

The use of Liquid Additives in Printing inks

NAPIM Sumer course 2026

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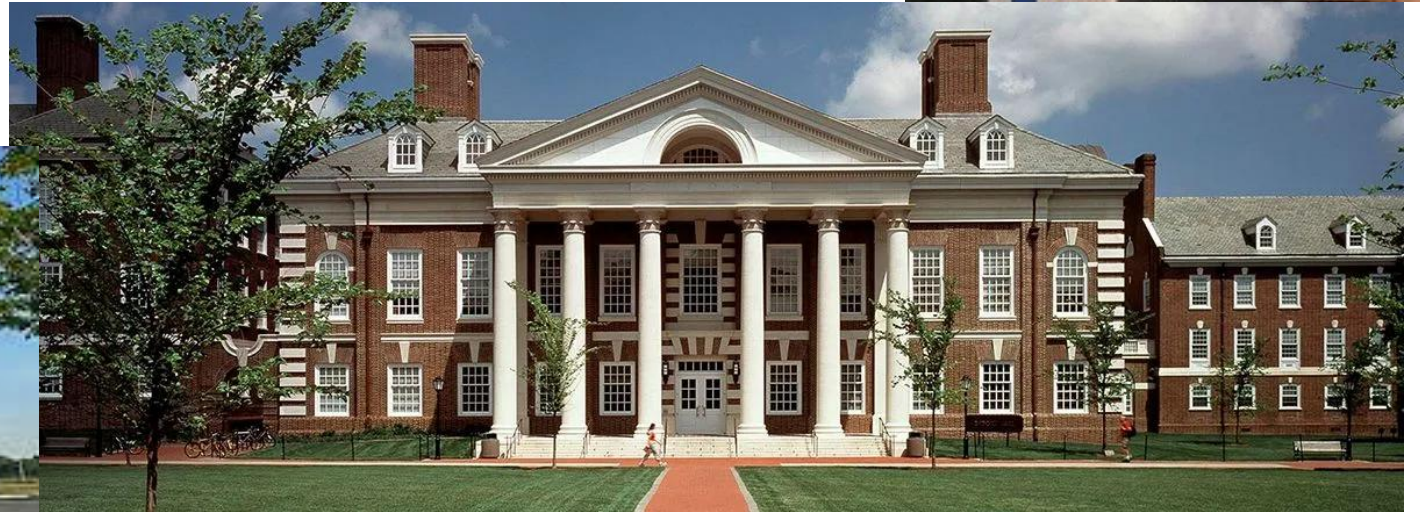
July 29th, 2026

