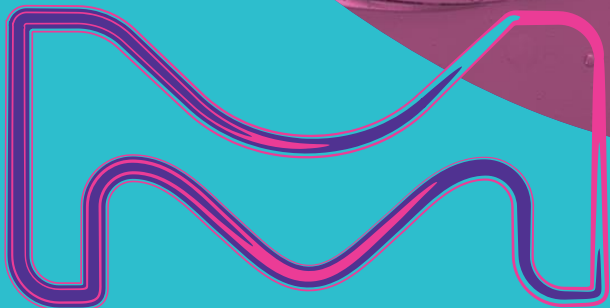


A large, circular, microscopic view of a surface covered with numerous water droplets of various sizes. The droplets are clear and reflect light, creating bright highlights. The surface they sit on is a light, neutral color. The background of the slide is a vibrant teal color with abstract, overlapping shapes in shades of purple and pink.

DURAZANE[®]

Efficient surface protection with Polysilazanes

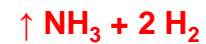
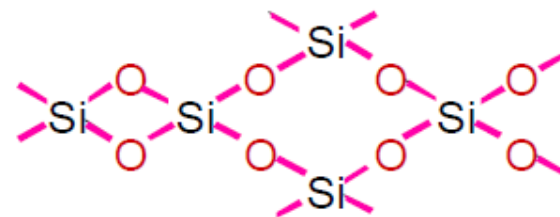
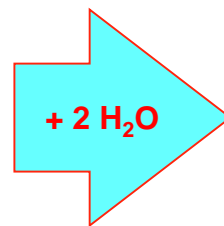
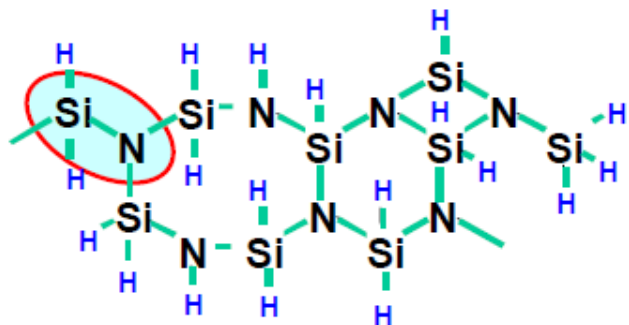
April, 2017



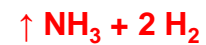
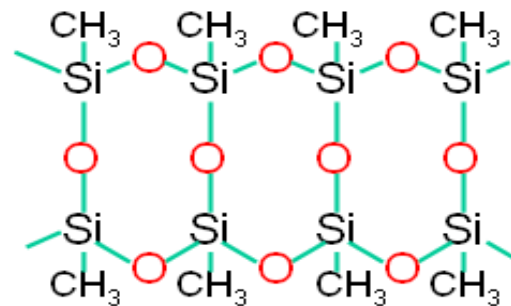
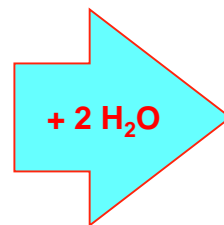
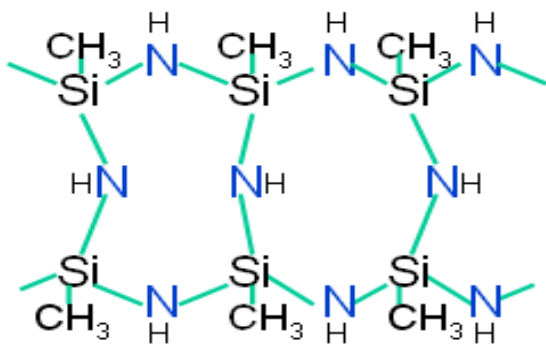
MERCK

Introduction of Polysilazane Transformation model

無機ポリシラザン (PHPS)



有機ポリシラザン (OPSZ)

