



高性能防腐涂料之流变性能 整体优化方案



Walee Wang/王全义
Technical service manager
Elementis Specialties/海名斯特殊化学

One-stop Total Solution Provider
一站式整体解决方案的伙伴

Agenda/主要内容



- 海名斯特殊化学简介
- 流变学基础分享
- 流变助剂分类与介绍
- 如何应用新型易分散有机膨润土来优化高固含环氧富锌涂料及醇溶性富锌涂料配方
- 新型粉体聚酰胺蜡在高厚膜型涂料中的应用




One-stop Total Solution Provider
一站式整体解决方案的伙伴

ELEMENTIS SPECIALTIES











One-stop Total Solution Provider
一站式整体解决方案的伙伴

全球的生产基地

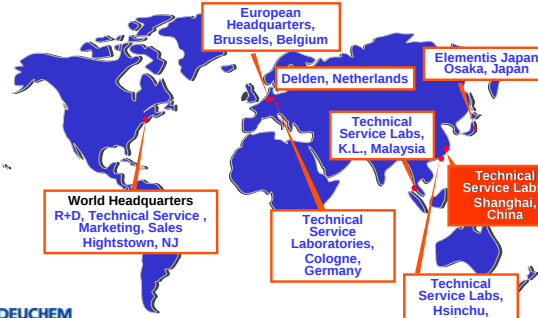




One-stop Total Solution Provider
一站式整体解决方案的伙伴

全球技术研发与应用实验室





One-stop Total Solution Provider
一站式整体解决方案的伙伴

专注于流变助剂及特殊化学品制造





Products for Coatings

Rheological additives

- BENTONE®
- BENGEL®
- THIXATROL®
- MPA®
- RHEOLATE®
- BENAQUA®
- DeuRheo

Surfactants

- NUOSPERSER®

Dispersants

- NUOSPERSER®

Defoamers

- DAPRO® DF
- Defom

Surface Conditioners

- SLIP-AYD®

Leveling Agent

- Levelol
- Levaslip
- DAPRO®

Polyacrylate Resin

- Hypomer®

Corrosion Inhibitors

- NALZIN®

Adhesion Promoter

- Adherent

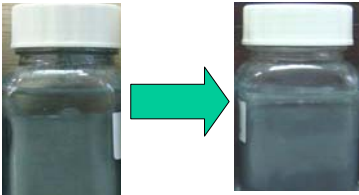
Colorants

- TINT-AYD

One-stop Total Solution Provider
一站式整体解决方案的伙伴

How to enhance anti-settling ?

怎样提升富锌漆的防沉性能？



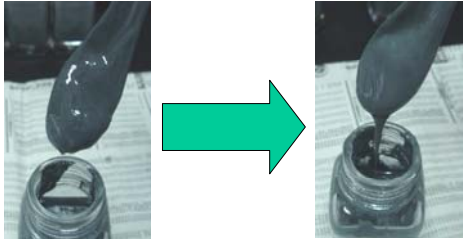
DEUCHEM
ELEMENTIS SPECIALTIES
海名斯·德谦

One-stop Total Solution Provider
一站式整体解决方案的伙伴

201072

How to improve flow properties?

怎样改善富锌涂料的流动性能？



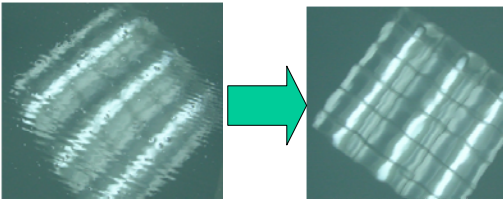
DEUCHEM
ELEMENTIS SPECIALTIES
海名斯·德谦

One-stop Total Solution Provider
一站式整体解决方案的伙伴

201072

How to improve seeding resistance?

怎样提升有机触变剂的抗结粒性能？



DEUCHEM
ELEMENTIS SPECIALTIES
海名斯·德谦

One-stop Total Solution Provider
一站式整体解决方案的伙伴

201072

Basic Of Rheology
/流变学基础



Confidential information of Elementis Specialties Inc.

Defination Of Rheology/流变的定义

A Study of the Deformation and Flow Behaviour of Matter Under the influence of External Forces
/主要研究液体在受到外力作用时，其本身所发生的形变及流动行为

DEUCHEM
ELEMENTIS SPECIALTIES
海名斯·德谦

One-stop Total Solution Provider
一站式整体解决方案的伙伴

201072

Why are Rheological Additives needed?

- Control viscosity _ 控制粘度
- Improve sag resistance _ 提升抗流挂
- Impart shear thinning behavior _ 改善剪切稀化
- Provide good balance of sag/leveling _ 提供流挂/流平平衡
- Improve pigment suspension and antisetling _ 悬浮与防沉
- Control application properties _ 控制施工性

DEUCHEM
ELEMENTIS SPECIALTIES
海名斯·德谦

One-stop Total Solution Provider
一站式整体解决方案的伙伴

201072

Viscosity/粘度的定义

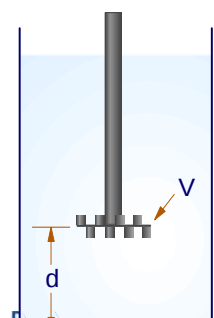
Definition of VISCOSITY

$$\text{Viscosity (Resistance to Flow)} = \frac{\text{Shear Stress } (\tau)}{\text{Shear Rate } (\dot{\gamma})}$$

DEUCHEM
海名斯·德谦

One-stop Total Solution Provider
一站式整体解决方案的伙伴

High Speed Disperser Shear Rate



Assumptions:

1 ft = 30.48 cm
V = 4,500 ft/min
V = 22.86 m/s

Unpigmented system

Linear Tip Speed (V) = 4,500 ft/min
d = 1 foot

Shear Rate = $\frac{V}{d} = \frac{4,500 \text{ ft/min}}{1 \text{ ft}}$

Shear Rate = $\frac{75 \text{ ft/sec}}{1 \text{ ft}} = 75 \text{ 1/sec}$

DEUCHEM
海名斯·德谦

One-stop Total Solution Provider
一站式整体解决方案的伙伴

刷涂施工

Application Shear Rates

$$\text{Shear Rate} = \frac{V}{d} = \frac{30''/\text{sec}}{0.003''} = 10,000 \text{ sec}^{-1}$$

1 inches = 25.4 mm
0.003 inches = 76.2μm

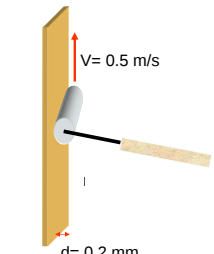
V = 30''/sec

Wet Paint Film (0.003" thick)

DEUCHEM
海名斯·德谦

One-stop Total Solution Provider
一站式整体解决方案的伙伴

滚涂施工



Assumption/假设:

linear velocity (V) /线速度 = 0.5 m/s
d = 0.2 mm

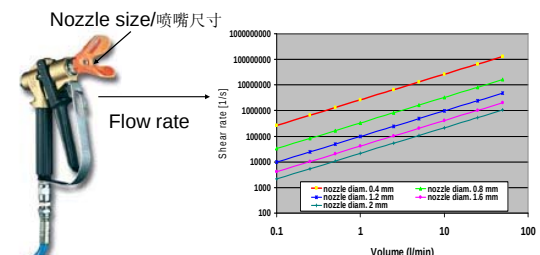
shear rate /剪切速率 = $\frac{V}{d} = \frac{0.5 \text{ m/s}}{0.0002 \text{ m}}$

shear rate /剪切速率 = 2500 1/s

DEUCHEM
海名斯·德谦

One-stop Total Solution Provider
一站式整体解决方案的伙伴

喷涂施工



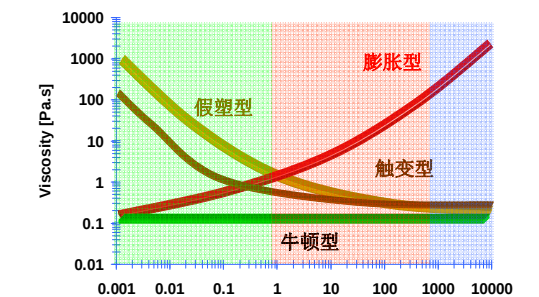
Nozzle size/喷嘴尺寸

Flow rate

DEUCHEM
海名斯·德谦

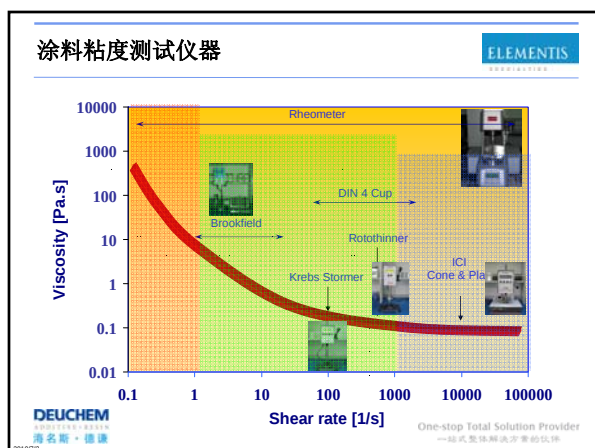
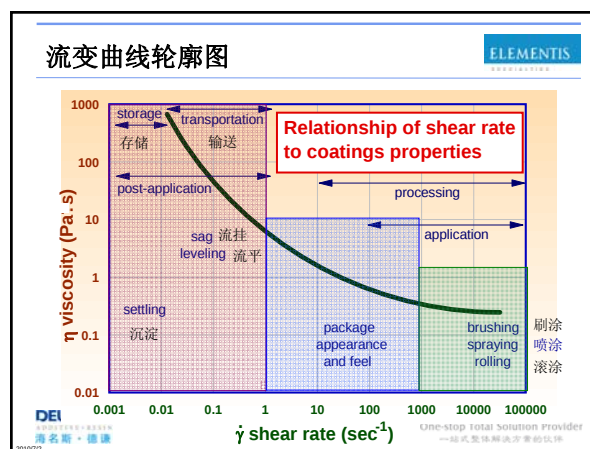
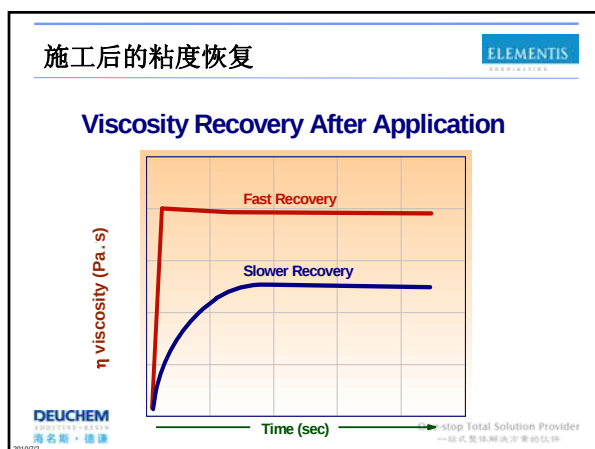
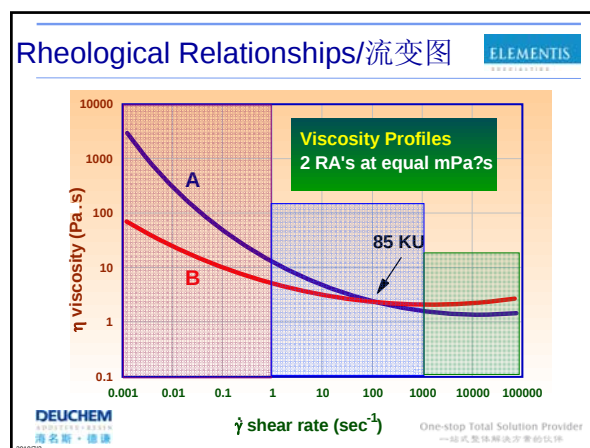
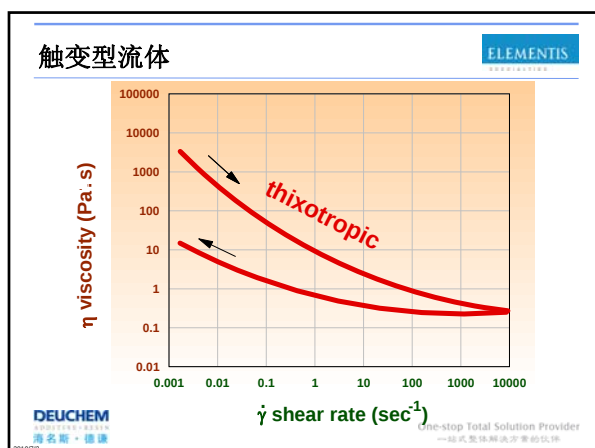
One-stop Total Solution Provider
一站式整体解决方案的伙伴