Evonik Coating Additives



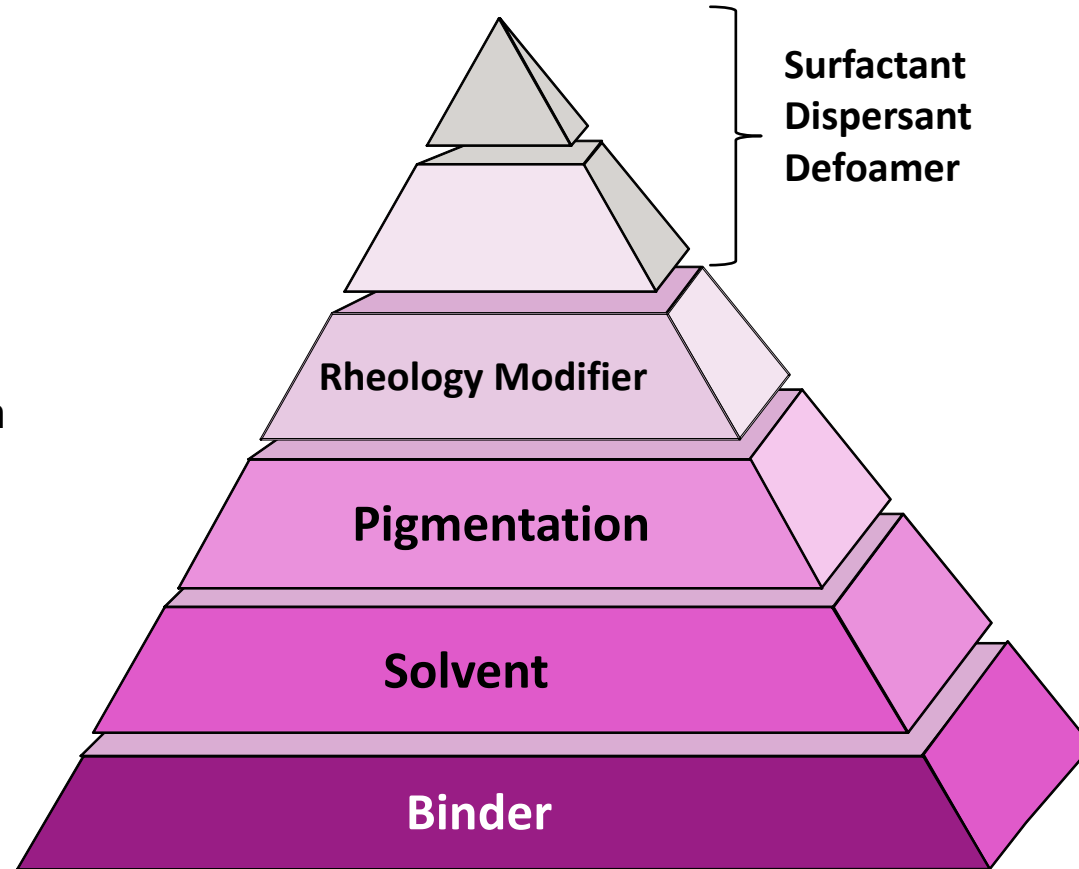
Background

- ❑ Bachelors in Chemistry – UNAM, Mexico
- ❑ Masters in Materials Science and Engineering – UNAM, Mexico
- ❑ Sherwin Williams – Product Finishes
- ❑ PhD in Materials Science and Engineering – University of Delaware

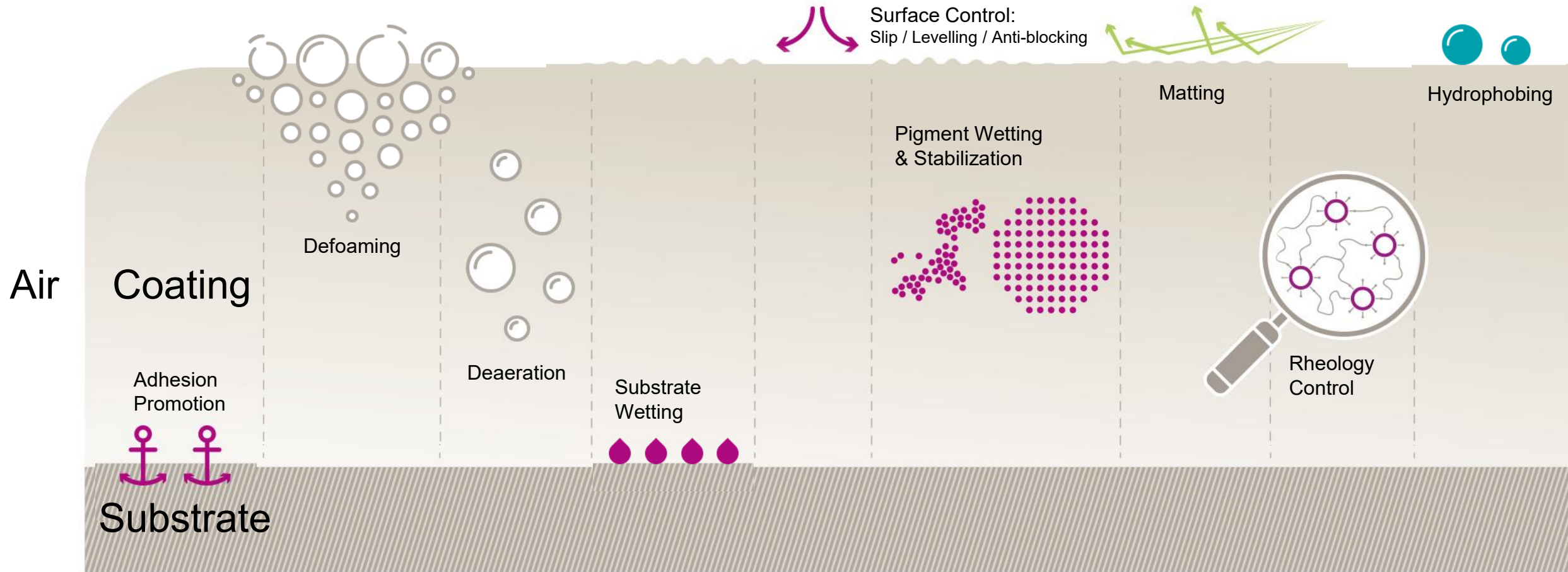


The formulator's pyramid

Also ask: is this a new formulation or a modification of an existing formulation?