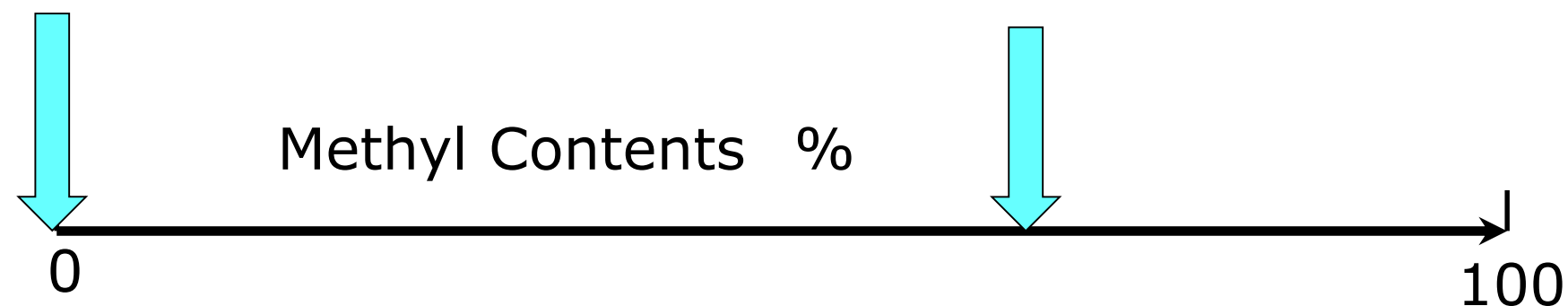


Introduction of Polysilazane

Polysilazane-resins

無機ポリシラザン

有機ポリシラザン



High	←	硬度	→	Low
Low	←	膜厚	→	High
Low	←	水接触角	→	High
High	←	価格	→	Low

Introduction of Polysilazane

Applications - polysilazane

期待できる性能

- ❖ 高耐熱性
- ❖ 耐食性
- ❖ 耐候性
- ❖ 耐火性
- ❖ 耐擦傷性
- ❖ 落書き防止
- ❖ 汚れ防止

密着性良好

- ❖ セラミック
- ❖ 金属
- ❖ ガラス
- ❖ プラスチック
- ❖ 木材

混合可能な樹脂（まずは少量でお試しお願いいたします）

- ❖ フッ素樹脂
- ❖ ユリア樹脂
- ❖ シリコン樹脂
- ❖ エポキシ樹脂
- ❖ アクリル樹脂

Introduction of Polysilazane Applications

- 汚れ防止 - キッチンシンク、自動車ボディコーティング、建築塗料(アルミ)、トンネル



無機、日本



無機・有機 日本、アジア



有機 韓国、台湾



有機 アジア

- 耐熱性 - ピストン、銃器、排気管



無機、日本



有機、アメリカ



有機、アメリカ

Introduction of Polysilazane Applications

- 密着性向上 - カーブミラー (ステンレス + TiO₂), 触媒 (ステンレス + CeO₂)



無機、日本

有機、韓国

- 落書き防止 - 電車, 切符販売機



有機、欧州



有機、欧州

Product Portfolio - Asia

Organo Polysilazanes

Product Name	Package
Durazane™ 1500 Rapid Cure	1Kg/5Kg/180Kg
Durazane™ 1500 Slow Cure	1Kg/5Kg/180Kg
Durazane™ 1800	1Kg/5Kg/180Kg

Inorganic Polysilazanes

Product Name	Package
NL120A-20	946ml
NAX120-20	946ml
NN120-20	946ml

Watch out:
Organo polysilazanes are subject to US export control regulations

Inorganic polysilazanes are supplied in 20% solvent-based solutions.



