Coatings Trends & Technologies Summit

CHT
SMART CHEMISTRY WITH CHARACTER.

HIGH PERFORMANCE WOOD COATING ADDITIVES

Coatings Trends & Technologies Summit 2024

September 2024

CONTENT

1) Bruce...
2) CHT
3) Wood Coating Formulation
4) Pigment Dispersants
5) Wetting and Leveling
6) Defoaming
7) Surface Modification
8) Summary

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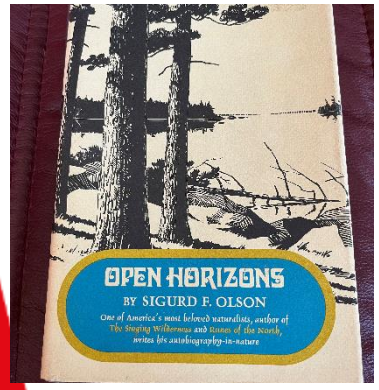
BRUCE BERGLUND



- Outdoors / Wilderness / Fishing
- Reading (Christian, Nature, Business, Health)
- Family – Andre and Mark, Brandy
- Hockey, Music (trumpet)
- Education (PhD, MBA) – Always Learning
- Minnesota Roots, Florida Home
- Focus on Health

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BRUCE'S LIFE LESSONS → COATINGS

• Fishing	If you're not catching fish, do something different. If you're catching fish keep doing it.
• Always keep learning	The more I know, the more I realize how little I know – Keep growing
• Grow through discomfort	Challenge yourself in new areas…like wood coatings
• Don't believe in the word "can't"	Music, language, chemistry…big achievements happen with perseverance
• Be bold	Great results come from willingness to go beyond the known, the expected…Creativity
• Be grateful	Produces happiness and content…we're fortunate to be at the CTT Summit
• Focus on your health	Give yourself the best opportunities to think, act and achieve
• Quantum Mechanics - Oneness	We are all part of one global community – Respect, Love, Truth, and yes, Sustainability…

- It's the little things in life that matter (Conductor Miles Johnson regarding music) – Also true for science, chemistry and coatings (additives)

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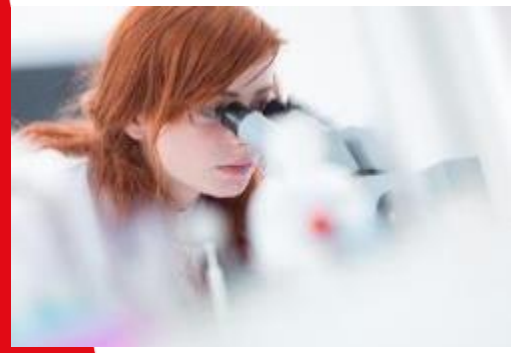

OUR COMPANY IS A FOUNDATION

The non-profit Reinhold-Beitlich-Foundation promotes:

- Social commitment to young people
- Science and research in the field of chemistry
- Research on renewable raw materials
- Promotion of environmental and nature conservation

Vision

- CHT is the preferred partner and leading reference for sustainable chemical solutions in our markets, worldwide!

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CHT TECHNICAL CORE COMPETENCIES

COMPETITIVE ADVANTAGE

CHEMISTRY	RAW MATERIALS	SYNTHESIS	PROCESSING	FUNCTIONS
Wax	▶ Polyolefins ▶ Polyester ▶ Natural Waxes	▶ Oxidation	▶ Emulsifying ▶ Formulating ▶ Dispersing ▶ Mixing ▶ Milling	▶ **Surface Modification** ▶ **Hydrophobicity** ▶ **Defoaming** ▶ **Wetting / Dispersing** ▶ **Rheology** ▶ **Film Formation**
Silicone	▶ PDMS ▶ Siloxane Oligomers ▶ Silanes	▶ Equilibration ▶ Hydrosilylation ▶ Polycondensation		
Polysaccharide	▶ Guar ▶ Xanthan ▶ Tamarind	▶ Alkoxylation		
Synthetic Polymers[1)]	▶ Acrylics ▶ Isocyantes ▶ Polyols	▶ Polymerisation		

1) Polyacrylates, polyurethanes, polyester

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WOOD COATING FORMULATION

Binder / Resin / Polymer	Provides most performance properties
Solvent	Necessary if want liquid
Co-Solvents	Generally needed for film coalescence
Pigments	For opacity, color, barrier properties
Fillers	For barrier properties, rheology
Additives (selected)	**Optimize film formation, provide rheology and added properties**

Pigment Dispersants

Wetting Agents

Leveling Agents

Defoamers / Deaerators

Surface Modification – slip, anti-slip, abrasion…

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LEVELING / WETTING / DISPERSING ADDITIVES

Solutions for special requirements in the areas of dispersion and wetting

Excellent wetting of substrates or pigments.

Properties and effects:

- Pigment stabilization
- Pigment wetting
- Substrate wetting
- Optimum flow

Industries and markets:

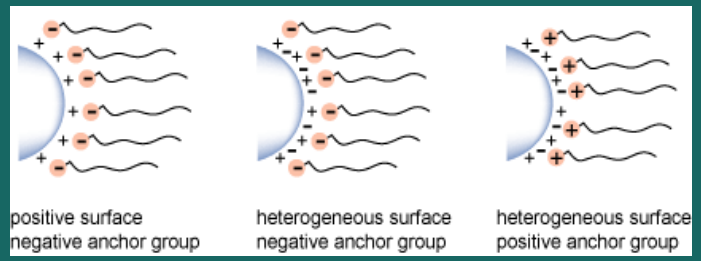
- Wood coatings
- Industrial coatings
- Pigment concentrates
- Metal treatment
- Seed Coatings

Polymeric dispersants

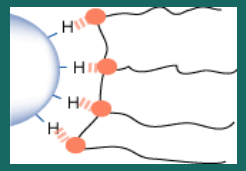
DISPERSING ADDITIVE

Anchoring Mechanisms:

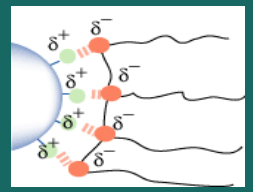
- Anchoring through ionic or acidic/basic groups



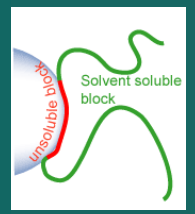
- Anchoring through hydrogen-bonding groups



- Anchoring through polarizing groups



- Anchoring through solvent insolubl Polymer Blocks



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Dsipersant A

DISPERSING ADDITIVE

APPLICATION AREA

- Pigment Pastes

PURPOSE AND DESCRIPTION

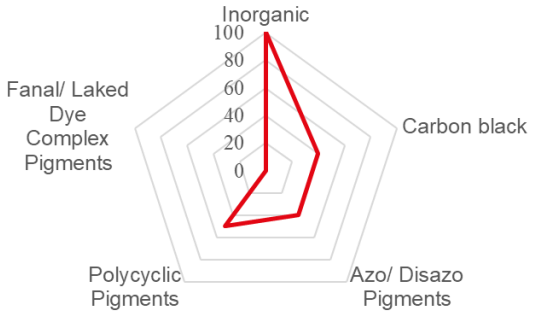
- Dispersing additive for inorganic pigments and fillers with a broad compatibility in water-based binders
- Compatibilizer
- Biocide-free

RECOMMENDED DOSAGE LEVEL

[delivery form on pigment] **:**

Titanium dioxide	8.0 - 15.0%
Inorganic pigments	10.0 - 25.0%

Guiding formulations are available on request



0	not recommended
<50	hardly suitable
50-70	suitable
70-100	best choice

TECHNICAL DATA

- **Characterization:** Wetting and dispersing additive for aqueous coatings systems
- **Chemical Structure:** Organo modified phosphoric acid esters in water
- **Appearance:** Yellowish, clear liquid
- **pH Value:** 8.0 ± 1
- **Concentration:** 50% ± 1
- **Ionic Character:** Anionic

