.7	Best transparency, high cost-effective, long pot life
	Aquolin® 268	100	20-21	High gloss, high hardness, good compatibility
	Aquolin® 269	100	18.8-19.8	High gloss, good hand mixing, excellent water resistance
	Aquolin® 270	100	21-22	Good hand mixing ability, high gloss, high hardness
	Aquolin® 278	100	21-22	Matting effect, good hand mixing ability, fast drying speed.



Product	Hand mixing	Drying speed	Pot-life	Gloss	Water resistance	Hardness
Aquolin® 168	2	3	5	5	3	4
Aquolin® 268	3	5	3.5	4+	4	5
Aquolin® 269	5	5	4	4	5	5
Aquolin® 270	4	5	4	4	4	5
Aquolin® 278	5-	5	5	1	2	5

2K : Selection of Aquolin® 268/168

- **Aquolin® 168**--better transparency, suitable as a hardener for PA&PUD&PUA varnish without hydroxyl
- **Aquolin® 168**—Longer pot life, suitable for 2K white coat
- **Aquolin® 268**—Higher NCO content, better hand mixing and hardness development speed, suitable as hardener of PA/PUD with hydroxyl

Performance comparison

Item	Lacper® 4221 varnish topcoat		(4701+2035) varnish topcoat	
	+Aquolin® 168	+Aquolin® 268	+Aquolin® 168	+Aquolin® 268
Appearance (wet)	Good,5	Bad, 2	Good, 4	Worse,4-
Warm effect	Good,5	Worse, 3	Good, 4	Good, 4
Hardness	Good,3	Better, 4	Good, 3	Better, 4
Appearance (dry)	Delicate and smooth, 5	Few particles, 3	Delicate and smooth,5	Delicate and smooth,5
Chemical resistance	Good	Good	Good	Good

Performance: 5 best , 1 worst

Chemical resistance test process:UV clear sealer--(4507 stain+1.5%CX100) –WB 2K varnish topcoat

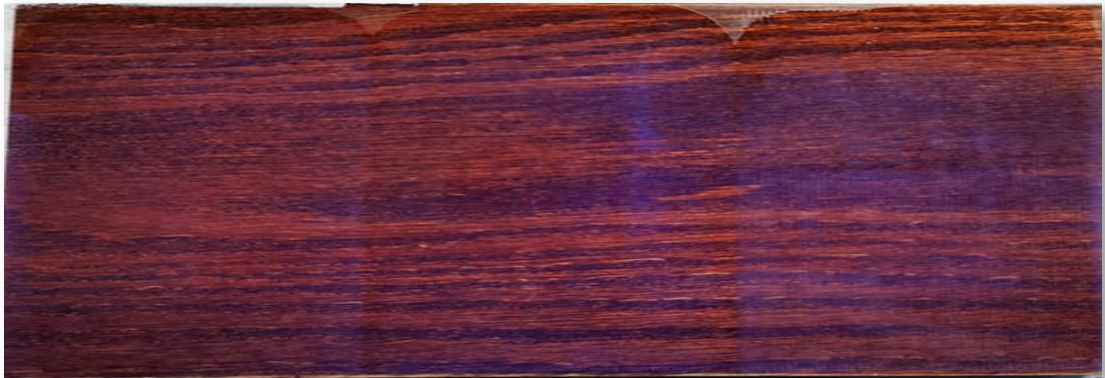
Aquolin® 168-better transparency



Lacper® 4221+10%Aquolin®168

Lacper® 4221

Lacper®4221+10%Aquolin®268



(4701+2035)lacquers+
15%Aquolin® 168

(4701+2035)WB2K
lacquers

(4701+2035) lacquers+
10%Aquolin® 268

Fast drying speed, good sandability.

Component A: WB 2K Clear Sealer			
<u>No</u>	<u>Raw material</u>	<u>Weight, %</u>	<u>Supplier</u>
1	Lacper® 4700	80.00	WanHua
2	Water	7.40	
3	DMEA	0.10	
4	BYK-190	1.00	BYK
5	Tego 902W	0.20	TEGO
6	Vesmody® U604	0.30	WanHua
7	Water	3.00	
8	DPnB	1.30	
9	DPM	3.20	
10	Tego 270	0.30	TEGO
11	Vesmody® U604	0.50	WanHua
12	Sanding Slurry	2.50	
Total		100.00	

Component B: WB Hardener			
<u>No</u>	<u>Raw material</u>	<u>Weight, %</u>	<u>Supplier</u>
1	PMA	25.00	
2	Additive OF	2.00	OMG
3	Aquolin® 268	73.00	WanHua
Total		100.00	

