Solus™系列功能性助剂

2010.7.27

内容

- ***介绍***
- ***Solus™ 3050 用于水性涂料***
  - ***Solus™ 3050***用于水性OEM/修补金属底色漆
  - ***Solus™ 3050***用于水性拟似镀铬涂料
- ***Solus™ 2100 用于高固型清漆&UV涂料***
  - ***Solus™ 2100***用于高固型OEM /修补/航空清漆
  - ***Solus™ 2100***用于UV固化涂料
- ***Solus™ 2300 用于高固型OEM /修补底色漆***
- ***结论***

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伊士曼化工公司一览

- 伊士曼是一生产多种化学品、塑料和纤维的全球性制造商
- 总部位于美国田纳西州的金斯堡
- 年销售额约50亿美元, 全球员工约为10, 000人

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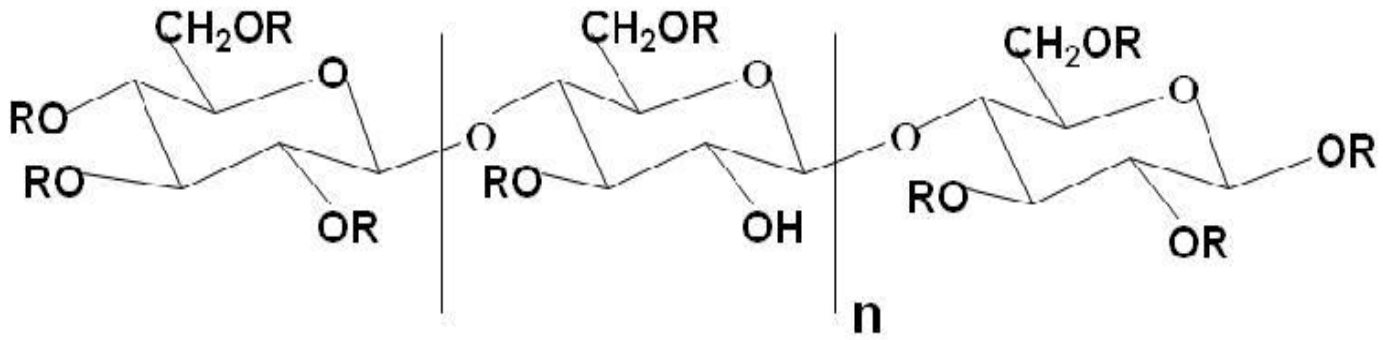
用于涂料的纤维素酯



纤维素酯, 特别是醋酸丁酸纤维素材料(CABs) 被广泛应用于涂料添加剂中，具有以下优点：

- 良好的流平性
- 速干性
- 抗流挂
- 铝粉定向性
- 减少涂层缺陷

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最新产品—

Solus™ 系列功能性助剂

- **Solus™ 3050** 用于水性涂料----在水性系统中追求溶剂型涂料的性能
- **Solus™ 2100** 和 **2300** 用于高固型, 低VOC的溶剂型涂料

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内容

- *介绍*
- ***Solus™ 3050 用于水性涂料***
  - ***Solus™* 3050**用于水性OEM/修补金属底色漆
  - ***Solus™* 3050**用于水性拟似镀铬涂料
- *Solus™ 2100 用于高固型清漆&UV涂料*
  - *Solus™* **2100**用于高固型OEM /修补/航空清漆
  - *Solus™* **2100**用于UV固化涂料
- *Solus™ 2300 用于高固型OEM /修补底色漆*
- *结论*

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Solus™ 3050的典型特性

Property	Solus™ 3050
Acid Number	50
Hydroxyl Content	2.8%
Mn (NMP GPC)	27K
T_g	130° C
Polymer Density	10.5 lbs/gal
ASTM-A Viscosity	0.2 seconds

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Solus™ 3050水溶液的溶剂选择

Brand name	Evaporation rate	Chemical name	Solus 3050
Eastman EB	0.09	Ethylene glycol butyl ether (Butyl glycol)	√
Eastman EP	0.2	Ethylene glycol propyl ether	√
Eastman PM	0.7	Propylene glycol methyl ether	√
Dowanol PnP	0.2	Propylene glycol n-propyl ether	√
Dowanol PnB	0.09	Propylene glycol n-butyl ether	√
Eastman PM acetate	0.39	Propylene glycol methyl ether acetate	√
Eastman DM	0.02	Di-ethylene glycol methyl ether	X
Eastman DB	0.003	Di-ethylene glycol butyl ether	X
Hexyl Cellosolve	0.01	Ethylene glycol monohexyl ether	X
Eastman EEH	0.003	Ethylene glycol 2-ethylhexyl ether	X
2-Ethylhexanol	0.01		X
NMP	0.04	n-Methyl-2-Pyrrolidone	√
MEK	3.8	Methyl ethyl ketone	√
IPA	1.7	Isopropyl alcohol	X
n-Propanol	1.0		√
Ethanol	1.7		√
N-Butanol	0.5		X
Acetone	6.1		√

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Solus™ 3050水溶液的制备

建议采用考雷司铜铝合金刀片高速搅拌

固含量为20%的溶液配方

1	Butyl glycol (EB)	500.0
2	DI Water	286.0
3	DMEA	14.2
4	Solus™ 3050	200.0
5	DMEA	2.5 (adjust pH to 6.5 to 7.5)
	Total	1000.0

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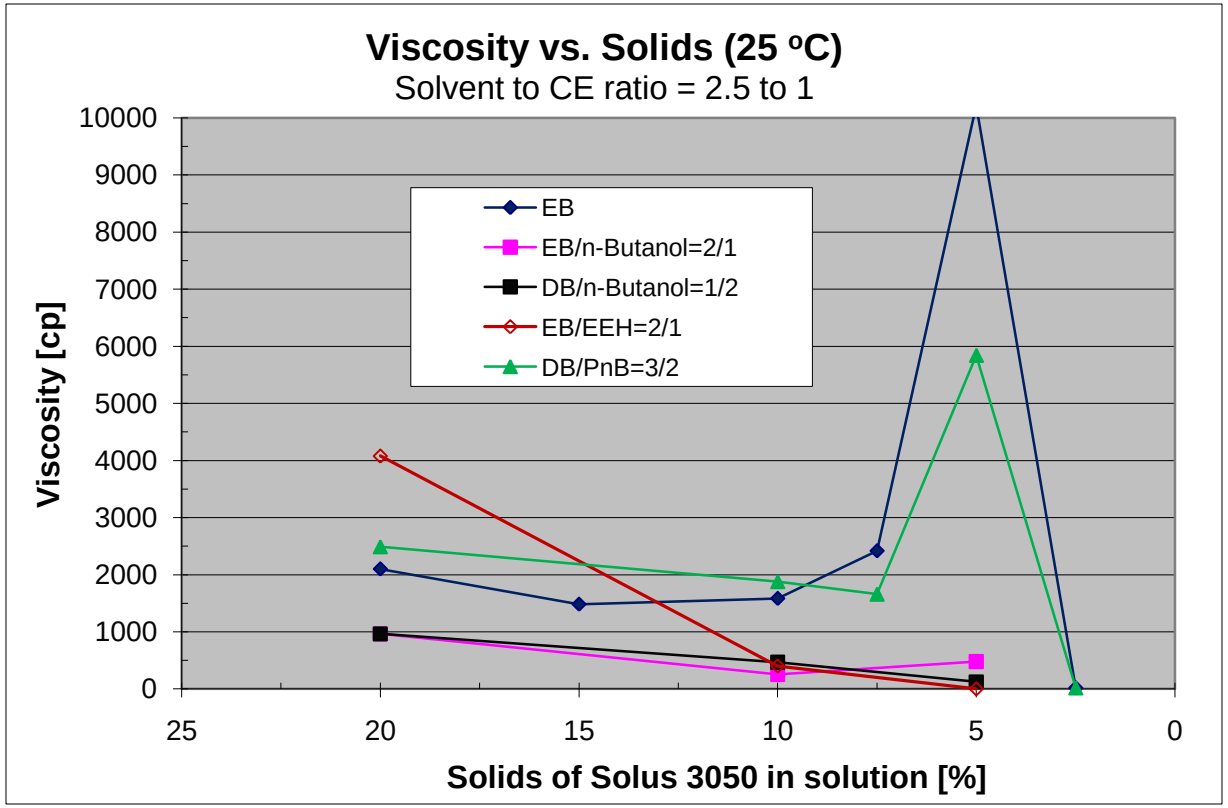
共溶剂的选择