Coating Additives – Key functional properties at a glance



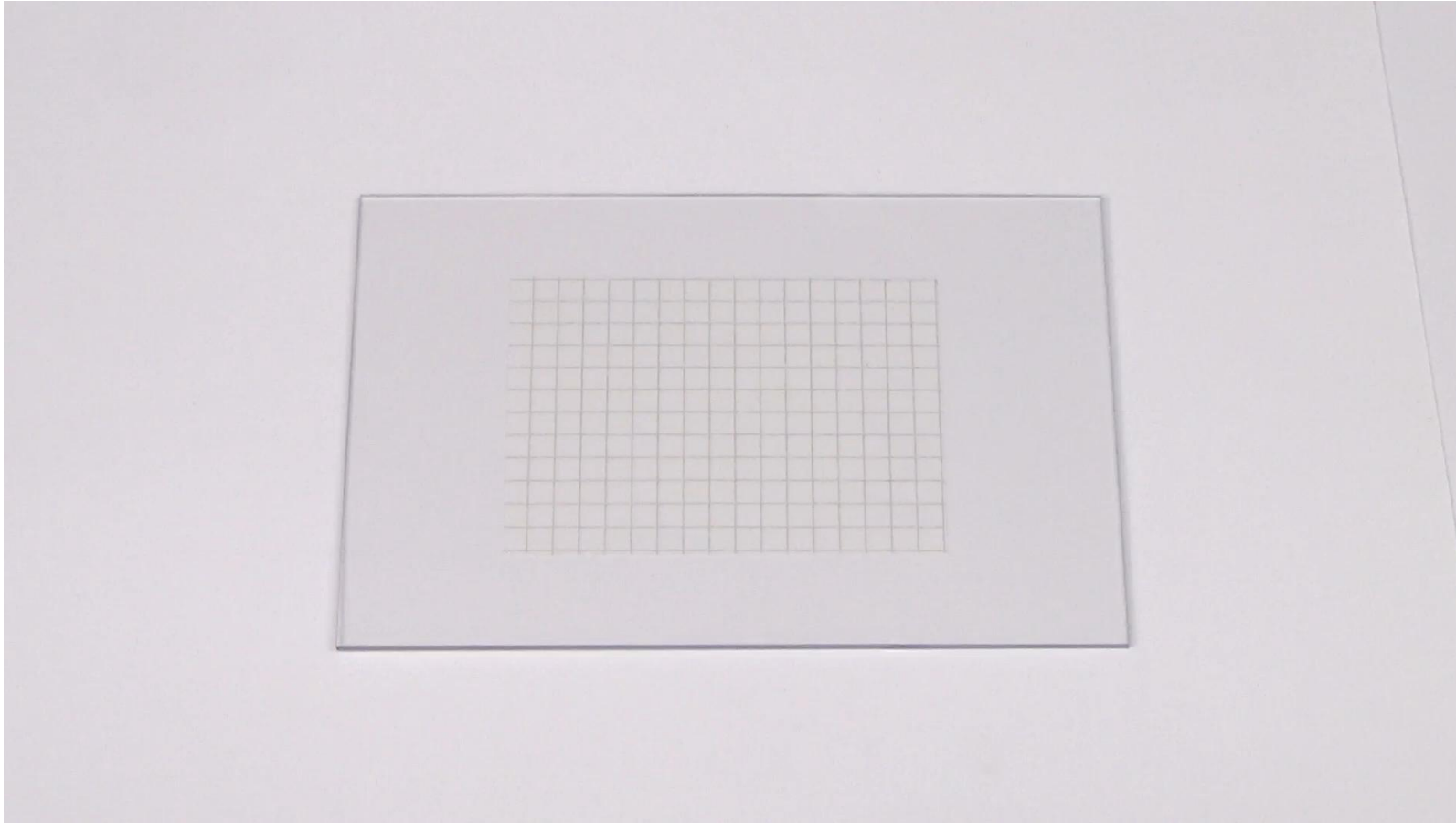
CONTENT

1	Substrate wetting additives
2	Pigment wetting and dispersing additives
3	Defoamer/Deaerator
4	Slip Additives
5	Coatino Campus