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Dispersant B

DISPERSING ADDITIVE

APPLICATION AREA

- Pigment Pastes

PURPOSE AND DESCRIPTION

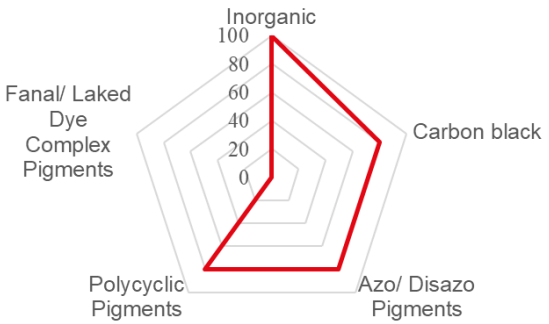
- Dispersing additive for organic and inorganic pigments suitable for water-based and universal pigment pastes
- Biocide-free

RECOMMENDED DOSAGE LEVEL

[delivery form on pigment]:

Titanium dioxide	8.0 - 15.0%
Inorganic pigments	10.0 - 25.0%
Organic pigments	10.0 - 35.0%

Guiding formulations are available on request



0	not recommended
<50	hardly suitable
50-70	suitable
70-100	best choice

TECHNICAL DATA

- **Characterization:** Wetting and dispersing additive for aqueous coatings systems
- **Chemical Structure:** Compound of organo modified phosphoric acid esters in water and polyalkylene glycol
- **Appearance:** Yellowish, clear liquid
- **pH Value:** 7.0 ± 1
- **Concentration:** 80% ± 1
- **Ionic Character:** Anionic

Bruce Berglund, Construction & Assembly, Coatings

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Dispersant C

DISPERSING ADDITIVE

APPLICATION AREA

- Pigment Pastes

PURPOSE AND DESCRIPTION

- Co-Dispersant or as stand alone for carbon blacks, organic and inorganic pigments with outstanding color strength development and viscosity reduction
- Recommended in combination with styrene-acrylic resins
- Suitable for applications with direct and indirect food contact

RECOMMENDED DOSAGE LEVEL

[delivery form on pigment] :

Organic pigments	4.0 - 8.0%
Carbon black	20.0 - 75.0%

Guiding formulations are available on request

0	not recommended
<50	hardly suitable
50-70	suitable
70-100	best choice

TECHNICAL DATA

- **Characterization:** Wetting and dispersing additive for aqueous coatings systems
- **Chemical Structure:** Hydroxyfunctional blockcopolymer in water
- **Appearance:** Yellowish, clear liquid
- **pH Value:** 6.0 - 9.0
- **Concentration:** 50% ± 1
- **Ionic Character:** Non ionic

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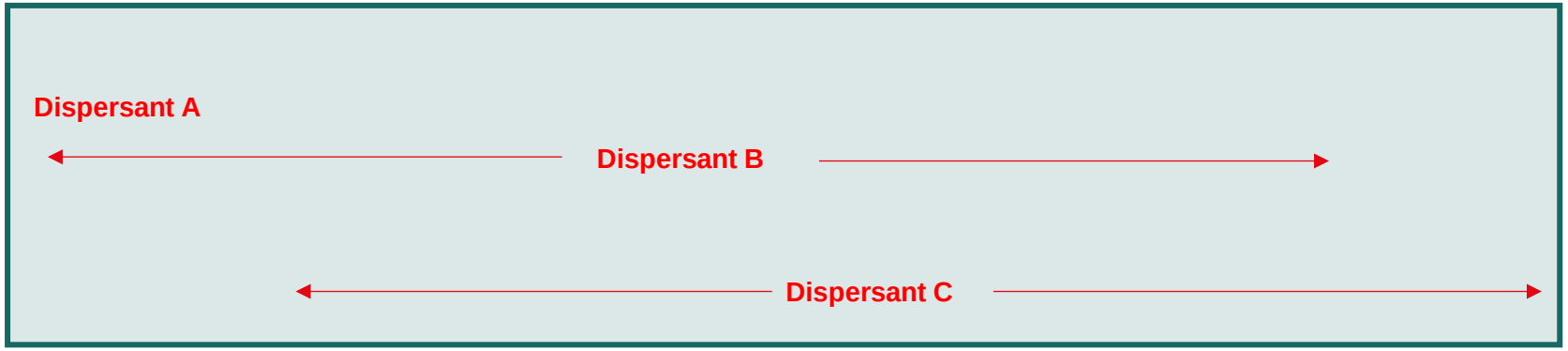
Recommendation Scheme

DISPERSING ADDITIVE

Inorganic	Carbon black	Azo / Disazo Pigments	Polycyclic Pigments	Fanal / Laked Dye Complex Pigments
▪ PY 42, PR 101 PBk 11 ▪ PW 6 ▪ PB 28 PB 29	▪ PBk 7	▪ PY 3 PY 74 ▪ PY 12 PY 13 ▪ PY 14 PY 83 ▪ PR 2 ▪ PR 112 PR 146 PR 170	▪ PB 15:X, PB 16, PG 7 ▪ PV 23 PV 37 ▪ PV 19 PR 122 PR 282	▪ PR 48:2 PR 53:1 PR 57:1 PR 169 ▪ PR 81:1 PV 3 PB 1



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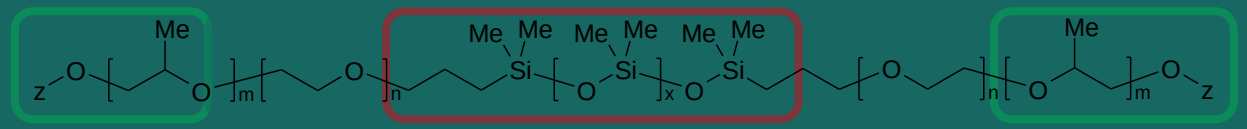
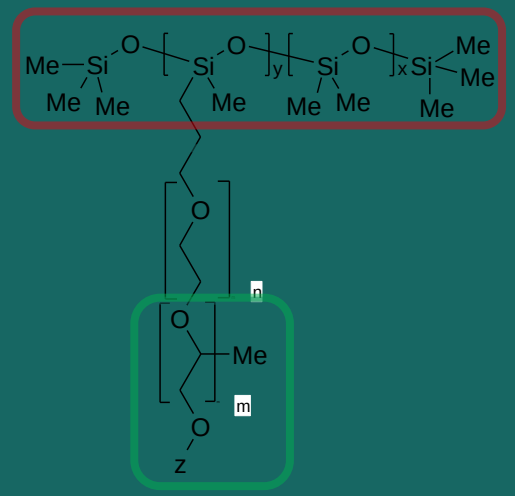
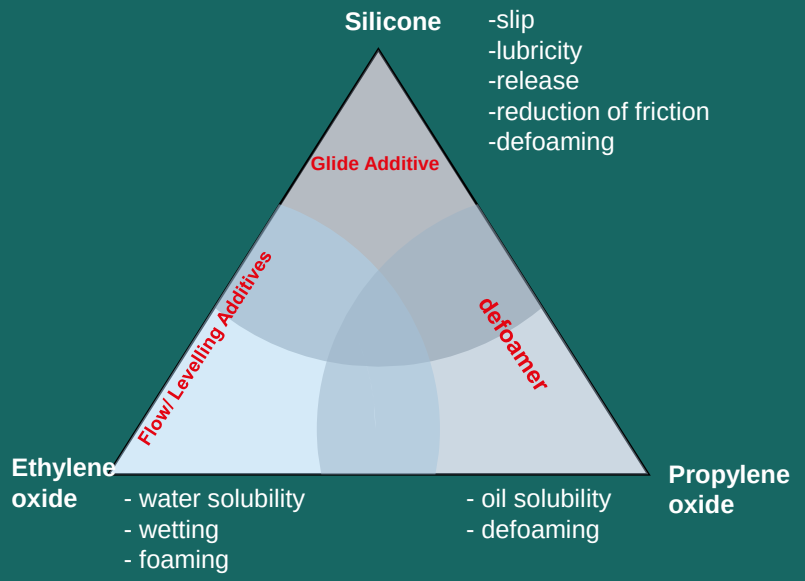
Silicone-Based Wetting and Leveling Additives