流体的分类



DEUCHEM
海名斯·德谦

One-stop Total Solution Provider
一站式整体解决方案的伙伴



Rheology Additives

Solvent Based System

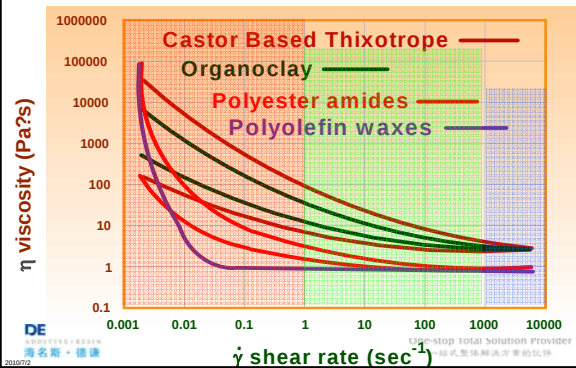
- ✓ Organoclays/有机膨润土
- ✓ Castor oil based/蓖麻油衍生物
- ✓ Mixed Diamide/混合双酰胺
- ✓ Polyester-amides/聚酯酰胺
- ✓ Polyamides/聚酰胺蜡
- ✓ Anti-settling agents/聚烯烃蜡防沉剂

DEUCHEM
SOLUTIONS SYSTEM
海名斯·德谦

One-stop Total Solution Provider
一站式整体解决方案的伙伴

201072

各类流变助剂-流变曲线图



201072

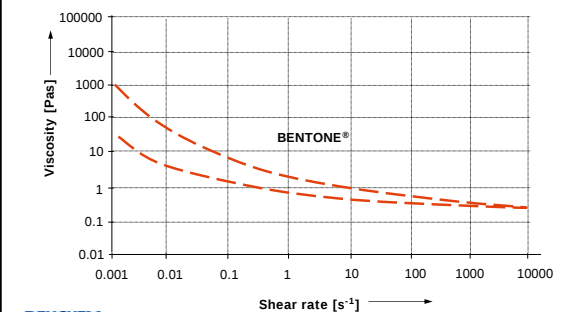
Organoclay / 有机膨润土 BENTONE® & BENGEL®



DEUCHEM
SOLUTIONS SYSTEM
海名斯·德谦

201072

有机膨润土的流变曲线



201072

Clay Products/膨润土的分类

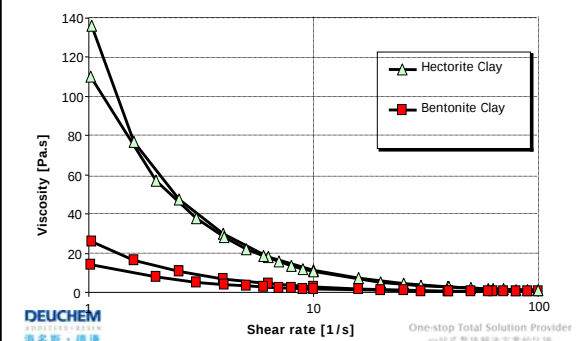
	Bentonite/蒙脱土 [Na-Al-Mg-Silicate]	Hectorite/ Hectorite [Na-Mg-Li-Silicate]
H ₂ O	13.7	12.5
颜色	green	cream
片晶外形	equidimensional	elongated
片晶尺寸	0.8 x 0.8 x 0.001 μ m	0.08 x 0.8 x 0.001 μ m
溶胀能力	16 x	24 x