CONTENT

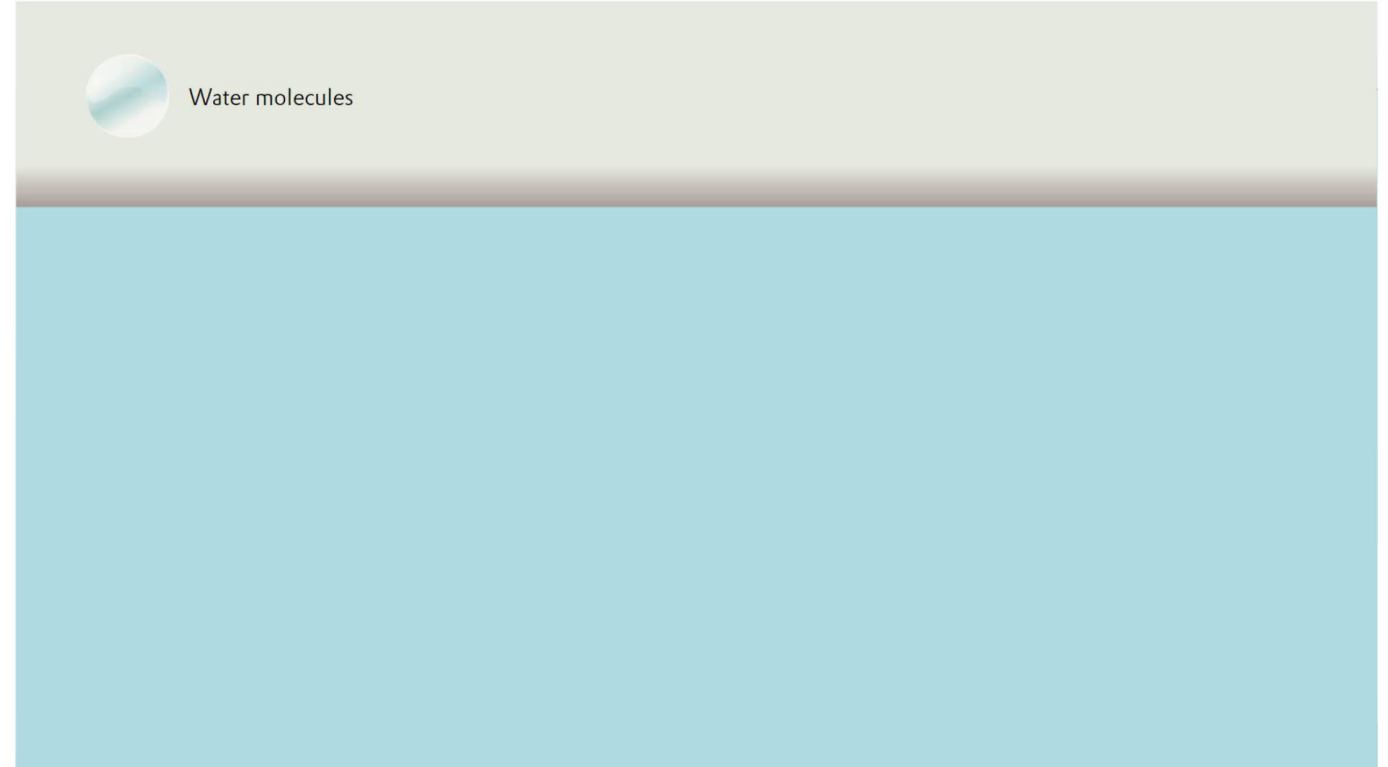
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Why do we need wetting additives?