linear ABA-structure



pendant graft structure



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Wetting Additive A

APPLICATION AREA

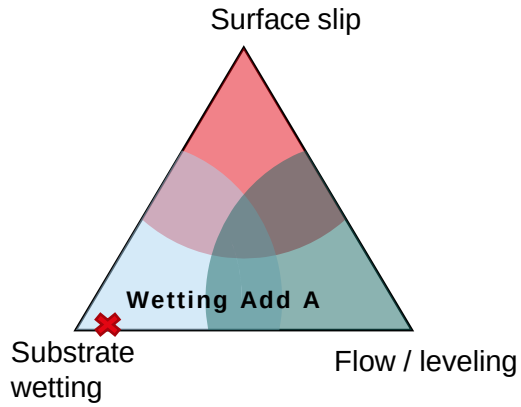
- Industrial coatings
- Wood coatings

PURPOSE AND DESCRIPTION

- Siilcone based substrate wetting additive
- Reduction of surface tension
- Enables surface wetting also on critical substrates

RECOMMENDED DOSAGE LEVEL

0.5% - 2.0%



TECHNICAL DATA

Characterization:	Silicone based wetting additive
Chemical Structure:	Organo modified trisiloxane
Appearance:	Colorless to yellowish, clear liquid
Concentration:	100%
Viscosity:	< 100 mPa*s

Wetting Additive B

APPLICATION AREA

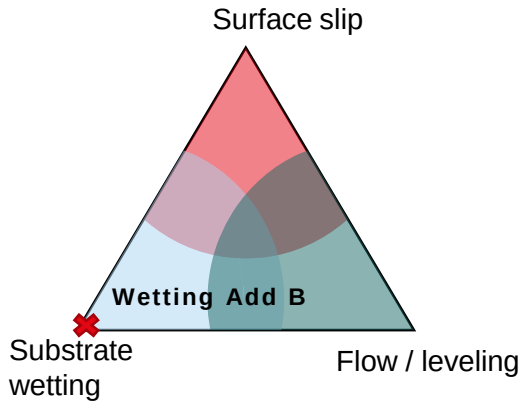
- Industrial coatings
- Wood coatings

PURPOSE AND DESCRIPTION

- Silicone based substrate wetting additive
- Low foaming substrate wetting additive
- Dynamic reduction of surface tension
- Enables surface wetting also on critical substrates

RECOMMENDED DOSAGE LEVEL

0.5% - 2.0%



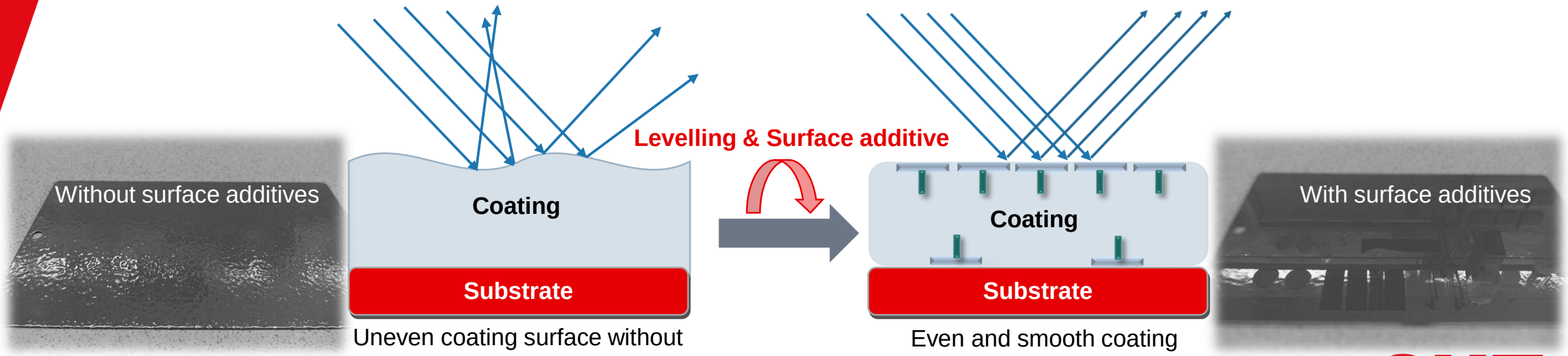
TECHNICAL DATA

- **Characterization:** Silicone based wetting additive
- **Chemical Structure:** Organo modified trisiloxane
- **Appearance:** Colorless to yellowish, clear liquid
- **Concentration:** 100%
- **Viscosity** (25°C)**:** 10 – 140 mPa*s

LEVELING ADDITIVES

During application and drying process different defects like orange peel or craters occur due to changes in surface tension

- Caused by solvent evaporation, curing process, overspray, substrate contamination, etc
- Additives influence the surface tension and reduce differences inside the coating, keep surface tension evenly low during drying/curing process



Uneven coating surface without surface additives

Even and smooth coating surface with surface additives

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Leveling Additive A

LEVELING ADDITIVE

APPLICATION AREA

- General Industrial Coatings
- Wood Coatings
- Automotive Coatings
- Water- and Solvent-Borne Coatings

PURPOSE AND DESCRIPTION

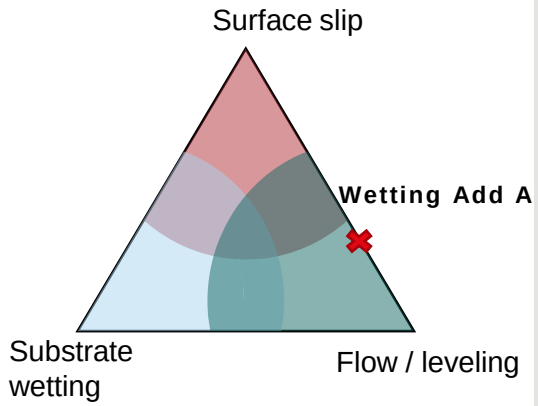
- Leveling additive
- Improves leveling, surface slip and crater and scratch resistance

MARKET POSITIONING

- SVHC free (D4, D5 und D6 content < 0,1%)
- Performance / Regulatory best

RECOMMENDED DOSAGE LEVEL

0.5% - 2.0%



TECHNICAL DATA

Characterization:	Leveling Addtive
Chemical Structure:	Organomodified polysiloxane
Appearance:	Opaque to white liquid
Non Volatile Matter:	100%