DEUCHEM
SOLUTIONS SYSTEM
海名斯·德谦

One-stop Total Solution Provider
一站式整体解决方案的伙伴

201072

Comparison of Hectorite with Bentonite

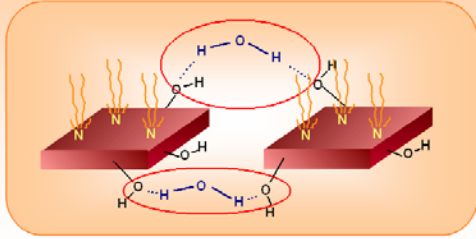


201072

Gel Development / 凝胶形成

ELEMENTIS

Gelling Mechanism

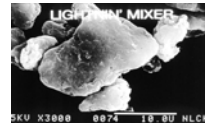


DE
201072
海名斯·德谦

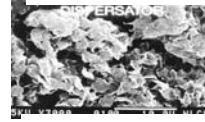
One-stop Total Solution Provider
一站式整体解决方案的伙伴

剪切速率对分散性的影响

ELEMENTIS



搅拌器
剪切速率: 接近零
10% 预凝胶: 1.5K mPa.s



高速分散机
剪切速率: $\sim 100 \text{ sec}^{-1}$
10% 预凝胶: 40K-60K mPa.s



均质器
剪切速率: $>300K \text{ sec}^{-1}$
10% 预凝胶: 1.5-2.0 million mPa.s

One-stop Total Solution Provider
一站式整体解决方案的伙伴

特殊的添加工艺

ELEMENTIS

Incorporation

Two Options to incorporate BENTONE / BENGEL

Pregel Addition/预凝胶	In-situ addition/前添加
Solvent/溶剂	Solvent/溶剂
Resin/树脂	BENTONE / BENGEL
Begin Mixing/开始混合	Disperse 5-10 minutes / 高速分散
BENTONE / BENGEL pregel	Polar Activator/极性活化剂
Mix, then add / 高速分散后添加	Disperse 10 minutes / 高速分散
Surfactant/表面活性剂	Resin/树脂
Pigment/颜料	Mix, then add / 高速分散后添加
Grind to desired fineness/研磨至规定细度	Surfactant/表面活性剂
Letdown / 调漆	Pigment/颜料
	Grind to desired fineness/研磨至规定细度
	Letdown / 调漆

DEUCHEM
201072
海名斯·德谦

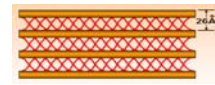
One-stop Total Solution Provider
一站式整体解决方案的伙伴

不同类型有机膨润土的比较

ELEMENTIS

传统型有机膨润土

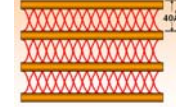
- 需要高剪切
- 极性活化剂
- 制备预凝胶
- $d_{001} \text{ spacing} = 26\text{\AA}$



DEUCHEM
201072
海名斯·德谦

易分散型有机膨润土

- 更低的剪切力
- 无需极性活化剂
- 直接添加/ 不需制作预凝胶
- 工厂生产更具灵活性
- larger $d_{001} \text{ spacing}$



One-stop Total Solution Provider
一站式整体解决方案的伙伴

传统有机膨润土的分散

ELEMENTIS

需要以下条件:

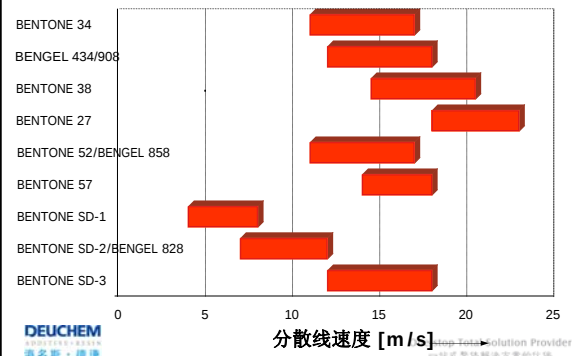
- 高剪切速率
- 极性/化学活化剂
- 特定的添加工艺
- 需要制备预凝胶

DEUCHEM
201072
海名斯·德谦

One-stop Total Solution Provider
一站式整体解决方案的伙伴

有机膨润土对剪切速率的需求

ELEMENTIS



DEUCHEM
201072
海名斯·德谦

One-stop Total Solution Provider
一站式整体解决方案的伙伴

Organoclays-Advantages & Limitations

- **Advantages/优点**
 - wide range of application/较宽的应用范围
 - provide thixotropic flow with good sag resistance and excellent levelling
/提供优异的抗流挂同时具有良好的流平性
 - effective pigment suspension/优异的防沉性
 - shear thinning for easy application/良好的剪切稀化
- **Limitations/限制**
 - not generally suitable for clear coats/不适合清漆

DEUCHEM
SOLUTIONS & SYSTEMS
海名斯·德谦

One-stop Total Solution Provider
一站式整体解决方案的伙伴

201072



RHEOLATE®
BENTONE®
THIXATROL®
NUOSPERSER®
RHEOX®
DAPRO®
TINT-AYD®

BENGEL® 958

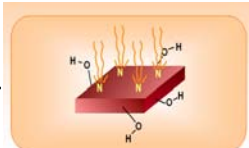
201072

One-stop Total Solution Provider
一站式整体解决方案的伙伴

BENGEL® 958

Composition/组成:
Organic derivative of a Bentonite clay/有机改性膨润土

Colour/颜色: White/白色
Form/形态: Finely divided powder/精细粉末状



DEUCHEM
SOLUTIONS & SYSTEMS
海名斯·德谦

One-stop Total Solution Provider
一站式整体解决方案的伙伴

201072

BENGEL® 958

- An easy dispersible grade organoclay /易分散型有机膨润土
- Provides good thixotropy, sag resistance, and anti settling properties /提供优异的触变性、抗流挂及防沉性能
- Eliminates the need for polar activator /无需极性活化剂
- Easy to incorporate, even at less than optimum dispersion conditions /易添加
- Provides good sag control and pigment suspension properties /提供良好的抗流挂与悬浮性能