Surface tension

- ❑ Energy required to create new surface area. (mN/m, dyne/cm or mJ/m²)
- ❑ Resultant of **cohesive** forces that hold the liquid together
 - A. Bulk → same forces in all directions
 - B. Surface → asymmetric forces
 - C. Wetting agent (surfactant)
→ asymmetric forces reduced
- ❑ Solids → **Surface energy**.



- **Surfactant**



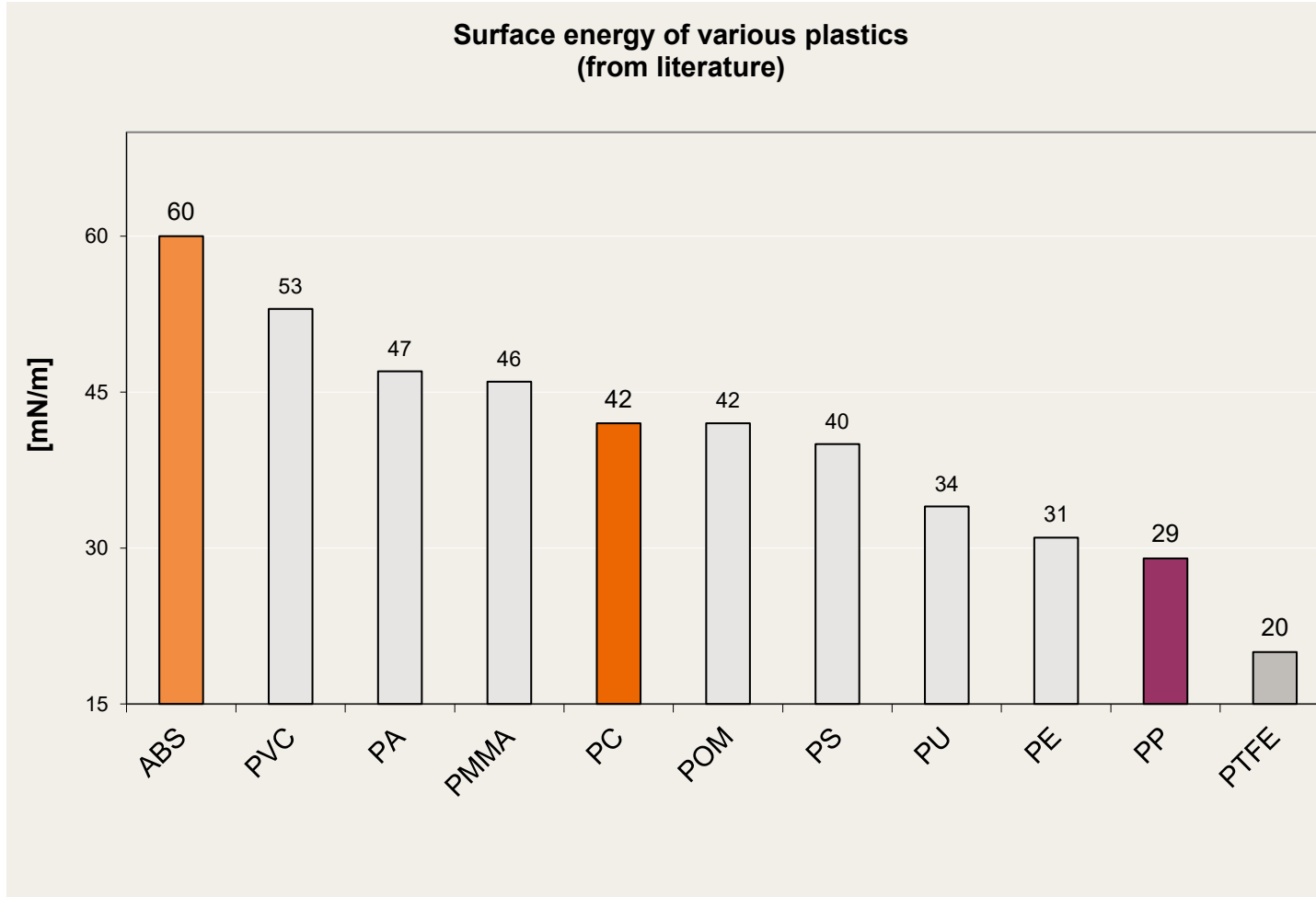
Rule of Thumb for Wetting

The surface tension of the ink/varnish needs to be lower than the surface energy of the substrate to be printed.