India
OPSZ



Japan
PHPS

Introduction of Polysilazane

Inorganic Polysilazane

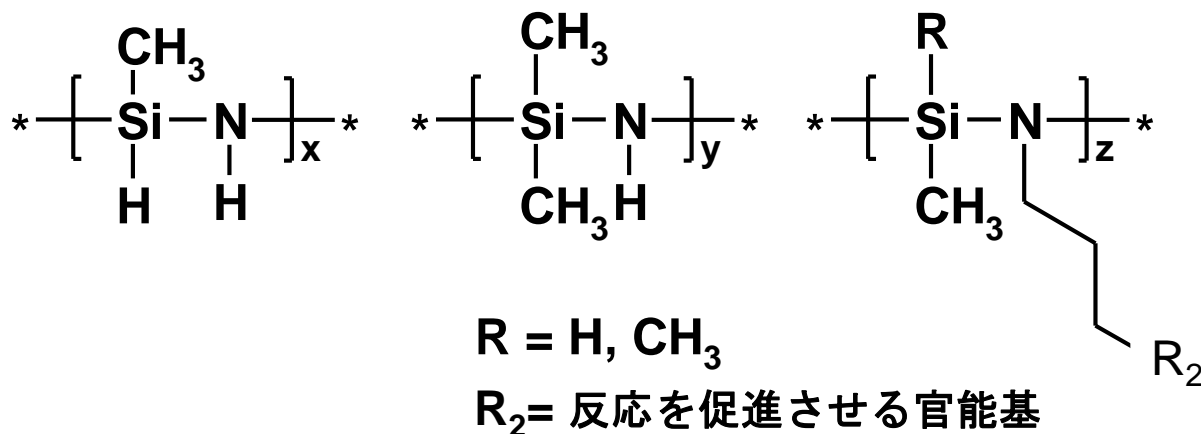
Product	Cure condition	Solvent	Catalyst	Feature
NAX120	R.T to 100degC	DBE	アミン	Low temperature curable but difficult handling because of the fast transformation to SiO ₂ . Can be mixed to OPSZ.
NL120A	Over 100 degC	DBE	金属	Need to cure over 100degC to achieve transformation from polysilazane to SiO ₂ . Easier handling than NAX120-20.
NN120	Over 500 degC	DBE	無し	No catalyst is contained. Need to cure over 500 degC.

Introduction of Polysilazane

Organic Polysilazane-chemical structure

DURAZANE 1500

反応促進基含有の有機ポリシラザン



Slow Cure;
Rapid Cure;

R₂含有率
低
高

推奨キュア条件

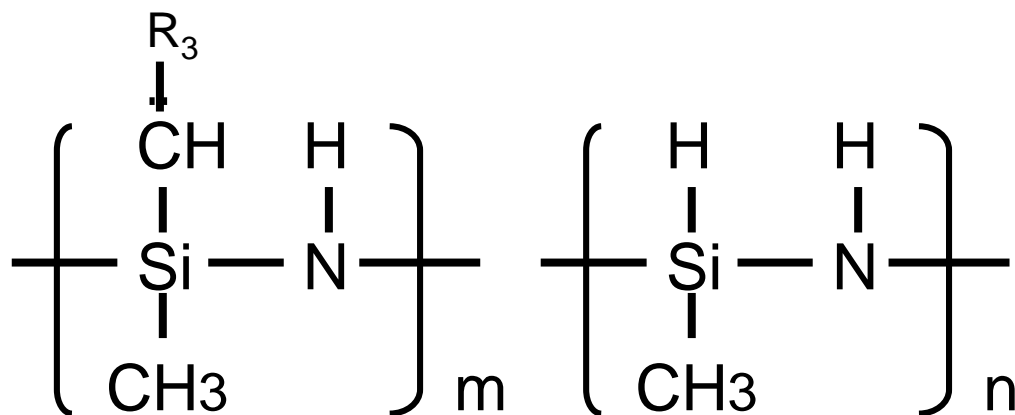
室温:	8 - 12 時間
80 °C:	2 時間
130 °C - 180 °C:	1 時間
240 °C:	数分