DEUCHEM
SOLUTIONS & SYSTEMS
海名斯·德谦

One-stop Total Solution Provider
一站式整体解决方案的伙伴

201072

BENGEL® 958

2 - C Epoxy Zinc Rich Primer 环氧富锌底漆

DEUCHEM
SOLUTIONS & SYSTEMS
海名斯·德谦

One-stop Total Solution Provider
一站式整体解决方案的伙伴

201072

Formula 1: 2K 环氧富锌涂料

Part A:

Raw materials	BENGEL 958	BENGEL 958	Competitor
	2.0%wt	2.5%wt	1.0%wt
Epoxy resin 602-75	14	14	14
Xylene	5.5	5.5	5.5
Rheological Additive	2	2.5	1
Disperse at 2000 rpm for 10 minutes			
n-butanol	2	2	2
Cyclohexanone	0.5	0.5	0.5
NUOSPERSER® PA 601	0.5	0.5	0.5
Talc (L2900)	5	5	5
Zinc dust	70	70	70
Disperse at 2000 rpm for 10 minutes			
Total	99.5	100	98.5

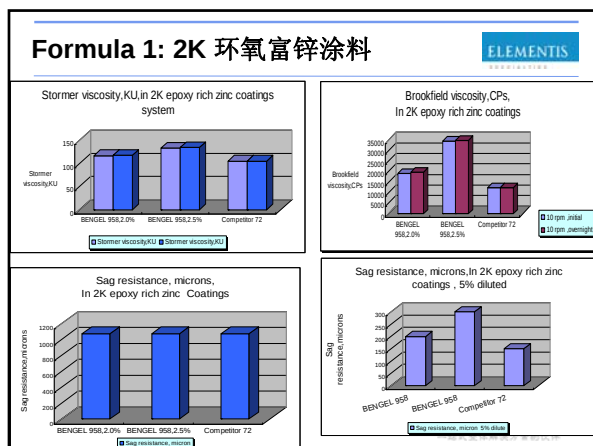
Part B:

Raw materials	Weight, %
Hardener	100
Total	100
Part A / Part B	10/1

DEUCHEM
SOLUTIONS & SYSTEMS
海名斯·德谦

One-stop Total Solution Provider
一站式整体解决方案的伙伴

201072



ELEMENTIS
SOLUTIONS

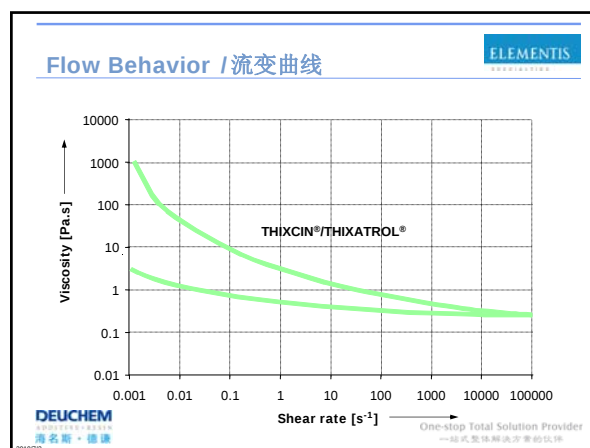
Castor Oil Derivative Based Rheological Additives

/ 蓖麻油衍生物流变助剂



201072

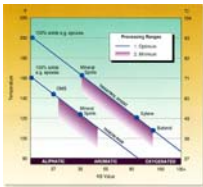
One-stop Total Solution Provider
一站式整体解决方案的伙伴



ELEMENTIS
SOLUTIONS

蓖麻油衍生物的特点

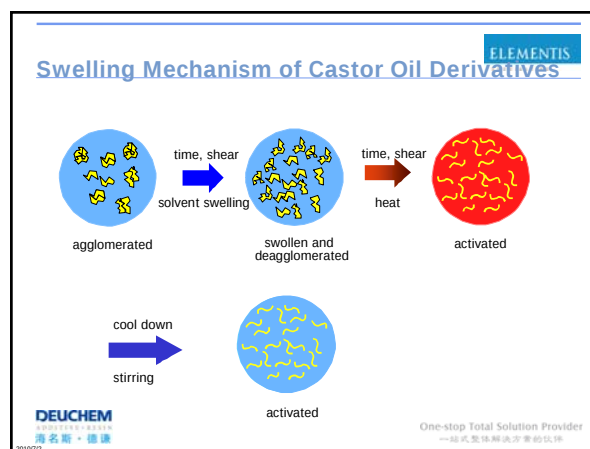
- Key properties/特征
 - thixotropic additive for low- to medium polarity systems/适合于中低极性体系
 - high rheological efficiency with thixotropic flow/提供触变型流动
 - needs exact temperature control in use/在使用时, 需要一定的活化温度
 - seeds when overprocessed/过热时, 有可能发生结粒现象
 - very good sag resistance/极佳的抗流挂
 - false body effects