Component A:Component B:Water= 10:1:1
NCO:OH = 1.26



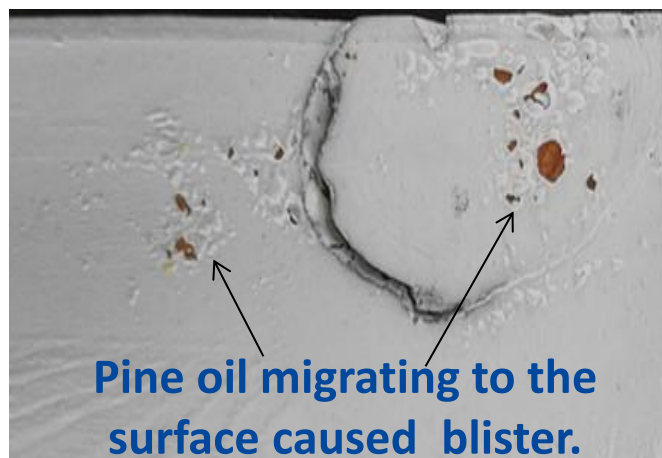
Substrate: Rubber wood, RT drying for 3hrs
(26°C, 45-55% humidity), then sand the film
30 times quickly at same position with 320
mesh sand paper, check the sandability.

Excellent oil-blocking ability

Substrate: Solid pine, with knot containing rich oil.

Coating procedure: WB clear sealer(1K or 2K) + WB 1K white topcoat (PA emulsion)

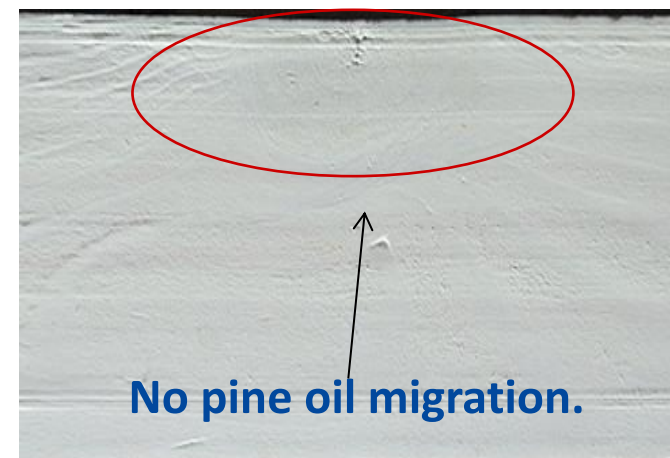
Test method: 70°C oven drying for 24h, observe the oil migration condition.



Competitor's WB 1K clear sealer
+ WB 1K white topcoat.