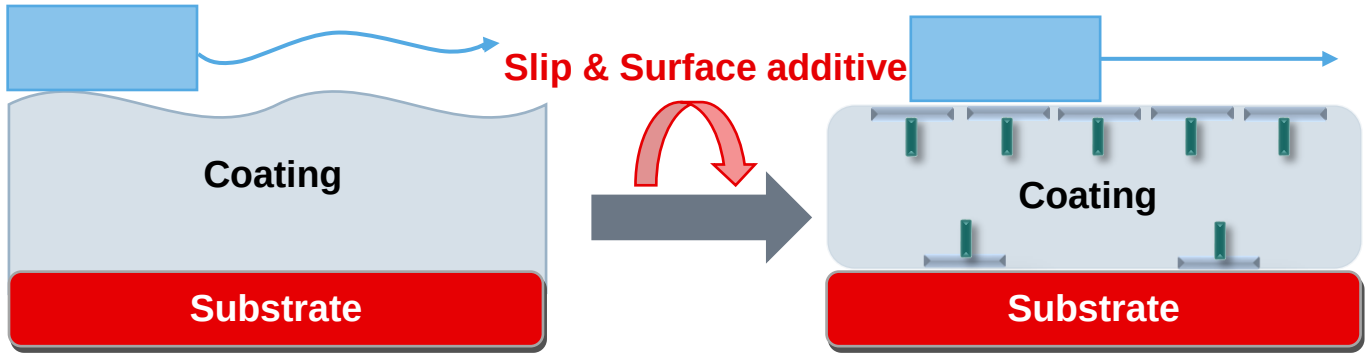
SLIP AND SURFACE ADDITIVES

By evening out the coating film, friction is significantly reduced using siloxane additives

To slide two surfaces past each other an uneven film causes more friction than a smooth, even film

Additionally, the siloxane concentrates on the surface and acts as a lubricant

- Reduced blocking tendency and improved scratch resistance



High friction without surface additives

Reduced friction with surface additives

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Slip Additive A

SLIP ADDITIVE

APPLICATION AREA

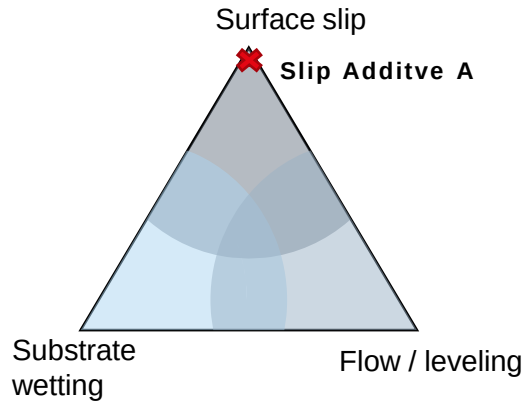
- Indusrial Coatings
- Wood Coatings

PURPOSE AND DESCRIPTION

- High performance slip additive based on a high molecular weight polysiloxane
- Increases surface slip, anti-blocking and anti-scratch properties
- SVHC free (D4, D5 and D6 content < 0,1%)

RECOMMENDED DOSAGE LEVEL

0.1% - 2.0%



TECHNICAL DATA

Characterization:	Slip addtive
Chemical Structure:	Aqueous emulsion of a high molecular weight polysiloxane
Appearance:	Opaque to white liquid
Non Volatile Matter:	65% ± 2

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Defoamers

Foam - none at all, or only in the acceptable quantity. With our defoamers, we ensure that production, processing or filling processes can be optimally designed. For more efficiency in production and application.

Properties and effects:

- Prevent foam formation during production processes
- Foam-free application of coating systems
- Prevent air pockets within the coatings

Industries and markets:

- Wood coatings
- Industrial coatings
- Pigment concentrates
- Facade paints and plasters
- Dry mortars
- Printing inks
- Overprint varnishes
- Foil coatings
- Seed coatings
- Precast

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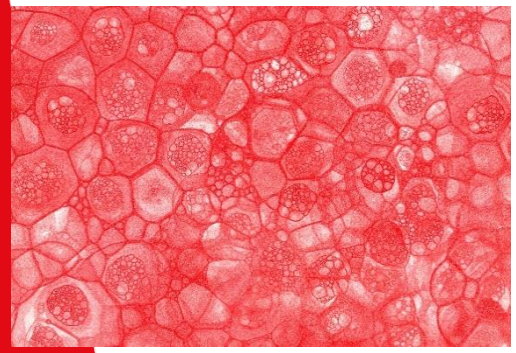
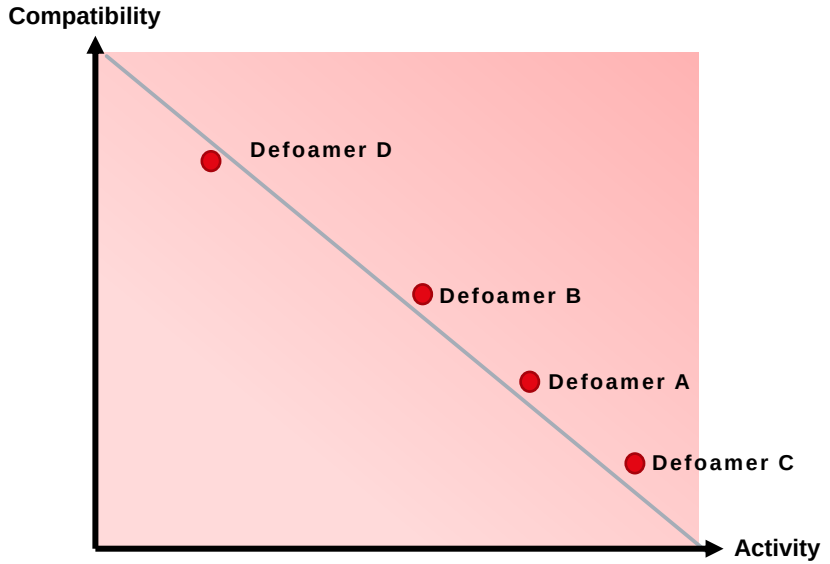
DEFOAMERS



- ***bubble break down***
- ***Persistence***
- ***long-term activity***



product	properties
Defoamer A	Excellent defoaming of waterbased coatings in high shear applications e.g. grinding and spray application
Defoamer B	Efficient defoaming of waterbased coatings in medium shear applications, e.g. brush application
Defoamer C	Excellent defoaming in applications with very high shear applications, e.g. when grinding pigments
Defoamer D	Universal, high compatibility, easy to incorporate in both grind and let-down

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Defoamer A

APPLICATION AREA

- Architectural Coatings
- Industrial Coatings
- Pigment Pastes

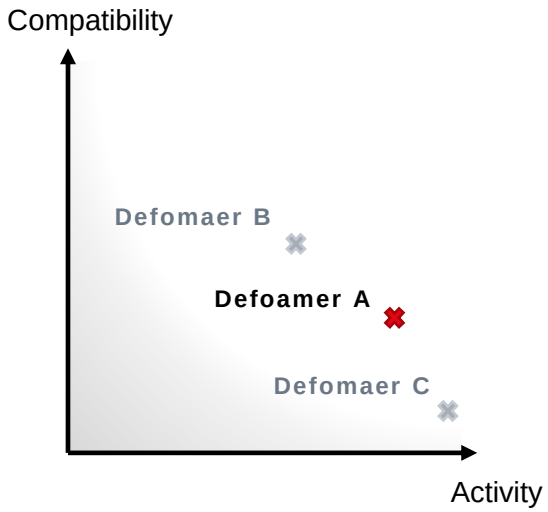
PURPOSE AND DESCRIPTION

- Defoamer for pigment grinding and shear intense let-down stages
- Suitable for applications with indirect food contact (FDA compliant, D4, D5 und D6 content < 0,1%)

RECOMMENDED DOSAGE LEVEL:

0.1% - 1.0%

- Stir before use
- Activity and compatibility are system dependent and should be determined through preliminary tests



TECHNICAL DATA

Characterization:	Defoamer for pigment grinding
Chemical Structure:	Blend of an organo-modified poly-siloxane with hydrophobic solids in polyglycol
Appearance:	Colorless, slightly turbid liquid
Concentration:	100%