Introduction of Polysilazane

Organic Polysilazane-chemical structure

DURAZANE1800

高耐熱性の有機ポリシラザン



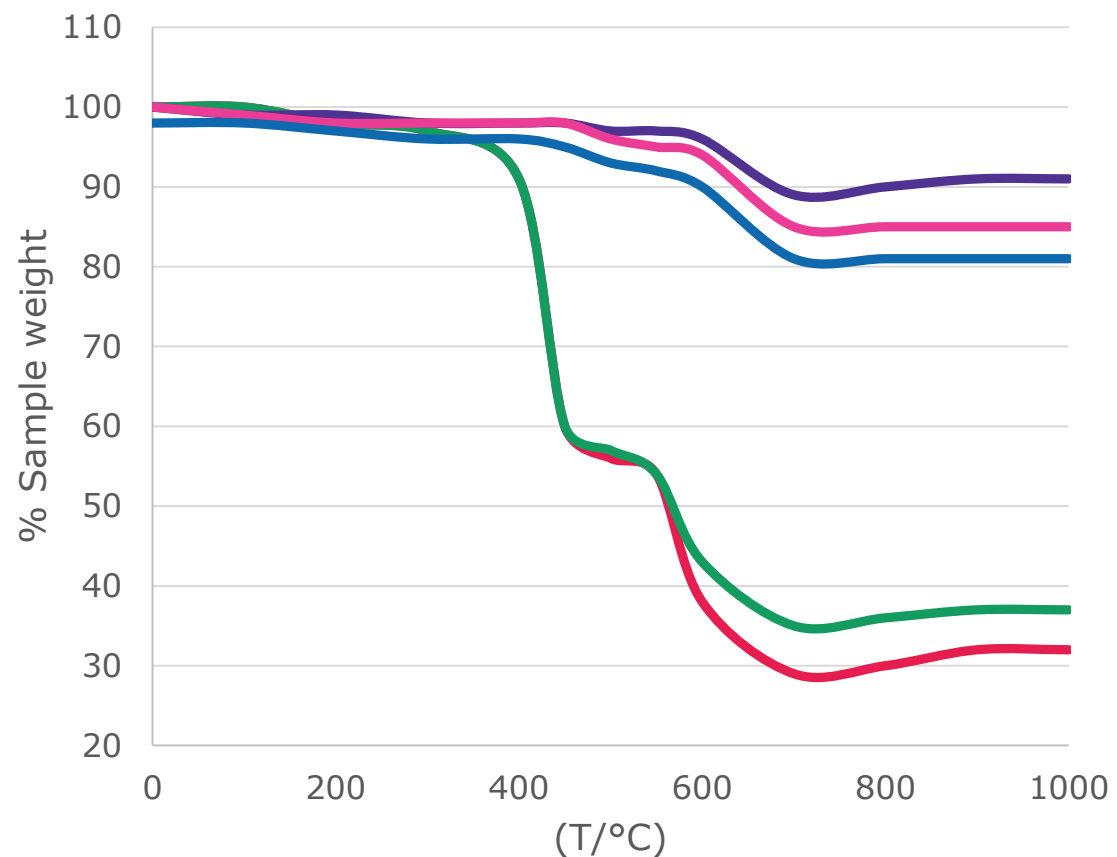
R₃ = 高耐熱を実現させる官能基

推奨キュア条件

室温:	24- 48 時間
80 °C:	5 時間