No coating



Lacper[®] 4700/Aquolin[®] 268 WB 2K clear sealer
+ WB 1K white topcoat

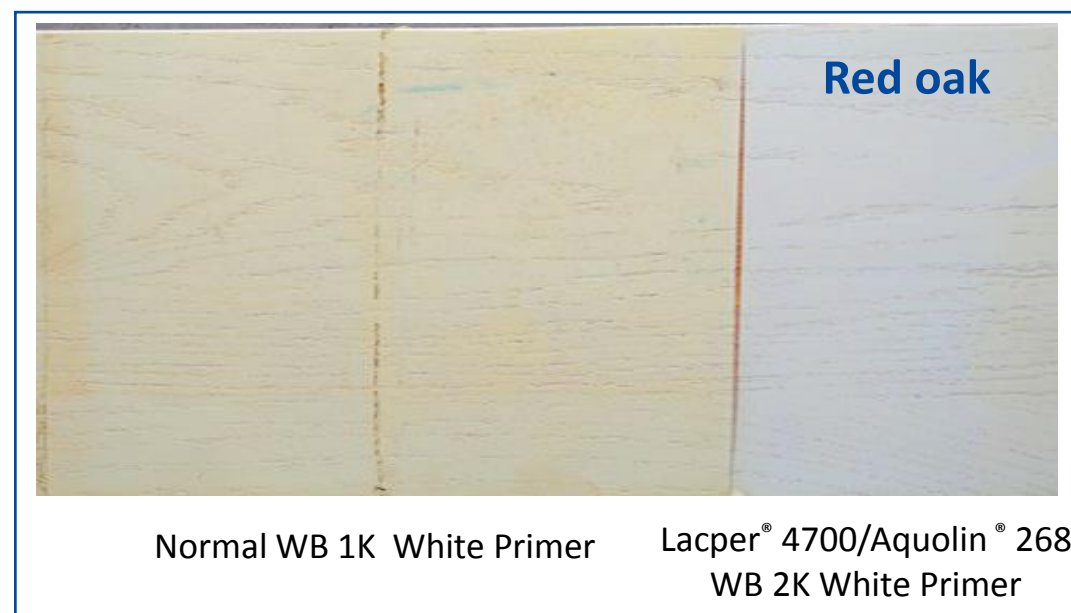
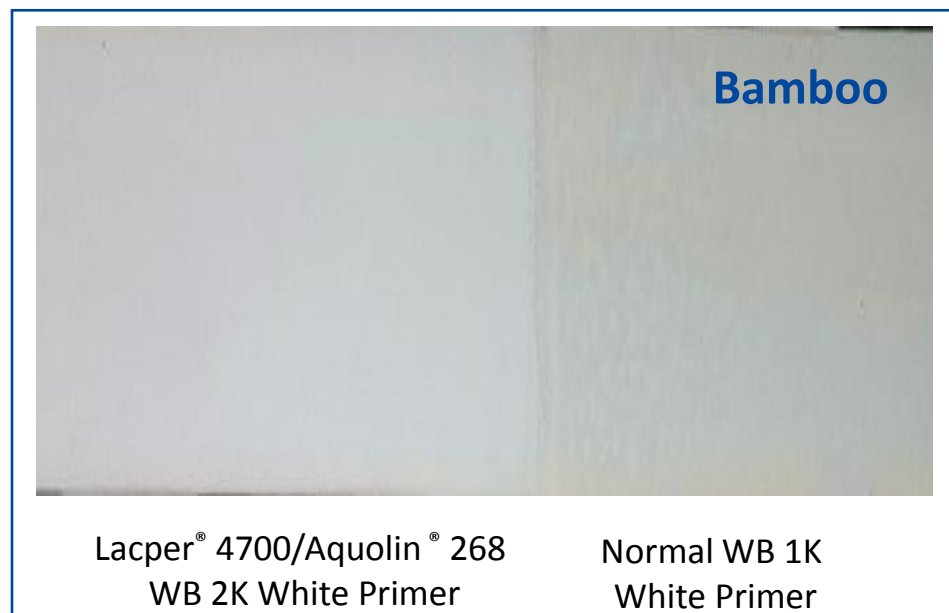
Excellent tannin blocking ability

Substrate: Solid wood containing rich water-soluble colouring material such as bamboo, red oak etc..

Coating procedure: W/B White Primer ×3.

Tannin blocking accelerated test:

Put the panel in oven with temperature 60℃ and humidity 80%, testing time 24hrs, then check the colouring material migration condition.



Lacper® 4701 is a low hydroxy content acrylic emulsion, it is the updated version of Lacper® 4700 with much higher film hardness.