共溶剂的使用可以降低初始粘度，消除粘度高峰

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水性OEM金属底色漆的配方

	Ingredients	NV [%]	Description	Control	With 6% Solus 3050
A	*Macrynal* VSM 6285w/43WABDG	43	acrylic emulsion	25.3	25.3
	Maprenal MF 900/95	95	melamine	4.9	5.3
	Butyl glycol			0.0	0.0
B	*Viacryl* VSC 6279w/45WA	45	acrylic emulsion	5.3	5.3
	Water			8.6	8.6
C	*Viscalex* HV 30/10%*[1]	10	acrylic thickener	6.9	6.9
	water			5.5	5.5
D	*Laponite* RD	100	Synthetic clay	0.3	0.3
	Water			13.3	13.3
E	TEGO *Foamex* 825	26	defoamer	0.1	0.1
F	10% Dimethyl ethanolamine(DMEA)			3.0	3.0
G	Butyl glycol			5.2	5.2
	Additol XL 250	47	wetting agent	0.5	0.5
	20% *Solus* 3050 solution	20		0.0	5.6
	DI Water			0.0	15.5
	Stapa Hydrolan 8154 AL pigment	*60*	aluminum paste	5.4	5.8
H	10% DMEA pH adjust 7.8--8.1			0.3	0.4
I	Water			15.3	13.8
	Butyl glycol			1.88	0.0
	Total			100.0	120.4
	Pig. / Binder ratio =			0.16	0.16
	NV [%]			22.54	20.07
	MF/Total Resin			25.84	25.8
	VOC less water [g/l] ASTM D3960			417	418
	VOC in can [g/l]			129	119

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水性修补金属底色漆的配方

		Ingredients	NV (%)		Control	With 8% Solus 3050
A		*Setalux* 6803 AQ-24	24.00	rheology modified acrylic emulsion	556.0	556.0
		Daotan VTM 1262/35WA	35	PUD	163.0	163.0
		DI Water	0		68.6	68.6
		Butyl glycol	0		24.0	24.0
B		TEGO *Foamex* 825	26	defoamer	0.9	0.9
C		10% DMEA	0		13.7	13.7
D		Butyl glycol	0		61.8	48.1
	D1	*Additol* XL 250	47	wetting agent	5.5	5.5
		DI Water	0		0.0	34.3
		20% *Solus 3050* Solution	20		0.0	76.2
	D2	*Stapa* Hydrolan 8154 AL pigment	60	aluminum paste	58.4	61.8
E		10% DMEA pH adjust 7.8--8.1	0		6.9	6.9
F		DI water	0		34.3	68.6
G		Butyl glycol	0		6.9	0.0
		Total			1000.0	1127.7
		Pig. / Binder ratio			0.165	0.162
		NV [%]			22.83	21.78
		VOC less water [g/l] ASTM D3960			405	407
		VOC in can [g/l]			126	122

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伊士曼机器人喷涂实验室

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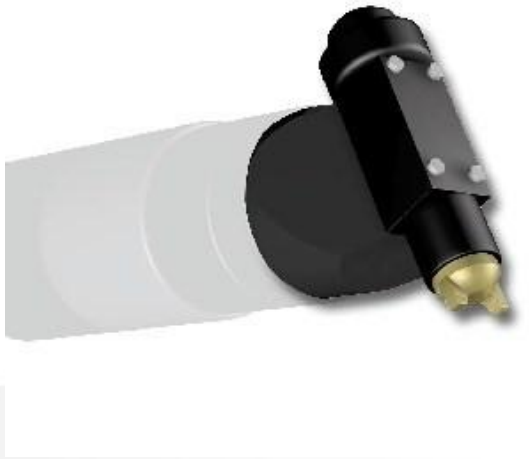
汽车OEM/修补底色漆的喷涂实验

应用于OEM 底色漆的喷涂参数

Atomizer Type	Multi-Spray
Bell type	Sames PPH 607 Serrated
Bell diameter	65 mm
Atomizer to Target	23 cm
Pattern Width	41 cm
Percent Overlap	50%
Voltage	80kv
Number of Passes	2
Flash time between passes	2 min.
Shaping Air @ Gauge	35 psi
Turbine Speed (RPM)	70 K