130 °C - 180 °C:	2 時間
240 °C:	30分

Performance

有機ポリシラザンの耐熱性

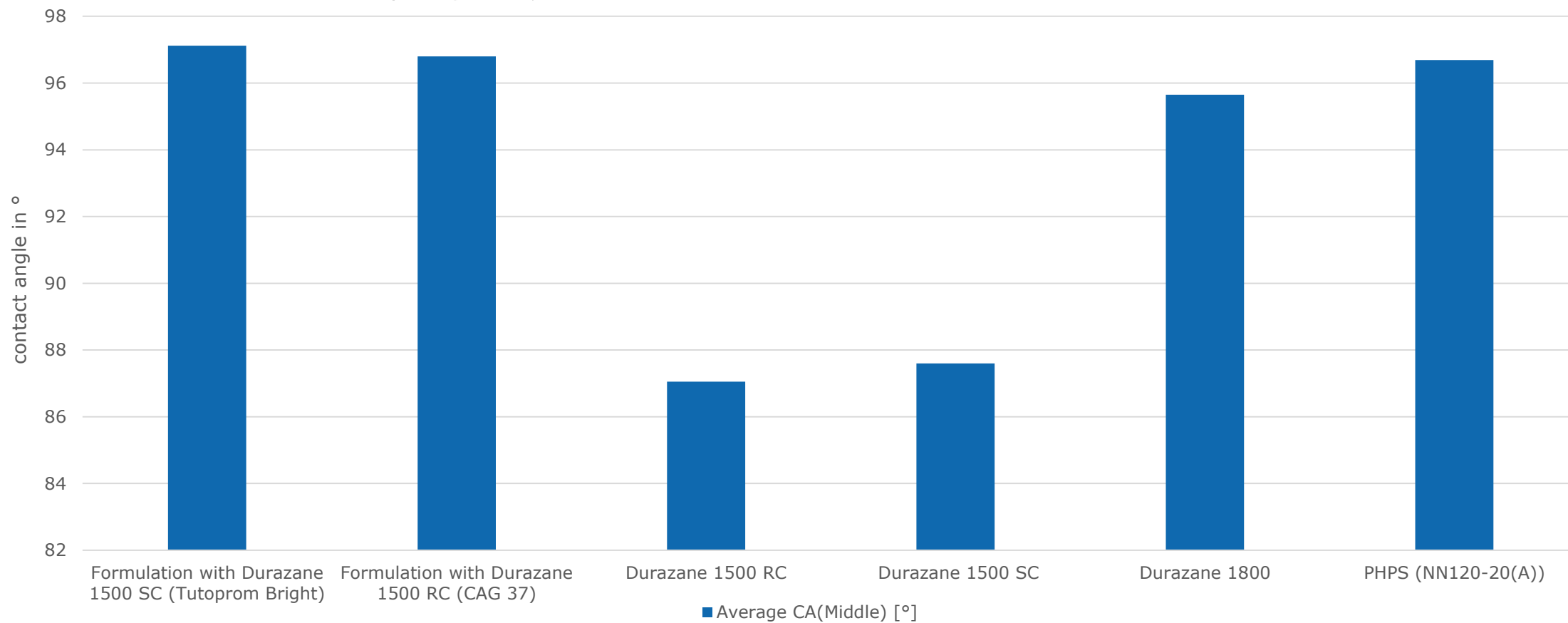


- Weight loss at high temp
- Comparison between OPSZ and silicone polyesters
- Rate of heating: 5 °C/min