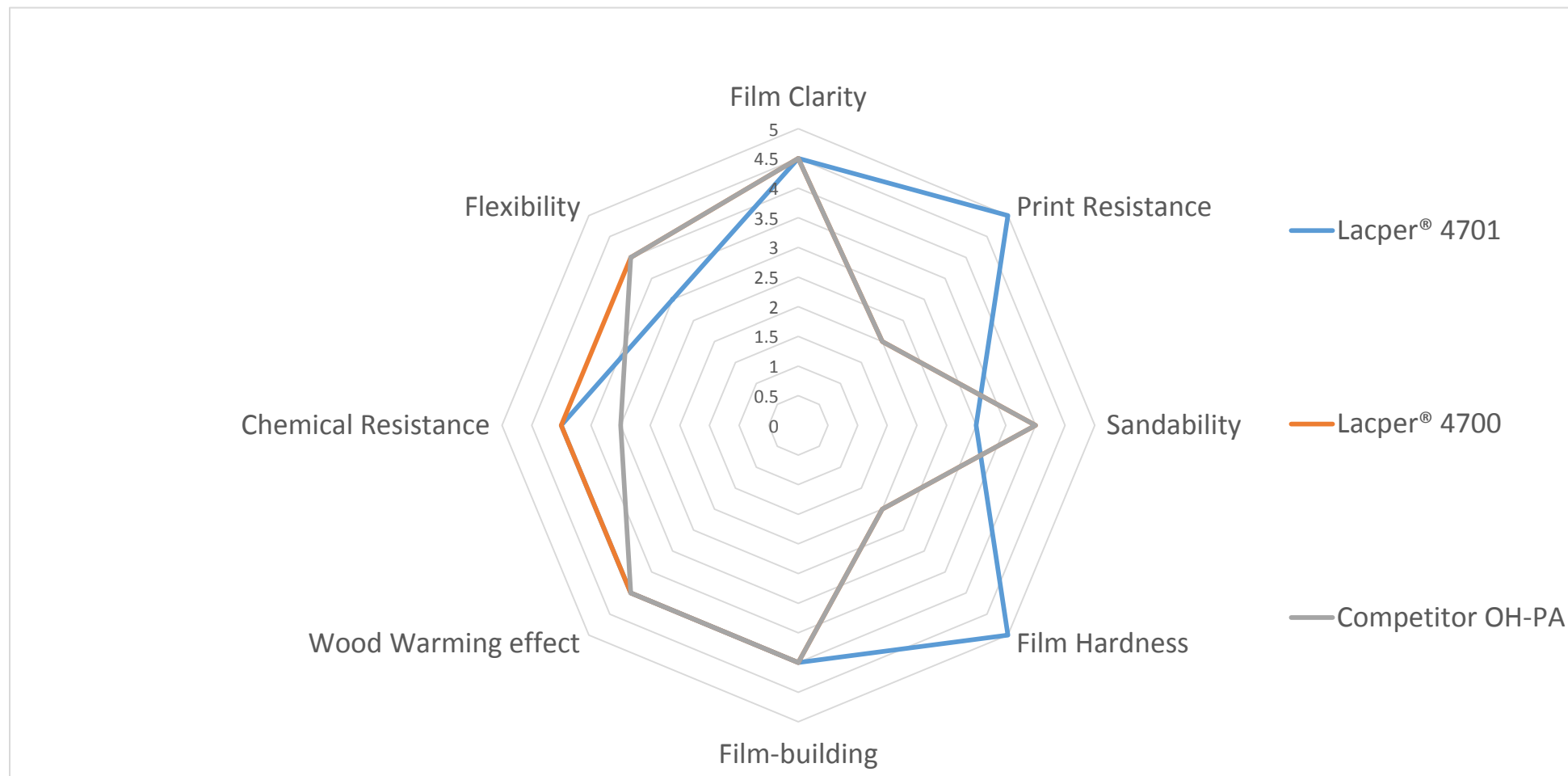
- Much higher film hardness compared with normal low hydroxy content OH-PA emulsion meanwhile has good film clarity.
- Good compatibility with hardener, long pot-life.
- Excellent compability with other hydroxy acrylic emulsion/dispersion, PUD, PUA.
- Good hardness development speed, the highest film hardness among all the commercialized emulsions with similar properties.
- Excellent blocking & print resistance.
- Excellent chemical resistance.



Lacper® 4701 performance



Items			Lacper® 4701 +10% hardener	Lacper® 4700+10% hardener	Competitor OH-PA+10% hardener
Appearance			Translucent , Best, 4	Less translucent, 3	Less translucent, 3
Dry film clarity			Clear, 5	Clear , 5	Slightly haze, 5
Film fullness			Good, 4	Good , 4	Good, 4
Pot life, 35℃			> 4h	> 4h	> 4h
Print resistance	RT drying for 22h	1 PSI	Pass	Fail	Fail
		2 PSI	Fail	Fail	Fail
	RT drying for 48h	1 PSI	Pass	Pass	Pass
		2 PSI	Pass	Fail	Fail
		3 PSI	Pass	Fail	Fail
Film hardness, glass /Mahogany veneer			H+/F+	B/2B	B/2B
Scratch resistance(RT 1d/RT 7d)			2/5, STD	3/5, early scratch resistance is better than STD	3/5, early scratch resistance is better than STD
Wood warming effect			4, STD	4, similar	4, similar
Flexibility			3, STD	4, better than STD	4, better than STD
Sandability			4, STD	5, better sandability	5, better sandability
Chemical resistance	Water , 24h		5, no testing trace	5, no testing trace	5, no testing trace
	Boiling water, 2h		4, slight testing trace, recoverable	4, slight testing trace, recoverable	3, obvious testing trace, unrecoverable
	10% acetic acid, 24h		5, no testing trace	5, no testing trace	5, no testing trace
	10% Na ₂ CO ₃ , 24h		5, no testing trace	5, no testing trace	4, slight testing trace
	50% alcohol, 1h		4, slightly testing trace	4, slightly testing trace	4, slightly testing trace



On the basis of Lacper[®] 4700, the updated product Lacper[®] 4701 has much better print resistance and film hardness meanwhile it has similar film clarity and chemical resistance. Compared with the best-selling OH-PA product, Lacper[®] 4701 has much better comprehensive performance.