修补底色漆的喷涂

使用HVLP喷枪

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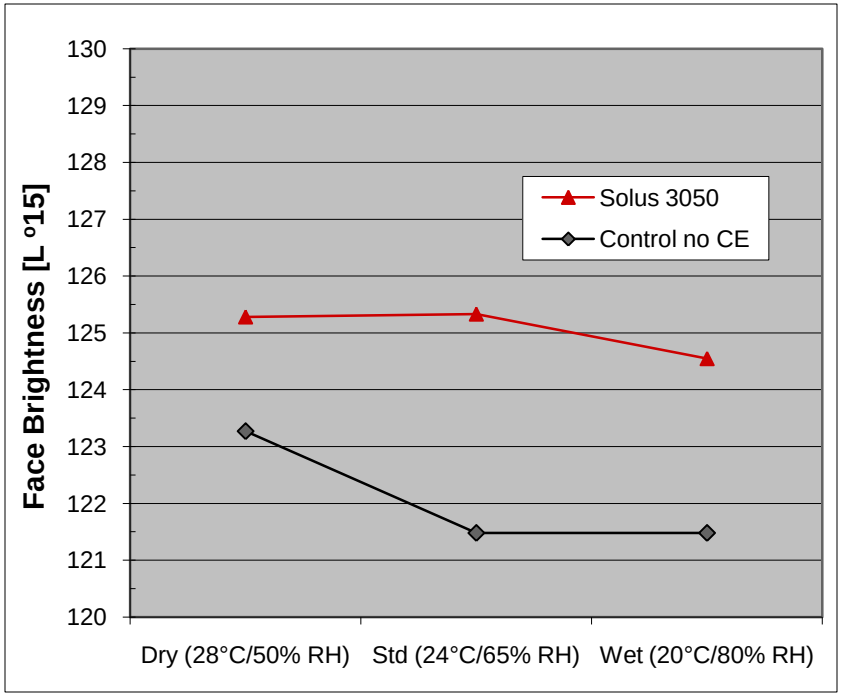
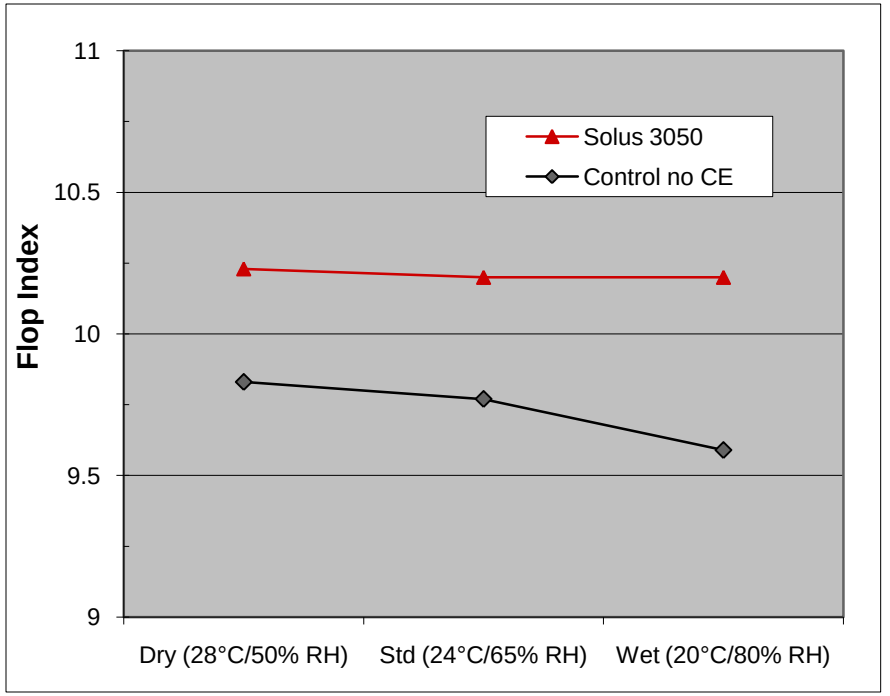
喷涂实验结果

水性金属OEM底色漆

表面亮度(L* 15°)



闪光指数*



闪光指数=

$$2.69\ (L^*@15^\circ - L^*@110^\circ)^{1.11}/(L^*@45^\circ)^{0.86}$$

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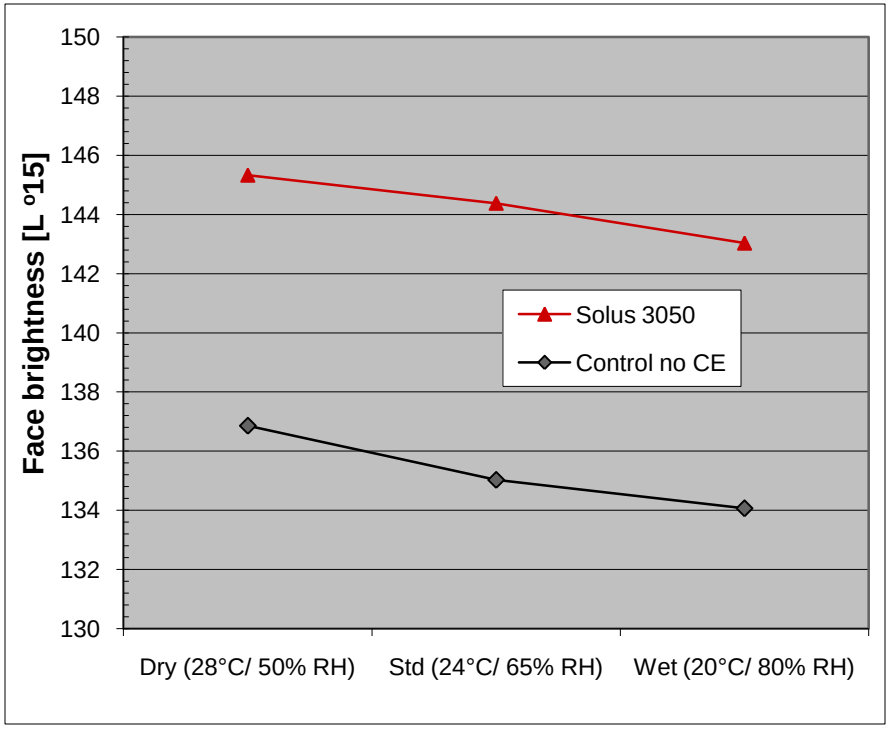
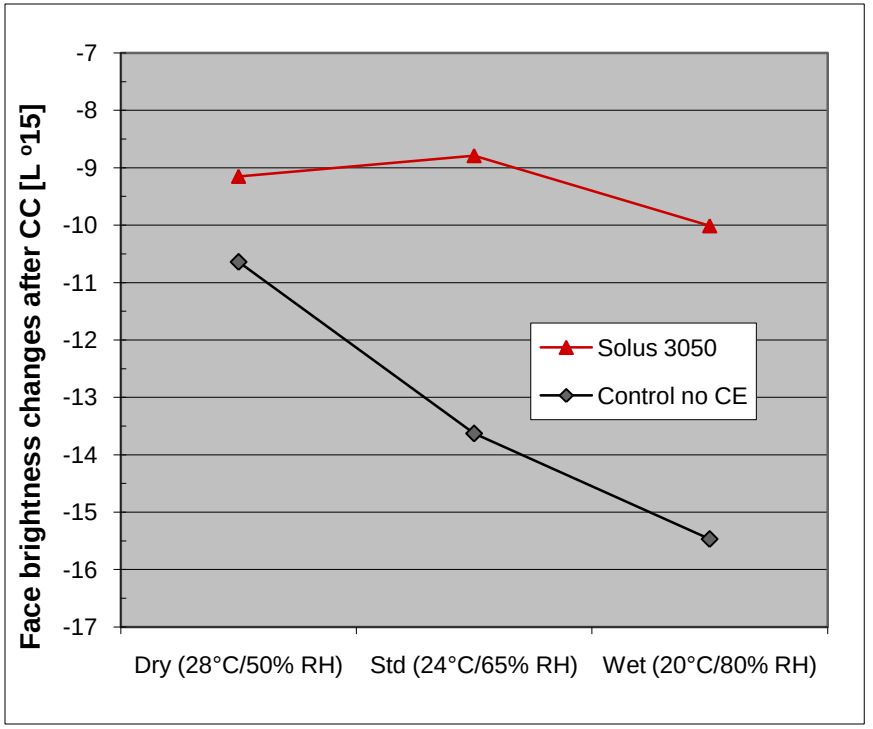
喷涂实验结果

水性金属修补底色漆

表面亮度(L* 15°)