Performance

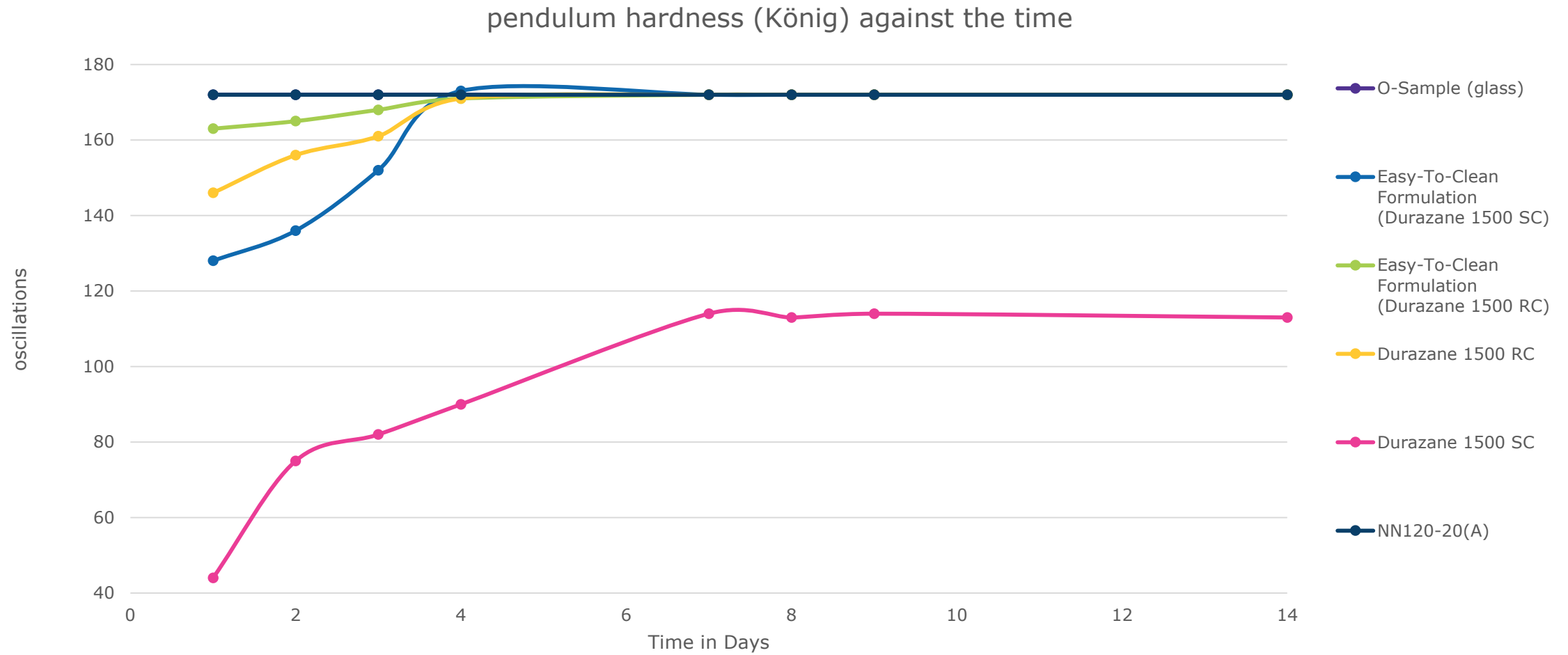
水接触角

塗布8日後に測定



Performance

振り子硬度測定試験

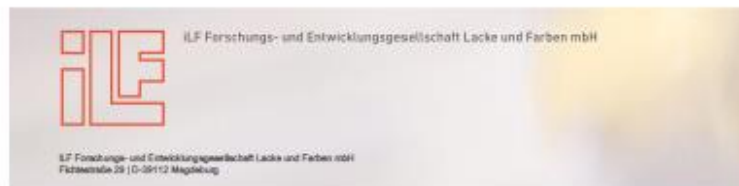


Performance 焼成条件

Resin	Curing conditions	Curing duration for full Hardness	Curing remark
Durazane™ 1500 RC	Room temperature	4 days	
	80 °C	2 hours	
	130 °C - 180 °C	1 hour	
	240 °C	several minutes	
	250 °C	Maximum temperature (decomposition at higher temperatures)	
Durazane™ 1500 SC	Room temperature	7 days	
	80 °C	2 hours	
	130 °C - 180 °C	1 hour	
	240 °C	several minutes	
	250 °C	Maximum temperature (decomposition at higher temperatures)	
Durazane™ 1800	180 °C	several hours	
	250 °C	5 hours	
	90 °C	5 hours	
	Lower curing temp. possible		with addition of 0.5 – 2 wt-% dicumylperoxide with addition of dicumylperoxide

Make sure to clean equipment quickly!

Performance 電車塗装(ウレタン)



TEST CERTIFICATE

Test report: 140274.1
 Customer: AZ Electronic Materials (Germany)
 Rheingonstr.190
 65203 Wiesbaden

塩水噴霧試験, 1000h
 凝縮水試験, 1000h
 キセノン耐候試験, 1400h

Test laboratory: iLF Magdeburg, Laboratory Paint Testing
 Test results: see page 2

Magdeburg, 18.08.2014
 iLF GmbH

Dipl. Chem. C. Dröyer
 Leader Laboratory Paint Testing

Dipl. Chem. H. Wienbeck
 Laboratory Paint Testing

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 St.1: 34 322 298
 Nordstr. Magdeburg
 St.2: 250 500 00
 St.1: 122 934 030