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Defoamer B

APPLICATION AREA

- Architectural Coatings
- Industrial Coatings

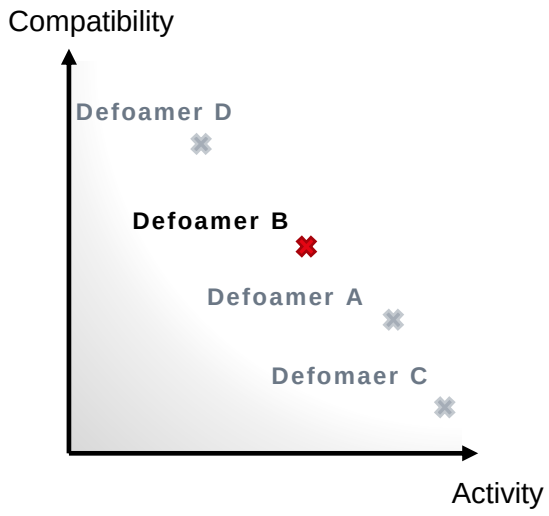
PURPOSE AND DESCRIPTION

- Let-down defoamer for architectural and industrial paints
- Suitable for applications with indirect food contact (FDA complianct, D4, D5 und D6 content < 0,1%)

RECOMMENDED DOSAGE LEVEL:

0.1% - 1.0%

- Stir before use
- Activity and compatibility are system dependent and should be determined through preliminary tests



TECHNICAL DATA

Characterization:	Defoamer for for waterbased coatings systems
Chemical Structure:	Blend of an organo-modified polysiloxane with hydrophobic solids in polyglycol
Appearance:	Colorless, slightly turbid liquid
Non Volatile Matter:	100%

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Defoamer C

APPLICATION AREA

- Pigment Pastes

PURPOSE AND DESCRIPTION

- Highly effective defoamer for pigment grinding

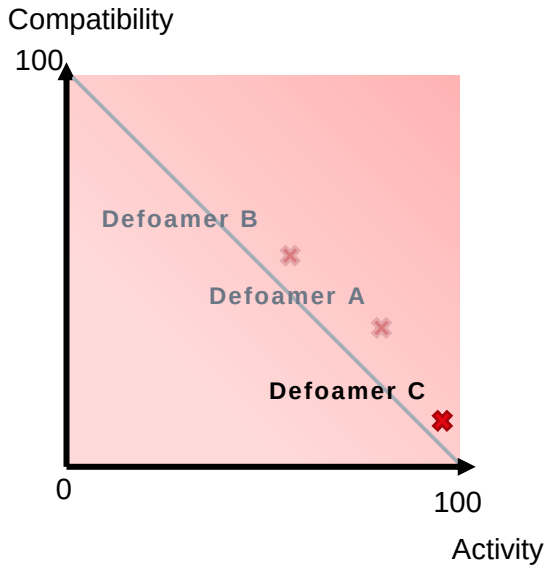
MARKET POSITIONING

- Suitable for applications with indirect food contact (D4, D5 und D6 content < 0,1%)
- Performance Best

RECOMMENDED DOSAGE LEVEL:

0.1% - 1.0%

- Stir before use
- Activity and compatibility are system dependent and should be determined through preliminary tests



TECHNICAL DATA

- **Characterization:** Defoamer for pigment grinding
- **Chemical Structure:** Organomodified polysiloxane with hydrophobic solids
- **Appearance:** Colorless to yellowish, slightly turbid liquid
- **Concentration:** 100%

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Defoamer D

APPLICATION AREA

- Architectural Paints

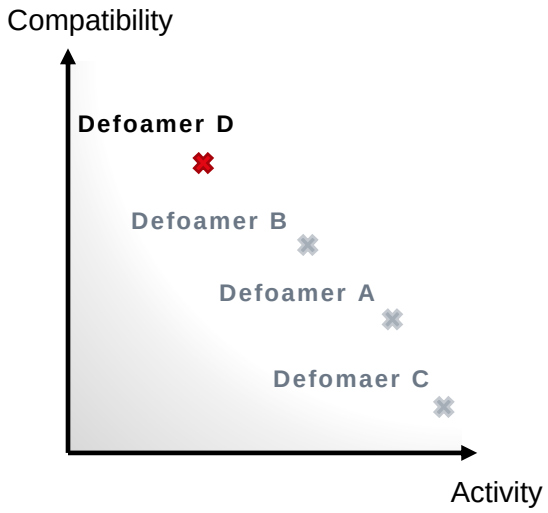
PURPOSE AND DESCRIPTION

- Defoamer for interior and exterior paints
- VOC free

RECOMMENDED DOSAGE LEVEL:

0.1% - 1.0%

- Stir before use
- Activity and compatibility are system dependent and should be determined through preliminary tests



TECHNICAL DATA

Characterization:	Defoamer emulsion for waterbased coatings systems
Chemical Structure:	Emulsion based on mineral oil and siloxanes
Appearance:	Opaque yellowish emulsion
pH Value:	8.0 ± 1
Non Volatile Matter:	30% ± 1

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SURFACE MODIFIERS

Are essential in waterbased wood coatings to provide functionalities like

- Abrasion Resistance
- Anti-Blocking & Slip
- Anti-Slip
- Soft feel
- Hydrophobicity

Why ULTRALUBE wax additives?

- Does what it should – No negative impact on formulation
- High product stability with low emulsifier content
- Broad compatibility with different binder systems

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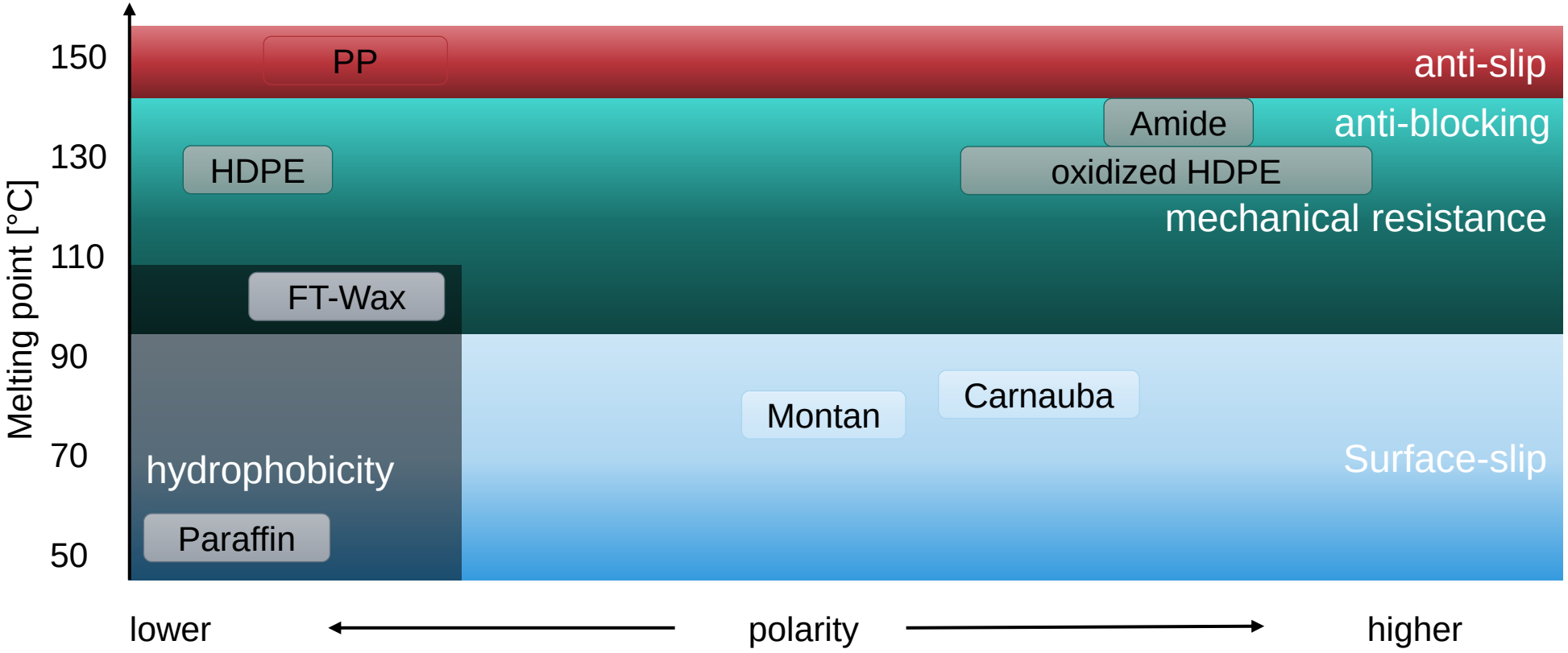
WAX CHARACTERISTICS