上清漆后表面亮度损失



Solus™ 3050 改善了铝粉定向, 增强了色泽安定性和底色漆的抗回溶性。

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水性涂料的表面湿润性

对照水性底色漆(不含纤维素酯)　　含有6% Solus 3050的金属底色漆

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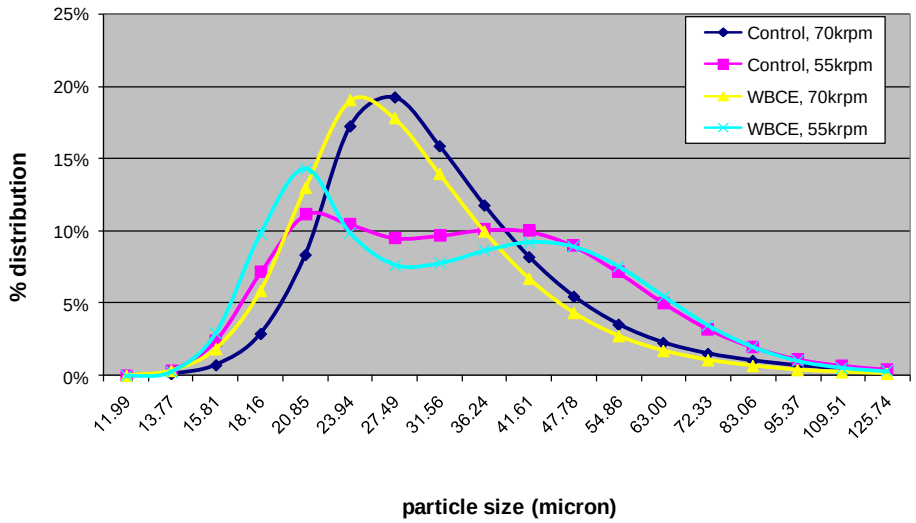
水性纤维素酯提高了雾化性能

OEM basecoat with WBCE spray pattern

OEM control basecoat spray pattern

Malvern® particle size analysis results



在流速380 ml/min和杯距23 cm 的标准条件下测量所得

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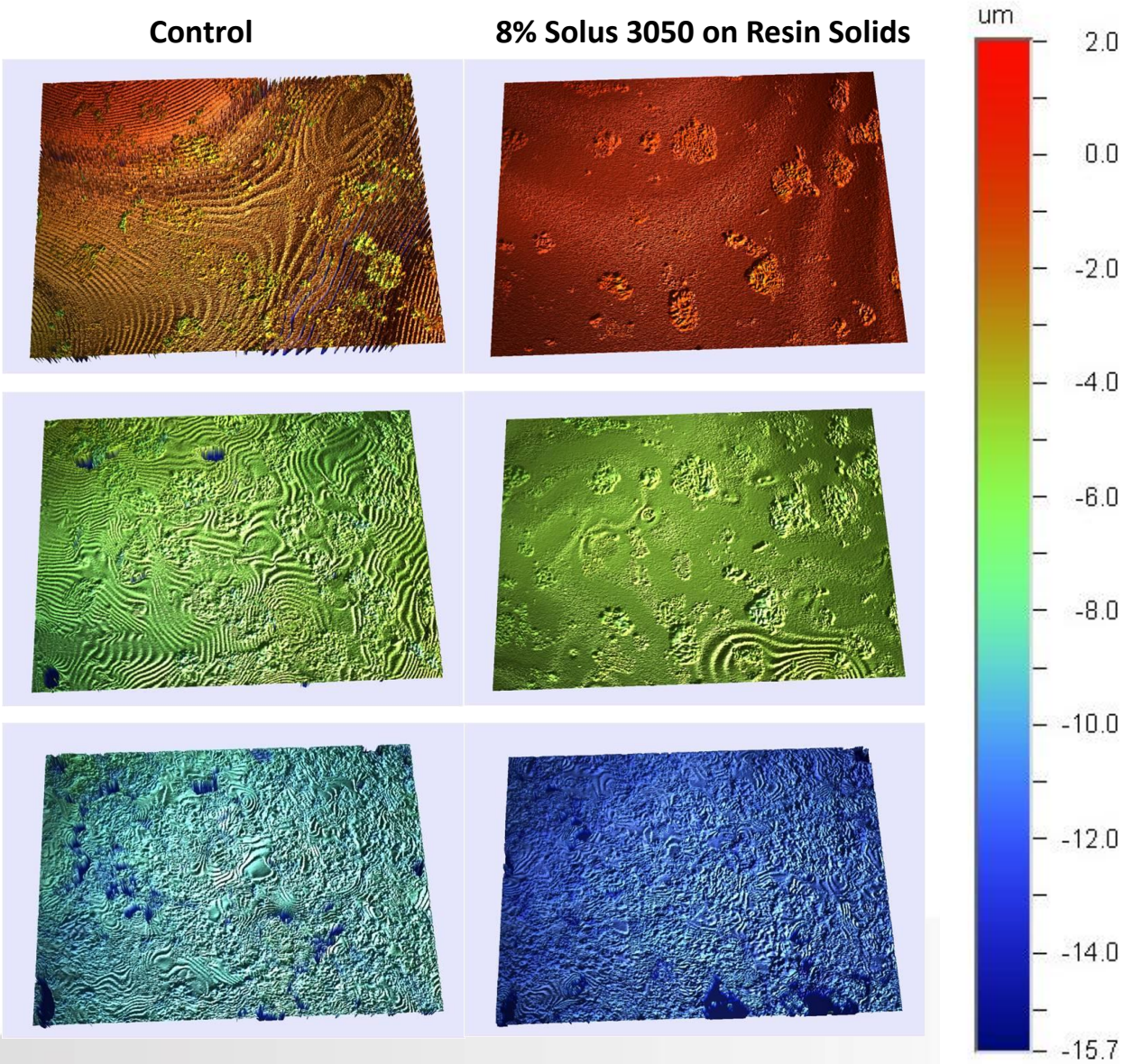
更好的流平性



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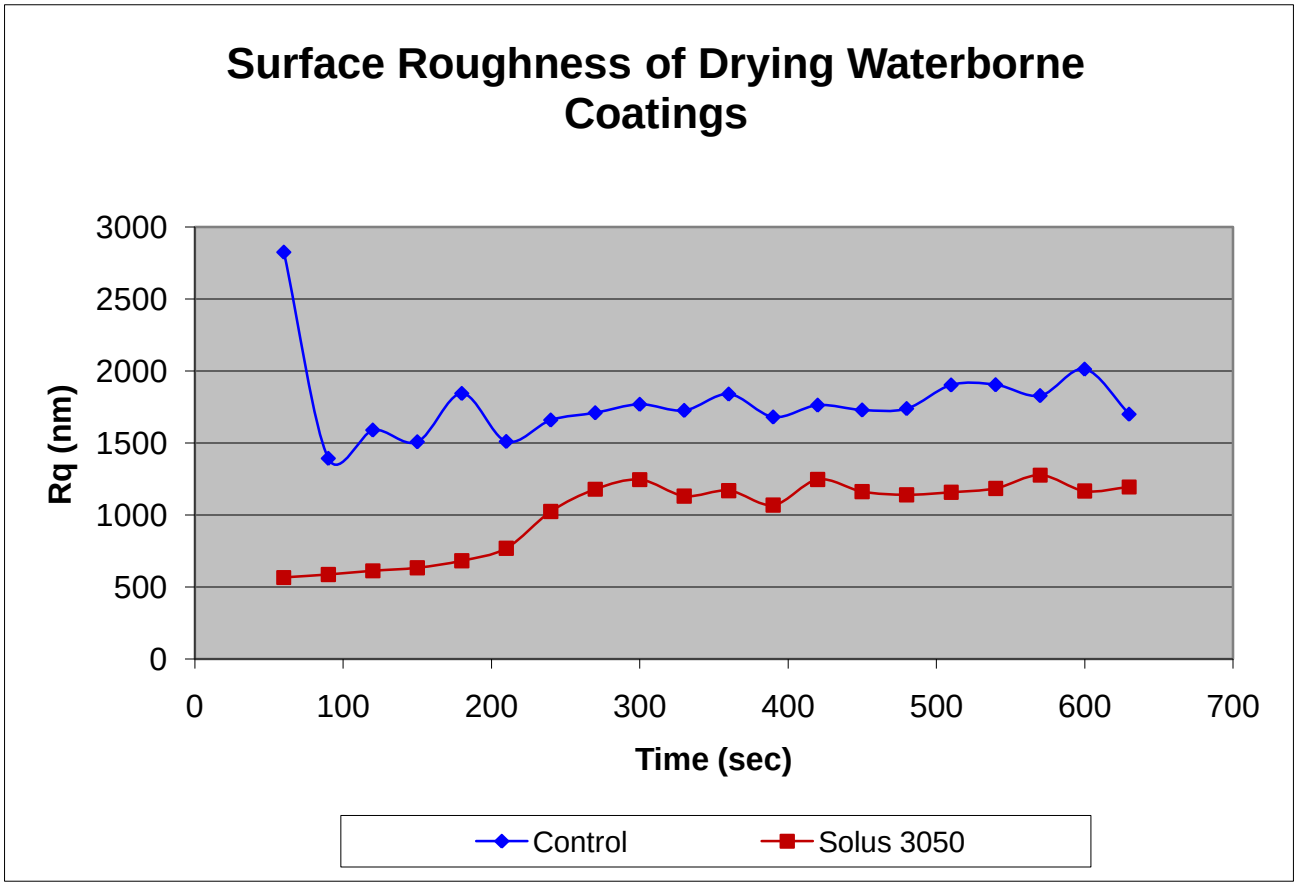
Solus™ 3050 对流平性的影响