Geschäftsbüro:
 Dr. Ulrich Westermann
 Sitz der Gesellschaft:
 Magdeburg

USt-IdNr.:
 DE163626383
 AG-Steuer-Nr. 107162



ILF Forschungs- und Entwicklungsgesellschaft Lacke und Farben mbH

test certificate 140274.1

Test method / Test results	
Salt spray test NSS (DIN EN ISO 9227) 1 000 h Blistering no Rusting no Corrosion in scribe < 0,5 mm	
Condensation atmosphere with constant humidity (DIN EN ISO 6270-2) 1 000 h Blistering no Rusting no	
Artificial weathering with Xenon-arc (DIN EN ISO 16474-2) 1400 h Loss of gloss 12% Colour difference $\Delta E^*_{ab} = 0,51$ Cracking no	

Performance アルミニウムに塗装



TEST CERTIFICATE

Test report: 140274.5
 Customer: AZ Electronic Materials (Germany)
 Rheingastr. 190
 65203 Wiesbaden

塩水噴霧試験, 1000h
 凝縮水試験, 1000h
 キセノン耐候試験, 1400h

Magdeburg, 18.08.2014
 iLF GmbH

Dipl. Chem. C. Dreyer
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Dipl. Chem. H. Wienbeck
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 StZ der Gewerkschaft
 Magdeburg

US-KDN:
 DE18302353
 AG Gewerkschaft
 107162

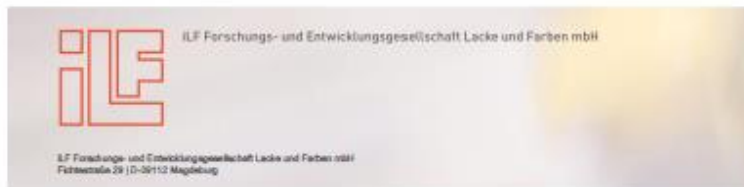


ILF Forschungs- und Entwicklungsgesellschaft Lacke und Farben mbH

Prüfzertifikat 140274.5

Test method / Test results		
Salt spray test NSS (DIN EN ISO 9227) 1500 h with CAG 37 Blistering no Rusting no Corrosion in scribe < 0,5 mm		
Condensation atmosphere with constant humidity (DIN EN ISO 6270-2) 1400 h with CAG 37 Blistering no Rusting no		
Artificial weathering with Xenon-arc (DIN EN ISO 16474-2) 1400 h with CAG 37 Colour difference $\Delta E^*_{45} = 0,17$ Cracking no		

Performance ステンレスに塗装



TEST CERTIFICATE

Test report: 140274.3
 Customer: AZ Electronic Materials (Germany)
 Rheingastr. 190
 65203 Wiesbaden

塩水噴霧試験, 1000h
 凝縮水試験, 1000h
 キセノン耐候試験, 1400h

Magdeburg, 18.08.2014
 iLF GmbH

Dipl. Chem. C. Dreyer
 Leader Laboratory Paint Testing

Dipl. Chem. H. Wienbeck
 Laboratory Paint Testing

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Geschäftsbüro:
 Dr. Ulrich Westermann
 Sitz der Gesellschaft:
 Magdeburg