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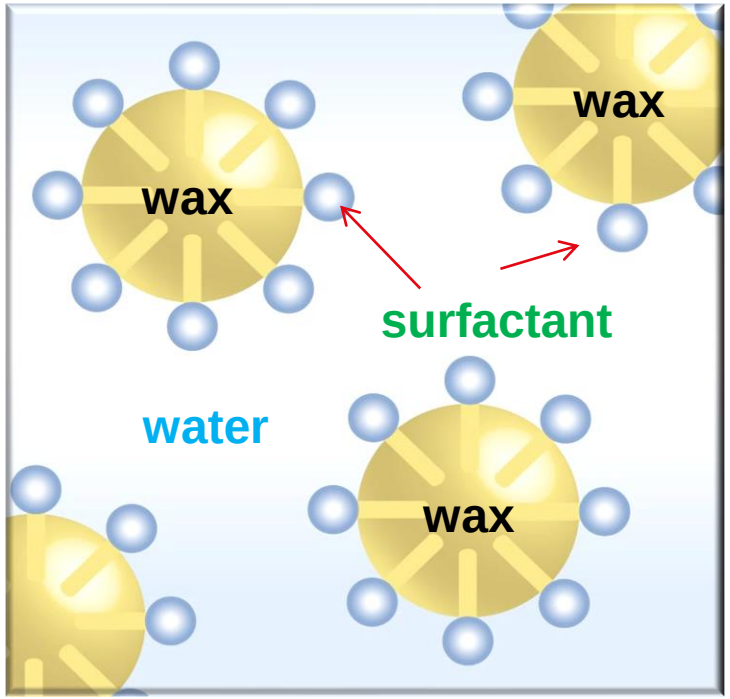
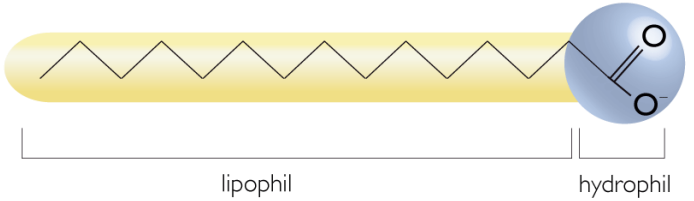
▶WAX DISPERSION / EMULSION CHARACTERISTICS

SURFACTANTS





lipophilic hydrophilic

Stabilization

Compatibility

ionicity

⇒ anionic

⇒ nonionic

⇒ cationic

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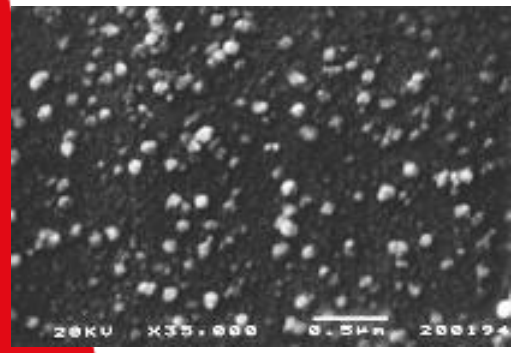
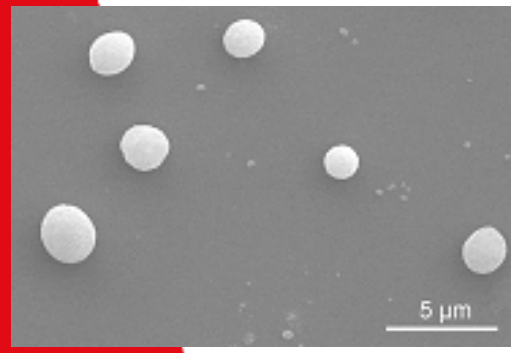
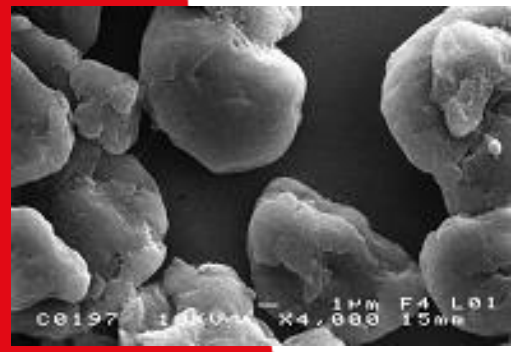
PARTICLE SIZE AND SHAPE



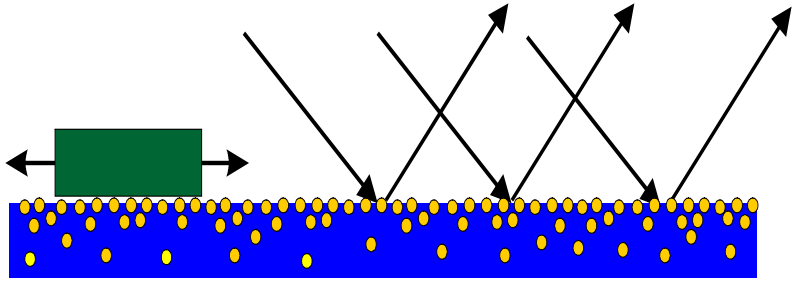
- Wax emulsion
  - Ø 35nm
  - High gloss
  - Mechanical resistance

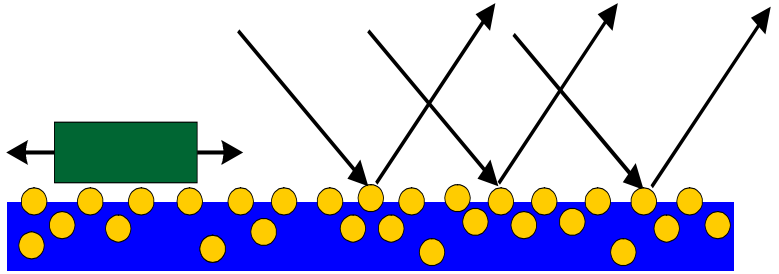


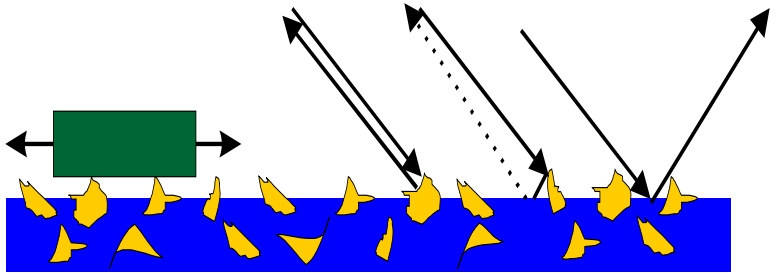
- Wax-microdisperion
  - Ø 0,2 – 2µm
  - Gloss
  - Very good mechanical resistance