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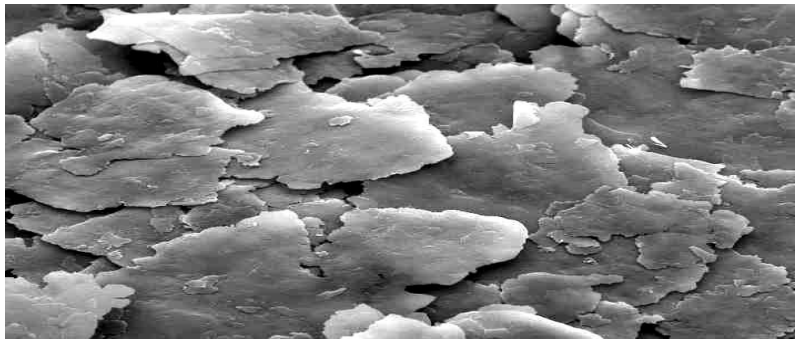
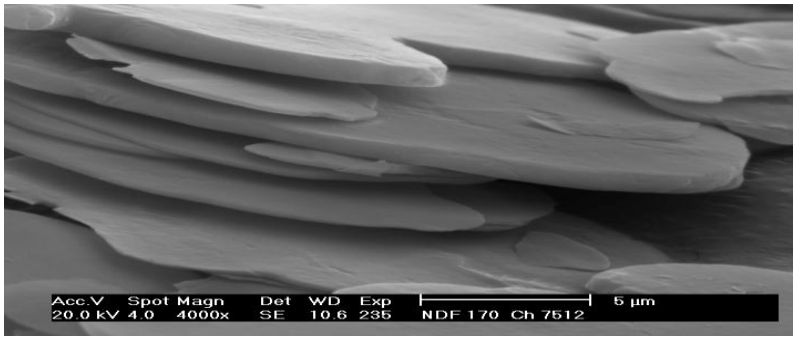
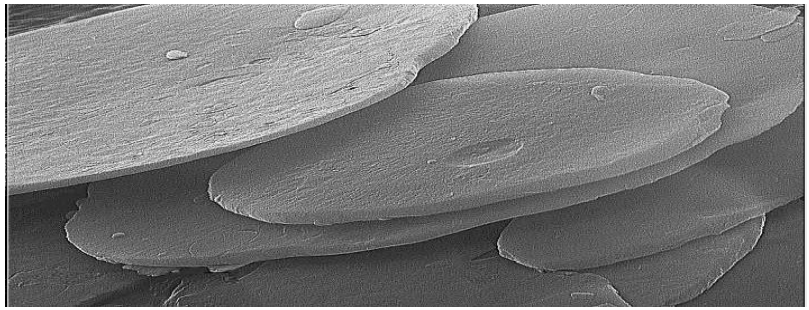
金属颜料(铝粉)的种类



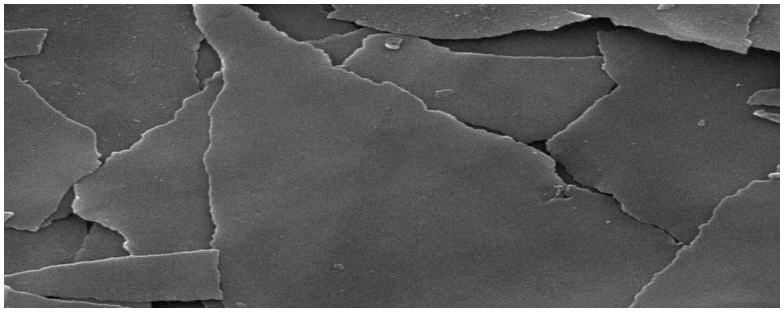
Conventional (Corn Flake)



Non Degradable Flake (Thick)



Lenticular (silver dollar）



Ultra Thin (Physical Vapor Deposition)

	Mean particle size (µ)	Price
Stapa Hydrolan 2154	20	$37.02/lb (51£/Kg)
Stapa Hydrolan 8154	20	$21.77/lb (30£/Kg)
Stapa Hydrolan 501	22	$17.42/lb (24£/Kg)

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能够在不牺牲外观的前提下使用较低品质的铝粉

表面亮度, 闪光指数和配方成本

	Description	Face brightness (L*15)	Flop Index	Formulation cost ($/gal)	Color uniformity (mottling)
A	Control w/Hydrolan 8154	**133.9**	**12.43**	**23.41**	Mottling
B	8% Solus 3050 w/Hydrolan 8154	143.2	15.38	24.86	No mottling
C	Control w/Hydrolan 501	130.1	11.53	21.3	Mottling
D	8% Solus 3050 w/Hydrolan 501	**141.6**	**14.54**	**22.75**	No mottling

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Solus™ 3050 用于水性拟似镀铬涂料

水性拟似镀铬涂料配方

Ingredient	1k formulation	2k formulation
20% Solus 3050	15.8	15.8
DI water	79.2	77.4
Foamex 825*	0.2	0.2
Hydroshine WS-3001**	4.8	4.8
Basonat HW 180***	0.0	1.8
Total	100.0	100.0

* Antifoam, Evonik

** 10% solids content aluminum pigment slurry Eckart GmbH

*** Isocyanate hardener BASF

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Solus™ 3050用于水性拟似镀铬涂料

外观结果

	1K Basecoat	**2K basecoat**
Viscosity (#4 Ford cup)	16 seconds	16 seconds
General appearance	Excellent	Excellent
Chrome effect (no-CC)	Excellent	Excellent (slightly lower than 1K)
Chrome effect (+ CC)	Reduced/good	Reduced/better than 1K
Adhesion to ABS	Poor (100% removal)	Poor (100% removal)
Adhesion to primed aluminum	Good (100% adhesion)	Good (100% adhesion)