201072

One-stop Total Solution Provider
一站式整体解决方案的伙伴



ELEMENTIS
SOLUTIONS

蓖麻油衍生物触变剂

- Advantages/优点
 - excellent thixotropy/优异的触变
 - strong shear thinning/较强的剪切稀化
 - quick film build/快速成膜
 - applicable in solventless systems/适合于无溶剂体系
 - highly efficient/高效
- Limitations/限制
 - temperature control in process/温控需求
 - adequate shear and dwell time/保温时间
 - seeding when overprocessed/过热时会结粒
 - sensitive to solvents/对溶剂较敏感

cool down before let-down (false-body)/包装前须逐步冷却



201072

One-stop Total Solution Provider
一站式整体解决方案的伙伴

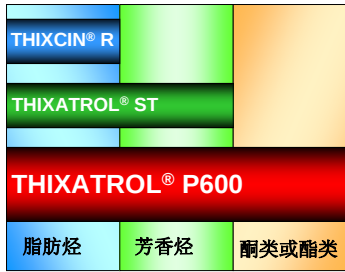
ELEMENTIS
SOLUTIONS

THIXATROL® P600 / 聚酰胺蜡有机触变剂

THIXATROL® P600

Key Properties / 性能

- ✓ 通用性强
- ✓ 适合低到高极性体系
- ✓ 更宽的温控范围
- ✓ 抗结粒性佳
- ✓ 高增稠性能, 同时保持优异的流动性
- ✓ 极佳的抗流挂性能
- ✓ 不影响层间附着
- ✓





201072

One-stop Total Solution Provider
一站式整体解决方案的伙伴



THIXATROL®P600



One-stop Total Solution Provider
一站式整体解决方案的伙伴

THIXATROL® P600

- Chemical composition**
 - 100 % active powder/100% 粉体
- Key properties/性能**
 - thixotropic additive for low- to high polarity systems/适合于低到极高极性体系
 - good dispersibility even at lower activation temperatures/优异的分散性，更宽的活化温度范围
 - high rheological efficiency with thixotropic flow/提供触变型流动
 - very good sag resistance/优异的抗流挂
 - seeding resistant/抗结粒
 - minimal false body effects/较低的塑性效应





One-stop Total Solution Provider
一站式整体解决方案的伙伴

THIXATROL® P600

- Advantages/优点**
 - no maximum processing temperature/无明显最高温范围
 - non seeding/无结粒现象
 - excellent thixotropy/优异的触变性
 - strong shear thinning/较强的剪切稀化
 - applicable in solventless systems/适合于无溶剂体系
 - highly efficient/高效
- Limitations/限制**
 - adequate shear and dwell time/需要足够的剪切和保温时间
 - minimum processing temperature/需要最低的活化温度需求





One-stop Total Solution Provider
一站式整体解决方案的伙伴

THIXATROL® P600

Order of Addition / 添加次序- HSD

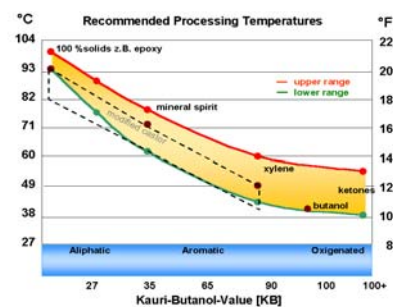
Resin solution / 树脂
Solvent / 溶剂
Organic rheological additive / 流变助剂
Mix 5 minutes / 高速分散 5 分钟
Surfactant / 表面活性剂
Pigments / Extenders / 颜填料
/ 在推荐的温度下分散，保温 15 - 30 分钟
Letdown / 调漆
冷却到室温包装





One-stop Total Solution Provider
一站式整体解决方案的伙伴

THIXATROL® P600 - Incorporation







One-stop Total Solution Provider
一站式整体解决方案的伙伴

THIXATROL® P600 - Incorporation

主要应用范围:

脂肪烃溶剂

芳香烃溶剂

酮类/酯类溶剂

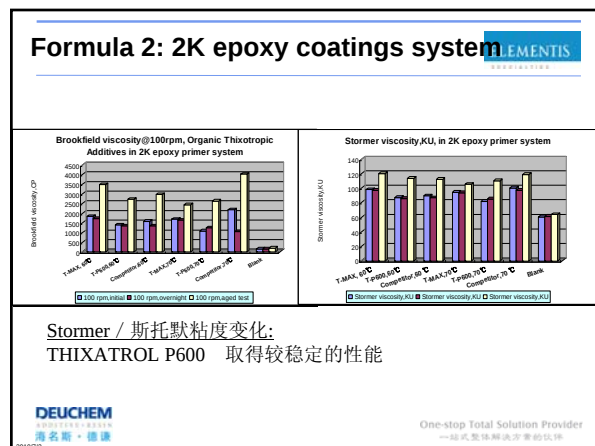
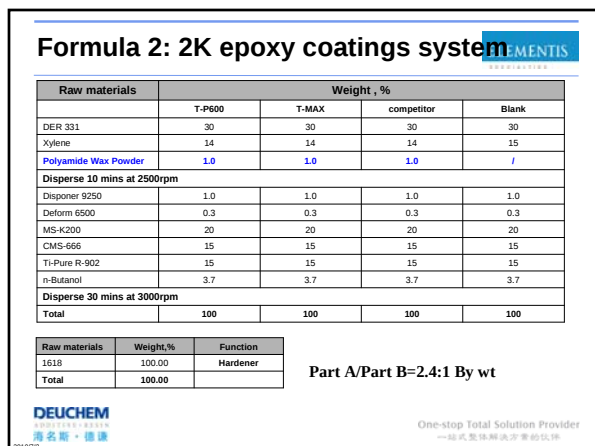
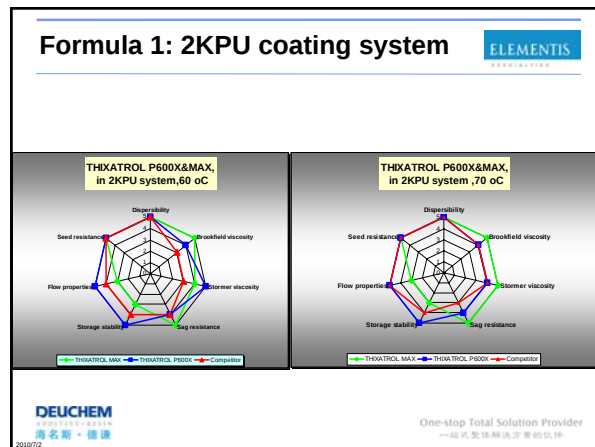
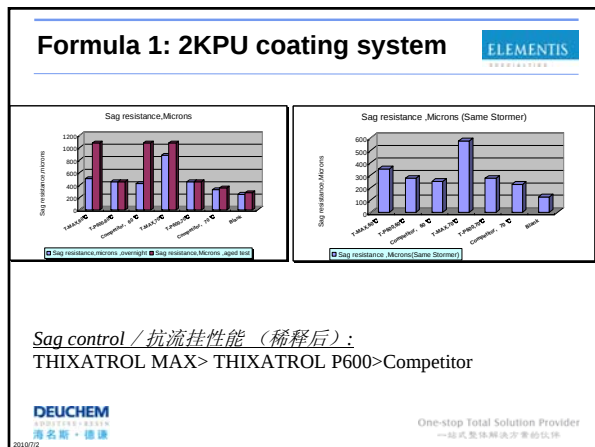
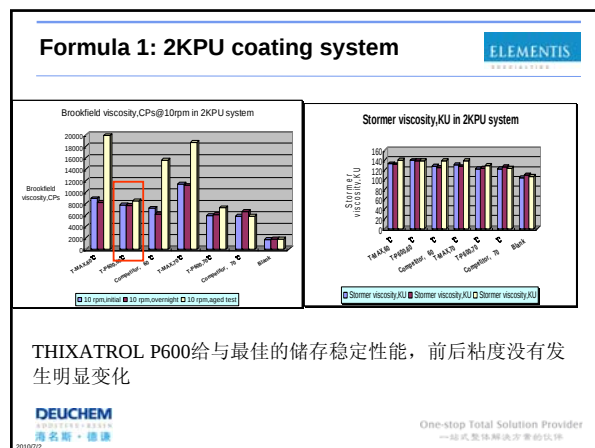
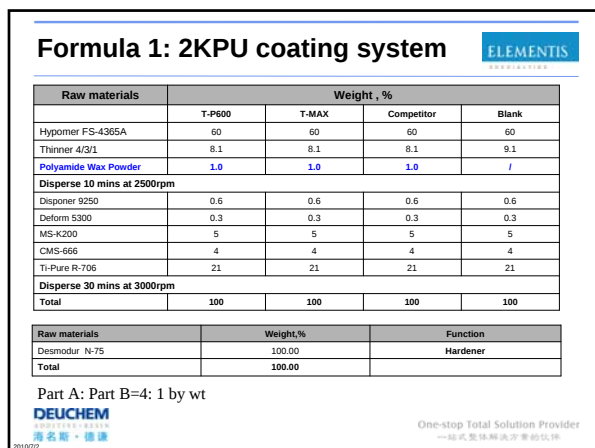
醇酸漆
丙烯酸涂料