- Wax-dispersion
  - Ø <15µm
  - Matting effect
  - Best mechanical resistance







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Surface Modifier A – Abrasion Resistance, Slip, Matting

SURFACE MODIFIER

APPLICATION AREA

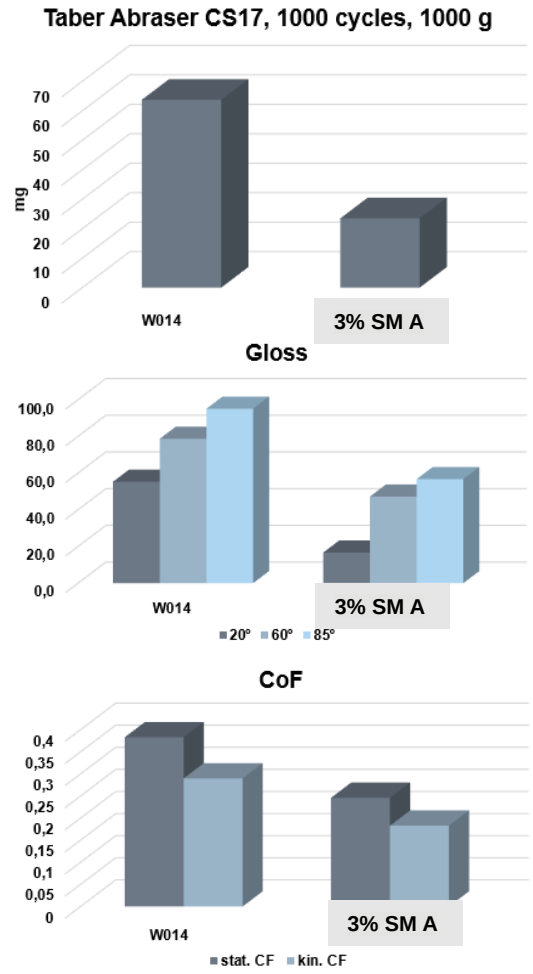
- Wood Coatings

PURPOSE AND DESCRIPTION

- Improves abrasion resistance
- Improves matting
- Improves slip

MARKET POSITIONING

- Recommended for parquet lacquer outstanding hardness



TECHNICAL DATA

Characterization:	Wax dispersion
Chemical Structure:	Aqueous dispersion of a HDPE wax / plastic compound
Appearance:	Milky white liquid
pH Value:	9.0 ± 0.5
Concentration:	65% ± 1
Ionic Character:	Non ionic
Melting Range:	~ 125 – 174 °C

MEASURING METHOD

Abrasion:	Taber Abraser, Model 5131 (Taber Industries)
CoF:	TMI Coefficient of friction tester, Model 32-07
W014:	Wood varnish (internal testing formulation), PU/Acrylate based

Surface Modifier B – Abrasion & Scratch Resistance, Slip, Ant-block, Haptic Properties

SURFACE MODIFIER

APPLICATION AREA

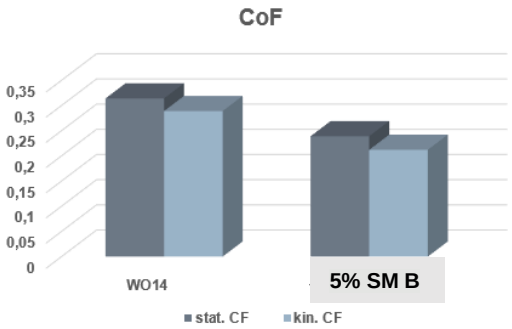
- Wood Coatings
- Industrial Coatings

PURPOSE AND DESCRIPTION

- Improves slip
- Improves abrasion resistance
- Improves scratch resistance
- Improves antiblocking
- Improves haptic properties

MARKET POSITIONING

- Recommended for soft feel and furniture coatings



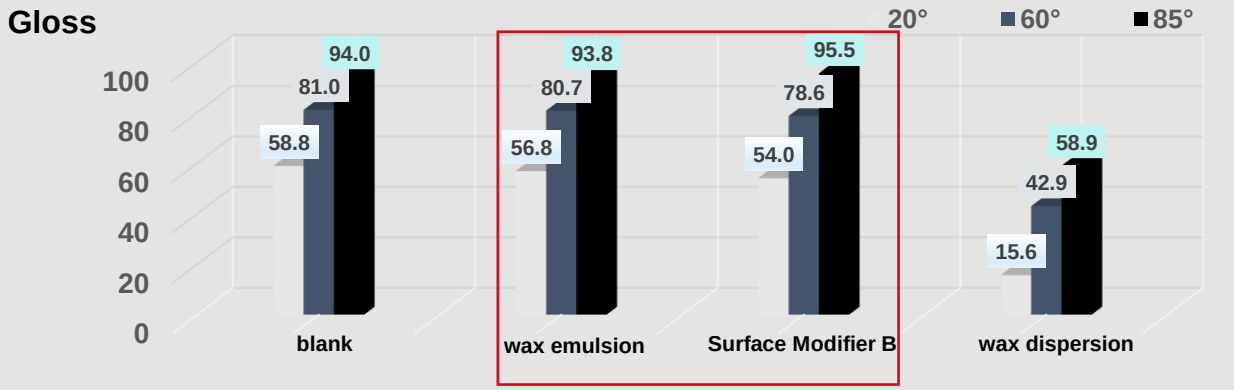
TECHNICAL DATA

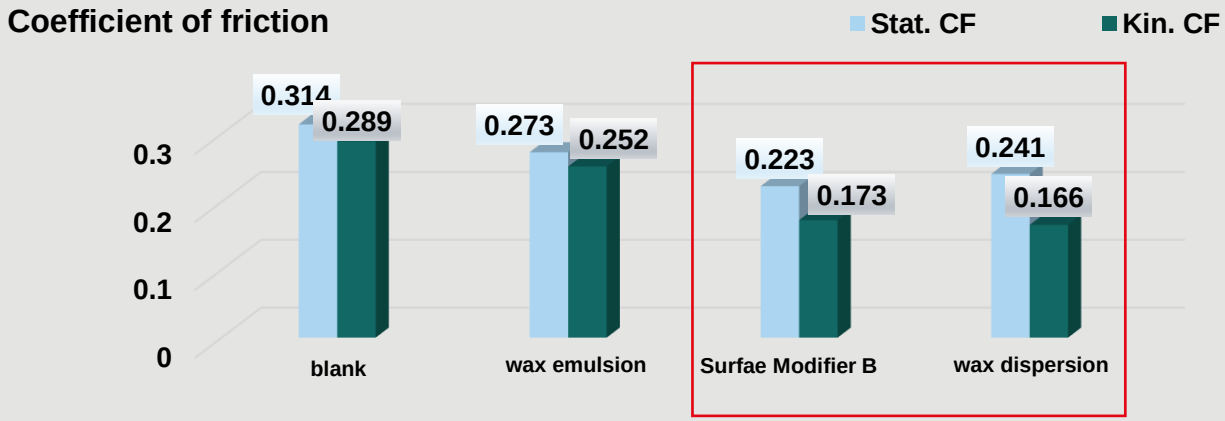
Characterization:	Microdispersion
Chemical Structure:	Aqueous dispersion of a modified HDPE wax (hybrid)
Appearance:	Milky white liquid
pH Value:	8.5 ± 0.5
Concentration:	50% ± 1
Ionic Character:	Non ionic
Melting Range:	~ 128 °C

MEASURING METHOD

CoF:	TMI Coefficient of friction tester, Model 32-07
W014:	Wood varnish (internal testing formulation), PU/Acrylate based

Surface Modifier B – Abrasion & Scratch Resistance, Slip, Ant-block, Haptic Properties
For High Gloss Paints