USt-IdNr.:
 DE183626557
 AG Stempel HRB-197162



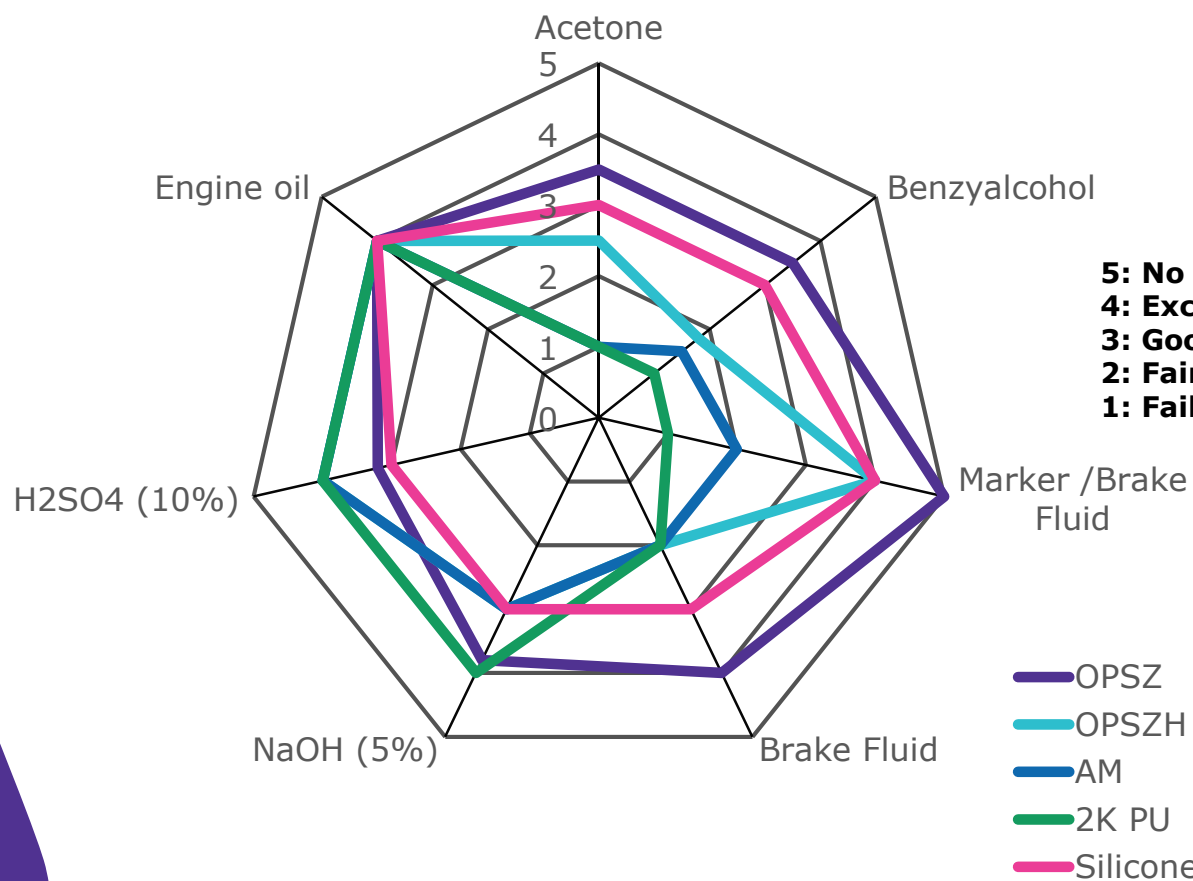
iLF Forschungs- und Entwicklungsgesellschaft Lacke und Farben mbH

test certificate 140274.3

Test method / Test results	
Salt spray test NSS (DIN EN ISO 9227) 1500 h Blistering no Rusting no Corrosion in scribe < 0,5 mm	
Condensation atmosphere with constant humidity (DIN EN ISO 6270-2) 1400 h Blistering no Rusting no	
Artificial weathering with Xenon-arc (DIN EN ISO 16474-2) 1400 h Loss of gloss 5% Colour difference ΔE^*_{uv} = 0,40 Cracking no	

Performance 薬液耐性

それぞれの薬液を24時間試料の上に静置後に測定。



- 5: No Effect** - 表面上に変化が無い
- 4: Excellent** - 色や光沢において微小な変化が見られるが、機能や寿命には影響が無い。
- 3: Good** - 色や光沢において変化が見られるが、顕著な性能や寿命の劣化が無い。
- 2: Fair** - 色や光沢に明らかな変化が生じ、欠落も見られるため、性能や寿命が劣化している可能性が高い。
- 1: Fail** - くぼみや穴が生じて明らかな性能劣化が認められる。

OPSZ: DURAZANE1500 Rapid Cure
OPSZH: DURAZANE1500 RC + ウレタン
AM: アルキドメラミン
2K PU: ポリウレタン
Silicone: シロキサン