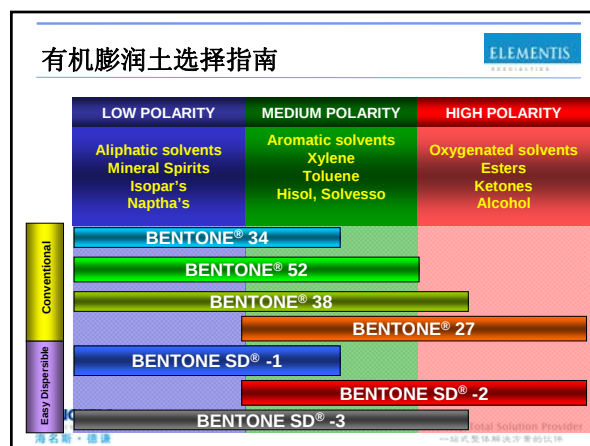
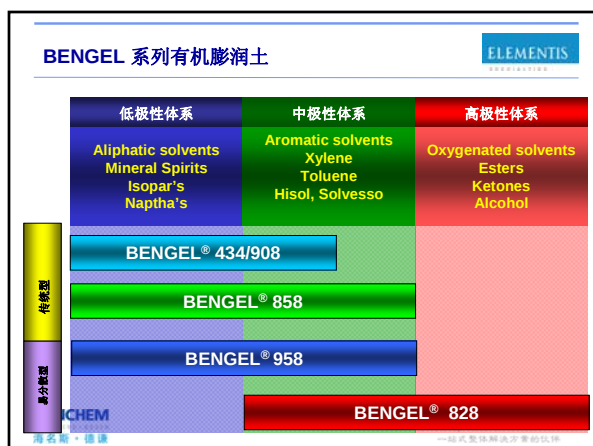
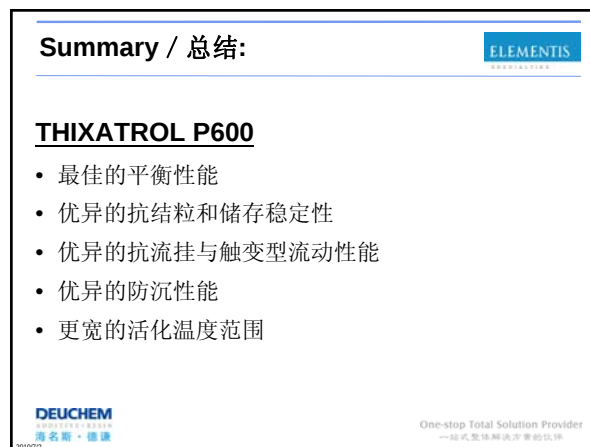
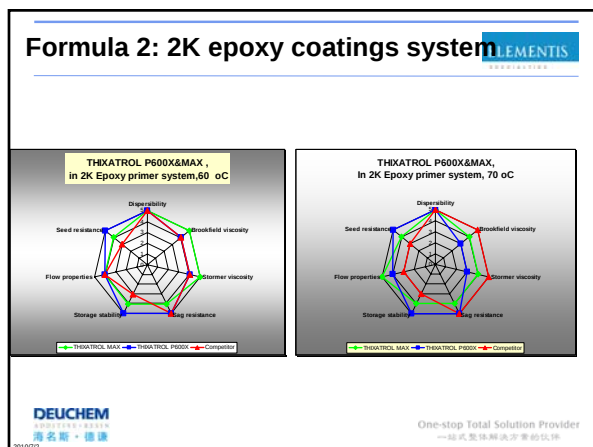
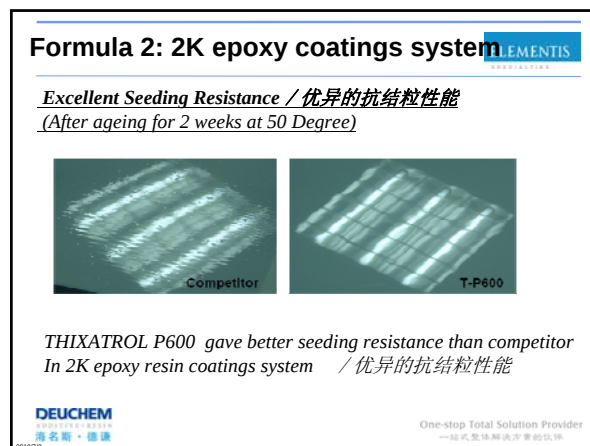
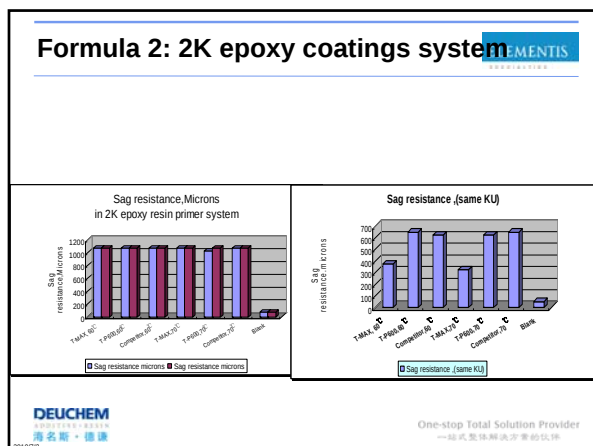
• 乙烯基面漆
 • 氯化橡胶涂料
 • 环氧/聚氨酯
 • 2K 聚氨酯
 • 氟碳涂料





One-stop Total Solution Provider
一站式整体解决方案的伙伴





Organic Thixotropic Additives			
Solvent Polarity/极性			
	低极性	中极性	高极性
THIXOTROPES			
THIXATROL® ST			
THIXATROL P600 /PLUS/MAX			
THIXATROL P200X/240X			
DeuRheo 219/229			
ANTISETTLING AGENTS			
MPA® & MPA 60 series			
MPA 1078X, 2000X,T			
MPA 4020 series			
DeuRheo 201/201P			
	Primary recommendation	May also be used	

Thank You !!

www.elementis-specialties.com

Walee Wang (Mr.) 王全义
Technical service manager

walee.wang@elementis.com
Mobile : 13816116438

Elementis Specialties, Inc.
No. 99, Liangyang Road,
Songjiang Industrial Zone,
Shanghai 201613 China.
Tel: +86.21.5774 0348—706
Fax: +86.21.5774 5356

Disclaimer
DEUCHEM
The information in this publication is, to the best of our knowledge, true and accurate, but since the conditions of use are beyond our control, no warranty is given or to be implied in respect of such information. In every case, caution must be exercised to avoid violation or infringement of statutory obligations and any rights of third parties. We are, at all time, willing to study customers' specific outlets involving our products in order to enable their most effective use.

Information and Samples

For more information on Elementis Specialties products, please contact:

EUROPE

Elementis Specialties
De Kleetlaan 12A, bus 3
1831 Diegem, Belgium
sofie.raemdonck@elementis-eu.com
Tel: +32.2.790 7600
Fax: +32.2.790 7660

REST OF ASIA

Elementis Specialties, Inc.
Lot PT 55, 64 & 65, Jalan Hulu Tinggi 26/6,
Section 26, 40400 Shah Alam,
Selangor Darul Ehsan, Malaysia
Tel: +603.5191 9879
Fax: +603.5191 6811

AMERICAS

Elementis Specialties, Inc.
PO Box 700, 329 Wyckoff's Mill Road
Hightstown, New Jersey 08520, USA
della.adkins@elementis-na.com
Tel: +1.609.443 2505
Fax: +1.609.443 2422

CHINA

Elementis Specialties, Inc.
99, Liangyang Road
Songjiang Industrial Zone
Shanghai 201613 China.
Tel: +86.21.5774 0348
Fax: +86.21.5774 9396

www.elementis-specialties.com

Disclaimer
DEUCHEM
The information in this publication is, to the best of our knowledge, true and accurate, but since the conditions of use are beyond our control, no warranty is given or to be implied in respect of such information. In every case, caution must be exercised to avoid violation or infringement of statutory obligations and any rights of third parties. We are, at all time, willing to study customers' specific outlets involving our products in order to enable their most effective use.