Surface Modifier C	
solids	50%
ionic chararacter	nonionic
pH value	8.5

method	contact angle
system	waterbased PU/acrylate dispersion
dosage	5.0% delivery form
conditions	60µm wet film thickness, drying 2d RT

Surface Modifier C – Antislip

SURFACE MODIFIER

APPLICATION AREA

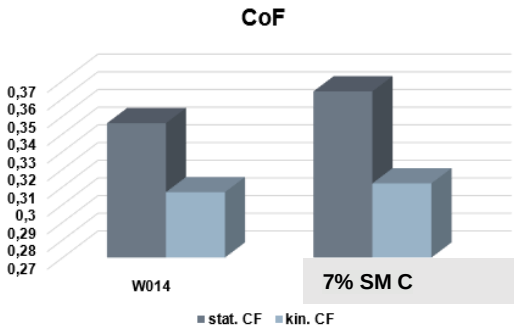
- Wood Coatings
- Industrial Coatings

PURPOSE AND DESCRIPTION

- Provides antislip

MARKET POSITIONING

- recommended for soft resins



TECHNICAL DATA

Characterization:	Fine particle sized wax emulsion
Chemical Structure:	Emulsion of a polypropylene wax
Appearance:	Yellowish transparent liquid
pH Value:	9.0 ± 0.5
Concentration:	35% ± 1
Ionic Character:	Non ionic/anionic
Melting Range:	~ 140 °C

MEASURING METHOD

CoF:	TMI Coefficient of friction tester, Model 32-07
W014:	Wood varnish (internal testing formulation), PU/Acrylate based

Surface Modifier D – Abrasion & Sctratch Resistance for High Gloss Systems

SURFACE MODIFIER

APPLICATION AREA

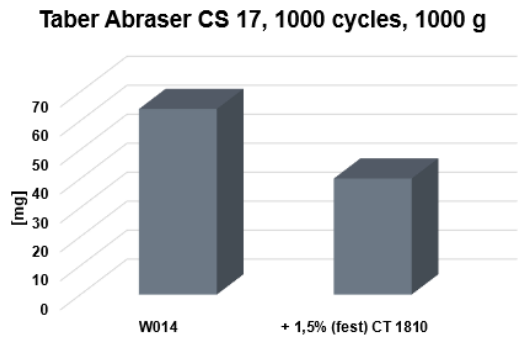
- Wood Coatings
- Industrial Coatings

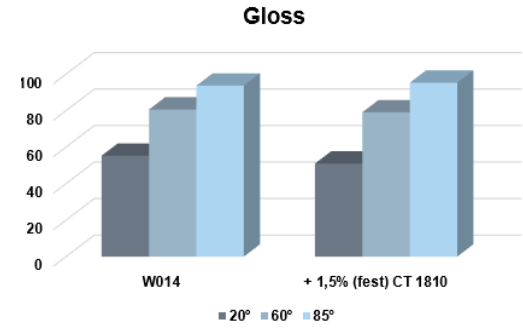
PURPOSE AND DESCRIPTION

- Improves scratch resistance
- Improves abrasion resistance for high gloss systems
- Improves slip
- Improves anti-blocking

MARKET POSITIONING

- Recommended for high gloss parquet and furniture coatings





TECHNICAL DATA

Characterization:	Fine particle sized wax microdispersion
Chemical Structure:	Emulsion of a **Biobased** HDPE wax
Appearance:	Yellowish transparent liquid
pH Value:	8.0 ± 0.5
Concentration:	35% ± 1
Ionic Character:	Non ionic
Melting Range:	~ 120 °C

MEASURING METHOD

Surface Modifier E – Hydrophobic, Beading, Anti-Block and Slip

SURFACE MODIFIER

APPLICATION AREA

- Wood Coatings
- Industrial Coatings

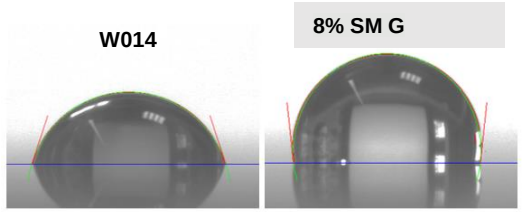
PURPOSE AND DESCRIPTION

- Improves antiblocking
- Improves slip
- Increases **hydrophobicity**
- Provides a **good beading effect**

MARKET POSITIONING

- Recommended for exterior coatings

Contact angle



Θ 71° **Θ 104,5°**

TECHNICAL DATA

Characterization:	Fine particle sized wax emulsion
Chemical Structure:	Emulsion of a PE/**paraffin** compound
Appearance:	Yellowish transparent to opaque liquid
pH Value:	9.0 ± 0.5
Concentration:	30% ± 1
Ionic Character:	Non ionic/Anionic
Melting Range:	~ 118 °C

MEASURING METHOD

Contact angle: KRUSS DSA 100
W014: Wood varnish (internal testing formulation), PU/Acrylate based

Surface Modifier F – Water & Alcohol Resistance, Beading, Ant-Block and Slip

SURFACE MODIFIER

APPLICATION AREA

- Wood Coatings
- Industrial Coatings

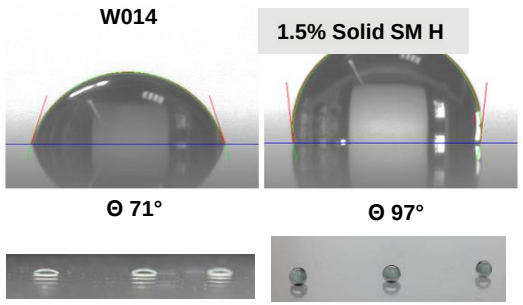
PURPOSE AND DESCRIPTION

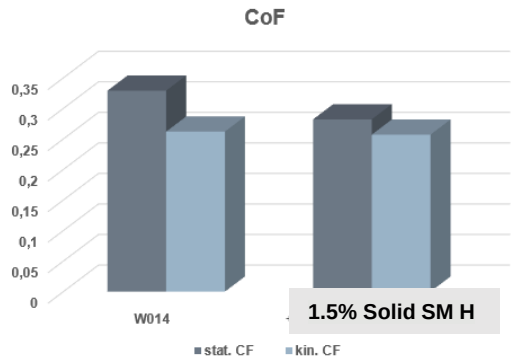
- Improves water beading
- Improves water & alcohol resistance
- Improves slip
- Improves antiblocking
- Emulsifier free system

MARKET POSITIONING

- Recommended for low pvc coatings

Contact angle





TECHNICAL DATA

Characterization:	Fine particle sized wax emulsion
Chemical Structure:	Emulsion of a **modified paraffin** wax
Appearance:	Transparent to opaque brownish liquid
pH Value:	9.0 ± 0.5
Concentration:	25% ± 1
Ionic Character:	Anionic
Melting Range:	~ 56 - 85 °C

MEASURING METHOD

Contact angle: KRUSS DSA 100
CoF: TMI Coefficient of friction tester, Model 32-07
W014: Wood varnish (internal testing formulation), PU/Acrylate based

SUMMARY

- **Pigment dispersions** utilize varying chemistry and mechanisms depending on the pigments
- **Wetting agents** reduce coating surface tension relative to substrates (wood) and can be low MW ethylene oxide functional trisiloxanes.
- **Leveling agents** reduce internal coating surface tension differences and can be comprised of organomodified polysiloxanes
- **Slip agents** often employ relatively non-functional high molecular weight polysiloxanes
- **Defoamers** vary in chemistry and compositionto deliver needed activity / compatibility
- **Surface Modifiers** are comprised of a wide range of wax, natural wax and hybrids with other materials (silicones) are used in dispersions, microdispersions and emulsions to provide desired surface properties.

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Thank you!