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- ***Solus™ 2100 用于高固型清漆&UV涂料***
  - ***Solus™ 2100用于高固型OEM /修补/航空清漆***
  - ***Solus™ 2100用于UV固化涂料***
- *Solus™ 2300 用于高固型OEM /修补底色漆*
- *结论*

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Solus™ 系列在高固型溶剂型涂料系统的应用

伊士曼已经商业化的高固体纤维素材料…

Solus™ 2100– 应用于汽车清漆 (固含量高达 60%)

- 缩短指触干燥时间
- 改进抗流挂
- 增强流平性
- 提高在修补漆系统中的磨光性

Solus™ 2300– 高固体底色漆 (固含量高达约50%)

- 通过增加固含量来促进喷涂效率
- 提高铝粉定向性和涂层亮度
- 最大限度减小表面粗糙度
- 增强在多层漆系统中的抗回溶性

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Solus™ 2100 & 2300的代表特性

	Solus™ 2100	Solus™ 2300
Appearance	Free-flowing white powder	
Solids	100%	
Tg	75°C	112°C
% OH	1.5	1.5
Butyryl level	High	Low
Density, cast film kg/l (lb/gal)	1.18 (9.89)	1.23 (10.3)
Applications Guide:	• Auto – clearcoats • Industrial – HS topcoats with alkyds or PU • UV cured systems • Wood – compatible with 2K-PU industrial finishes	• Auto – basecoats / primers • Industrial – HS topcoats, limited to PU systems

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Solus™ 2100 用于 OEM 清漆的配方

	NV (%)	Clear No. 1 13.9% SCA	Clear No. 2 18.0% SCA*2	Clear No. 3 and 4 8.5% CAB *1	Clear No. 5 SCA/CAB*2
Setalux 1795 VX-74	74	43.82	40.07	45.42	44.62
Setalux 91795 VX-60	60	13.63	17.45	0.00	6.82
Setamine US138	70	24.34	24.04	23.17	23.75
50% CAB in Butyl acetate	50	0.00	0.00	9.45	4.75
Solvent blend*3	0	16.55	16.92	20.38	18.45
Tinuvin 292	100	0.49	0.45	0.46	0.47
Tinuvin 1130	100	0.68	0.62	0.65	0.66
10% BYK 331 in MEK	10	0.49	0.45	0.47	0.48
Total		100.00	100.00	100.00	100.00

*1. Clear No. 3 contains 8.5% of CAB 551-0.01 and clear No. 4 contains 8.5% of *Solus* 2100 (based on solids)

*2. Clear No. 5 contains 7% of SCA resin and 4% of CAB 551-0.01

*3. The solvent blend contains 45% n-butyl acetate, 35% MAK, 15% MEK and 5% butyl glycol

Setalux 91795 VX-60 is a sag control agent (SCA) modified resin

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清漆的喷涂固含量和抗流挂性

	Clear No. 1	Clear No. 2	Clear No. 3	Clear No. 4	Clear No. 5	Clear No. 6
	SCA (13.9%)	**SCA (18.0%)**	**CAB 551-0.01 (8.5%)**	***Solus* 2100 (8.5%)**	**SCA/CAB 551-0.01 (7%/4%)**	**Commercial control**
Spray solids	50.7	49.2	47.7	53.5	49.2	42.0
Sag limit* [μm]	31	34	39	34	35	35
Gloss [20°]	100.3	96.5	96.5	98.7	97.7	97.0
Gloss [60°]	104.1	102.6	102.6	101.4	103.5	102.5

* Sag limit was tested on e-coated sag testing panels without primer and basecoat

Solus™ 2100的使用能够提高清漆中的喷涂固含量，同时不影响或增强抗流挂性

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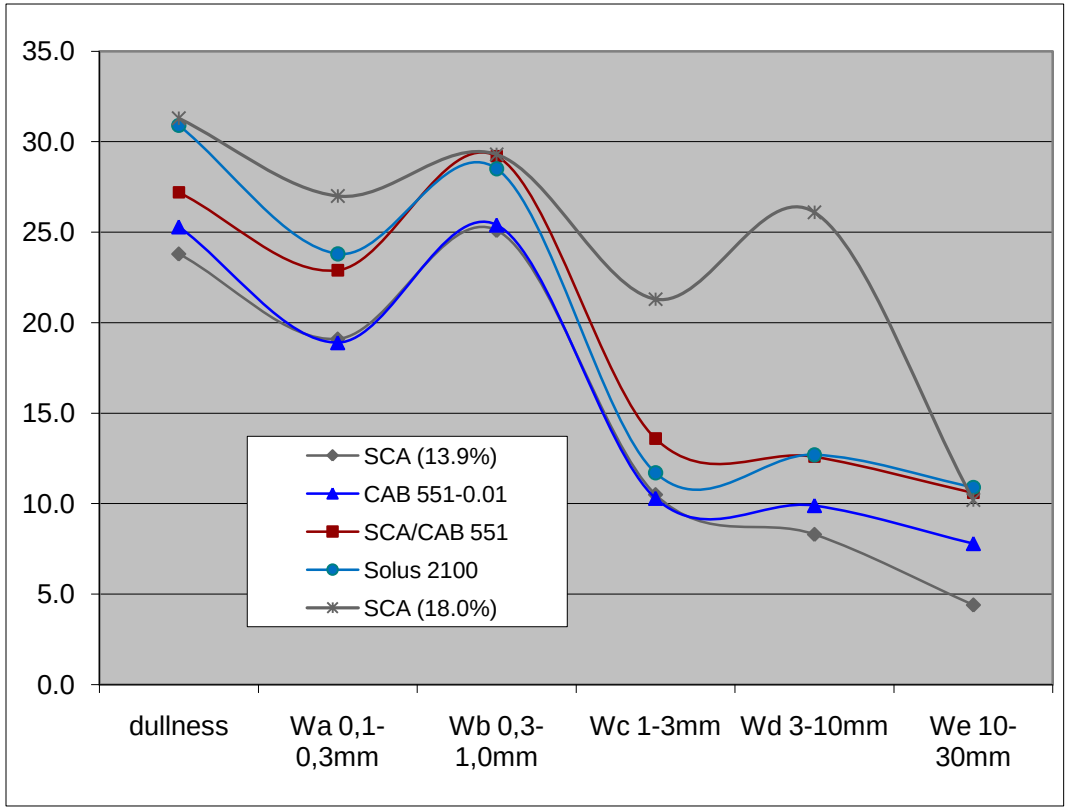
外观资料