Typical Properties

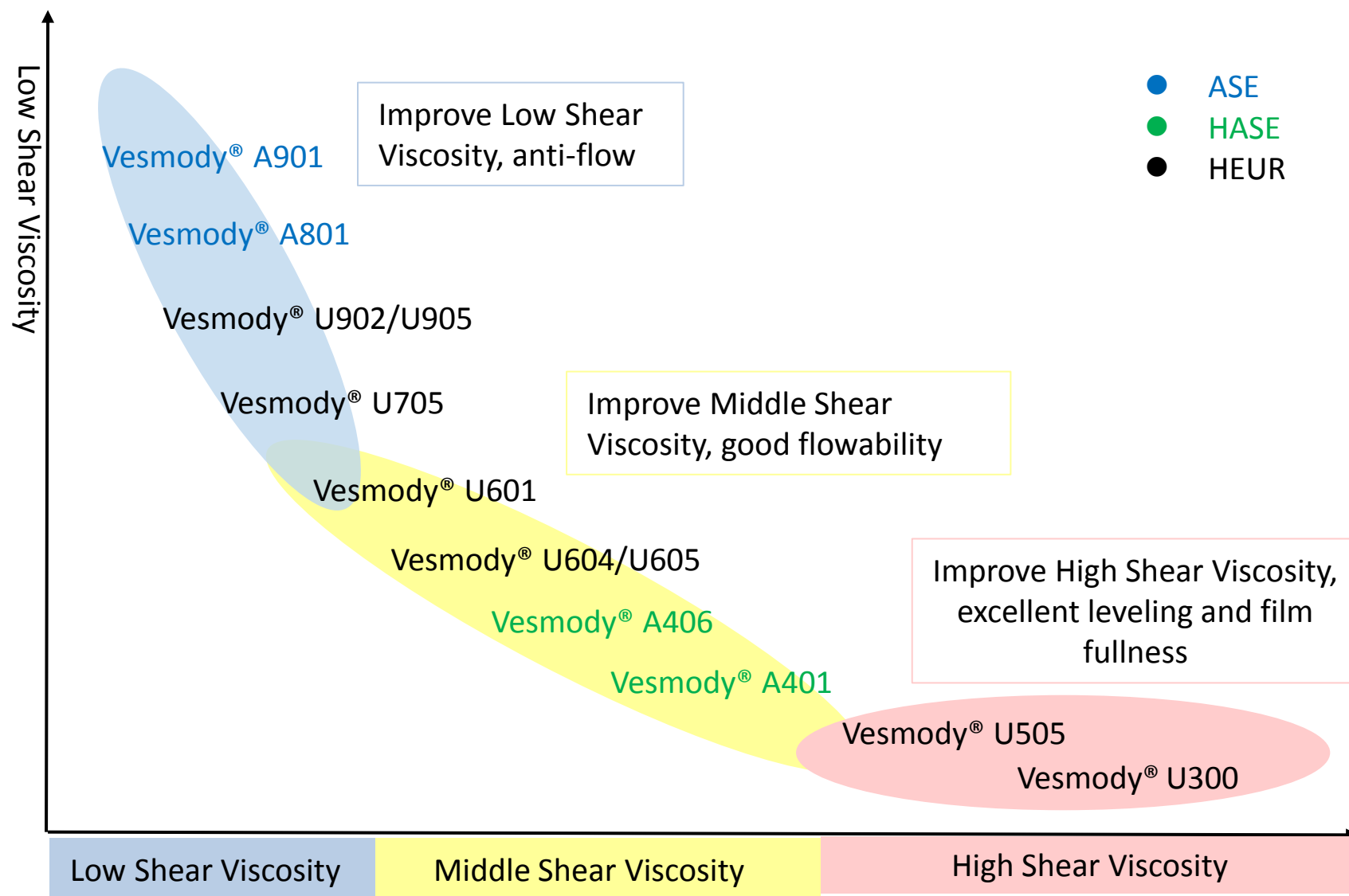
- S100# solvent free
- Fast film hardness development speed, and high final film hardness
- High gloss and film-building
- Excellent chemical and stain resistance
- Good compatibility and long pot-life
- Good compatibility with PA/PUA/PUD/OH-PA

Application fields: Plate furniture, cabinet door, etc..



Antkote®2702--Excellent comprehensive properties

Test item	Antkote® 2702	Antkote® 2701	Competitor
OH , %	3.9	3.9	3.9
Solvent	6.5% PNB	3.5% S100#+3.5% PNB	3.5% PNB
Film hardness	1H--2H	1H--2H	1H--2H
Touch dry time	23min	23min	35min
BFFT (Anti-blistering)	> 65um	40-45um	50--55um
Gloss,20/60	85/93	85/94	83/92
Pot life, 35℃	2.0--2.5h	1.0--1.5h	2.0--2.5h





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