Wave scan分析数据---水平固化涂板



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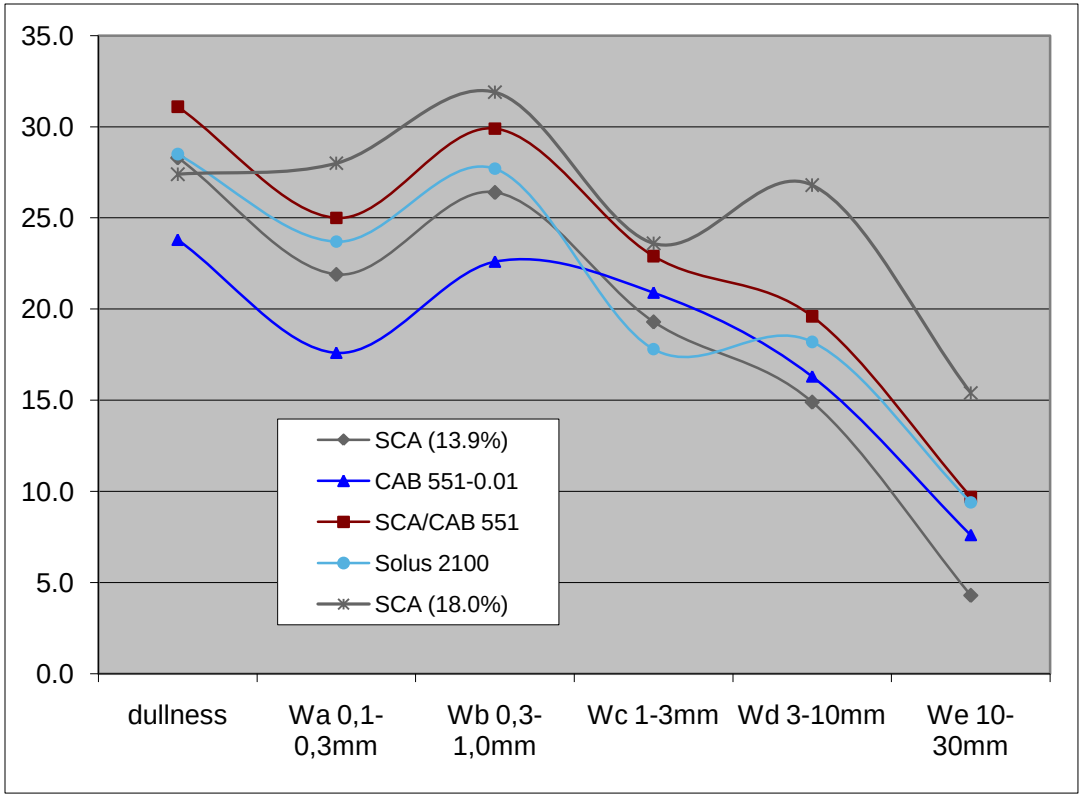
外观资料

Wave scan分析数据---纵向固化涂板



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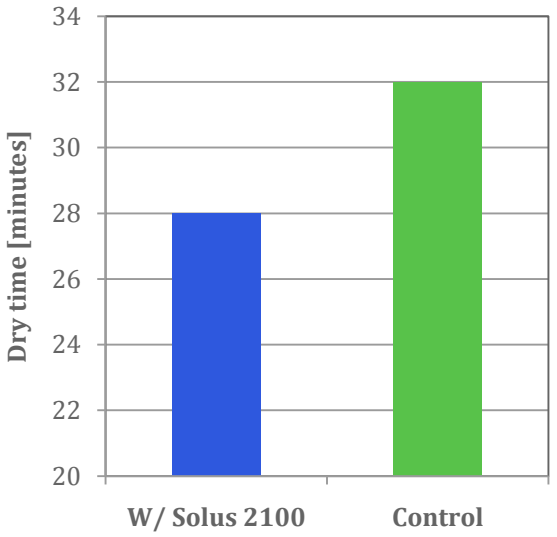
Solus™ 2100 用于2K 修补清漆

Material	Weigh %
Cytec Macrynal SM 515 acrylic	23.0
Nuplex Setalux 1901 acrylic	22.6
50% Solus 2100 in slovent blend	11.3
DBTDL (10%)	0.6
BYK-331	1.3
Irganox 1010 (10%)	1.3
Solvent blend	9.9
Tolonate HDT-LV (100%)	30.1
	100.0
NV [%]	60
VOC [g/l]	420
NCO/OH	1.1/1

使用了Solus™ 2100的
2K 清漆指触干燥更快



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Solus™ 2100 用于UV固化涂料

- 提高UV固化涂料的流平性
- 减小涂层的收缩应力, 增强附着力, 降低薄基底的卷曲
- 改进UV涂料滚涂法(抑制雾气) 和淋涂法的适用性
- 改善UV固化涂料的抗流挂性(喷涂法)
- 增强消光剂的效率和低光泽UV涂料的光泽均匀性

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纤维素酯和Solus™ 2100在选定UV单体中的粘度 [cPs]

Additive	(Wt%)	HDODA	TMPTA	DPGDA	TPGDA	Styrene
CAP 504-0.2	5	NA	NA	NA	NA	NA
CAB 553-0.4	5	1550	1550	1190	40000	NA
CAB 381-0.1	5	60	1670	113	180	NA
CAB 321-0.1	5	53	1420	93	128	NA
CAB 551-0.2	5	87	2080	136	204	30
CAB 551-0.01	5	29	661	40	57	7
Solus 2100	5		424	30	44	
Solus 2100	20	56	1660	104	172	10

- Solus™ 2100 和选定的CABs 在常规的单体中是可溶的
- Solus™ 2100 和 CABs通常可先溶于UV单体如HDODA, 再导入配方中

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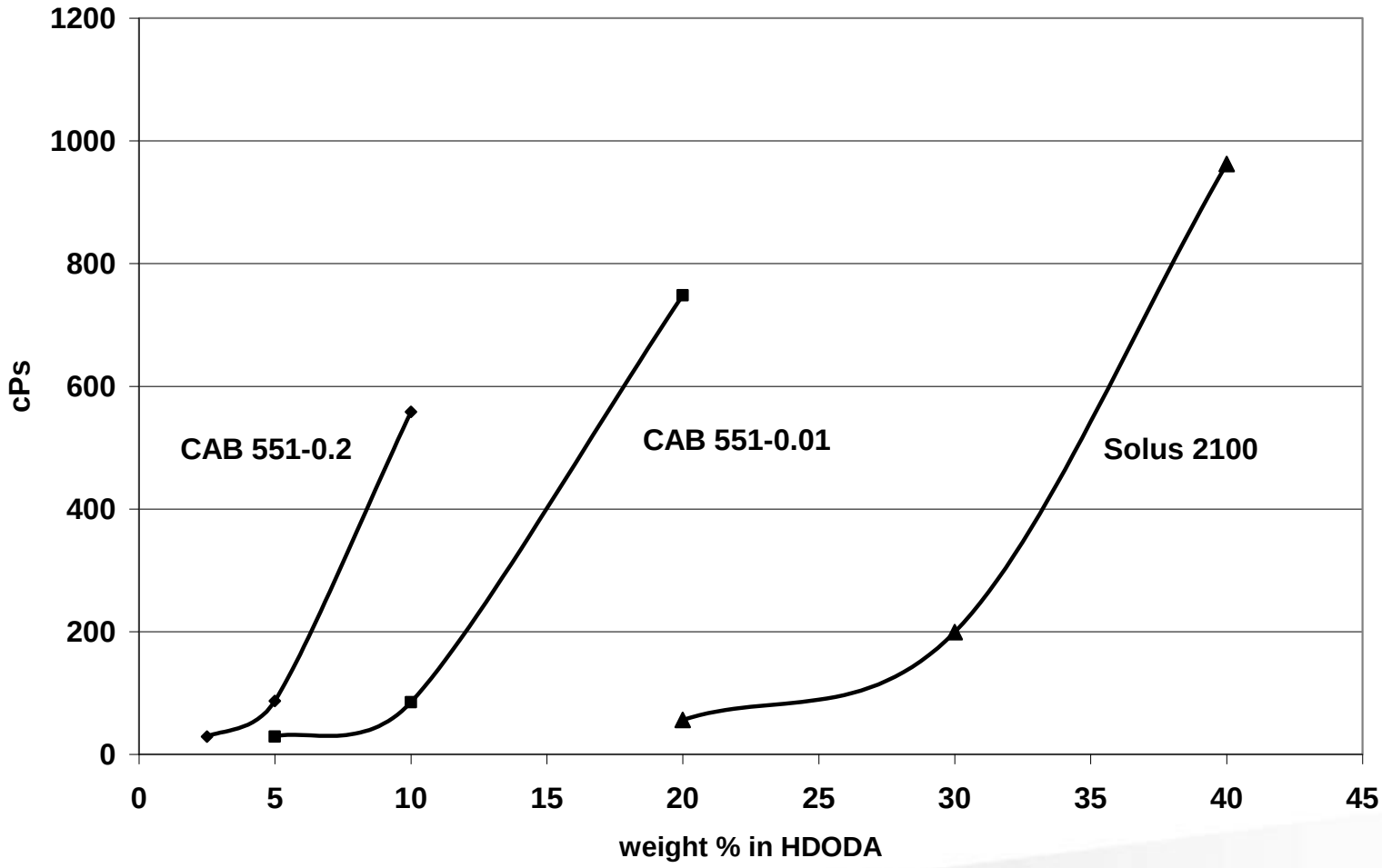
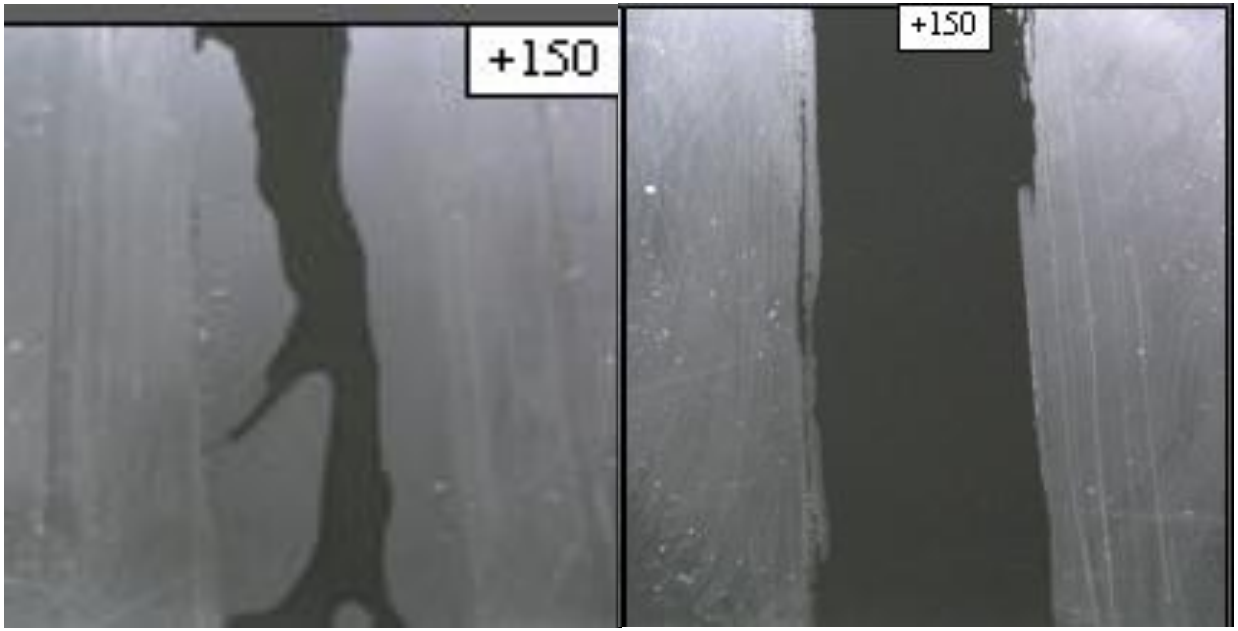
纤维素酯和Solus™ 2100在HDODA中的粘度



Solus™ 2100 对UV OPV流平性和表面湿润性的影响

对照配方　　包含 5% Solus™ 2100



涂有对照OPV膜的TPO板上的涂层迅速收缩，而含5%Sous 2100 的OPV不仅对TPO有良好的湿润性，涂层的附着力也有所提高。

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内容

- *介绍*
- *Solus™ 3050 用于水性涂料*
  - *Solus™ 3050*用于水性OEM/修补金属底色漆
  - *Solus™ 3050*用于水性拟似镀铬涂料
- *Solus™ 2100 用于高固型清漆&UV涂料*
  - *Solus™ 2100*用于高固型OEM /修补/航空清漆
  - *Solus™ 2100*用于UV固化涂料
- ***Solus™ 2300 用于高固型OEM /修补底色漆***
- *结论*

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Solus™ 2300 用于 汽车OEM 和修补底色漆

- 能提供和CABs内似的性能，而不增加额外的VOC
- 易溶于常见的有机溶剂中而形成50%固含量的溶液
- 具有很高的玻璃移转温度(112°C)

含有Solus™ 2300的高固型底色漆

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Solus™ 2300 用于 OEM 底色漆

Material	Weight %
Polyester Polyol (60% NV)	40.7
Melamine Resin (70% NV)	17.2
Solus 2300 (40% in n-BA)	9.4
Wax Dispersion (5% NV)	19.8
Flow additive	0.7
Aluminum Flake (70% NV)	11.2
Solvent Blend	1.0
Total	100
Solids as Prepared (%)	46.9
Application Viscosity (#4 Ford Cup)	20
Measured Solids at application (%)	39.4

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使用Bell-Bell喷涂40% 固含量OEM 底色漆和商业清漆后的外观数据

Basecoat Rheology Additive	DOI	Flop Index (BC)	Flop Index (BC/CC)	Δ Flop Index
Control (no additive)	69.6	9.7	7.1	-2.6
Microgel (16% on resin solids）	74.1	9.9	8.1	-1.9
Solus™ 2300 (10% on resin solids)	79.6	10.8	10.0	-0.8

Solus™产品改善了涂层的鲜映性(DOI)和闪光指数, 并增强了底色漆对清漆的抵抗性 (抗再溶解)

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结论

Solus™ 3050 用于水性涂料系统

- 提高了表面亮度和闪光指数
- 增强了在不同环境条件和喷涂条件下的色调稳定性
- 明显减少了上清漆后的底色漆再溶解
- 显著提高了表面湿润性和流平性
- 可作为水性拟似镀铬涂料和气雾涂料的主要成膜树脂

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结论

Solus™ 2100 用于高固型清漆和UV涂料

- 增加固含量，降低VOC
- 提供优异的抗流挂性能
- 减少指触干燥时间
- 提高表面湿润性和流平性

Solus™ 2300 用于高固型OEM/修补底色漆

- 增加固含量
- 改善铝粉定位, 从而增加表面亮度和闪光指数
- 增强鲜映性, 减少表面粗糙度
- 增加了底色漆对清漆扩散到底色漆的抵抗能力 (抗再溶解性)
- 加速干燥

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Solus™系列产品的链接

www.Eastman.com/Solus

请参观我们的展台:

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