Printing processes are highly dynamic; therefore, wetting predictions must be based on dynamic surface tension.

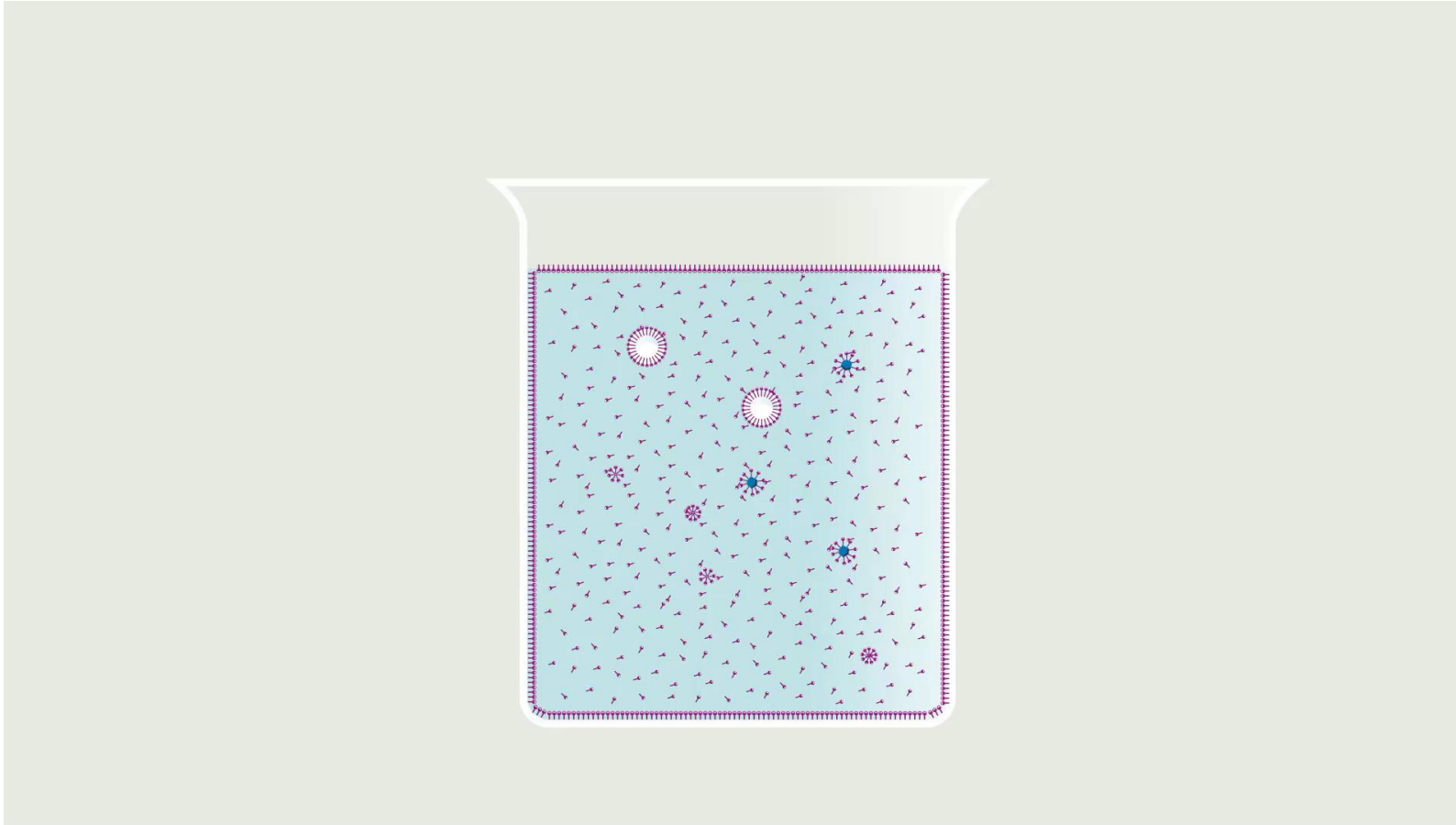


Common Substrates we are working with

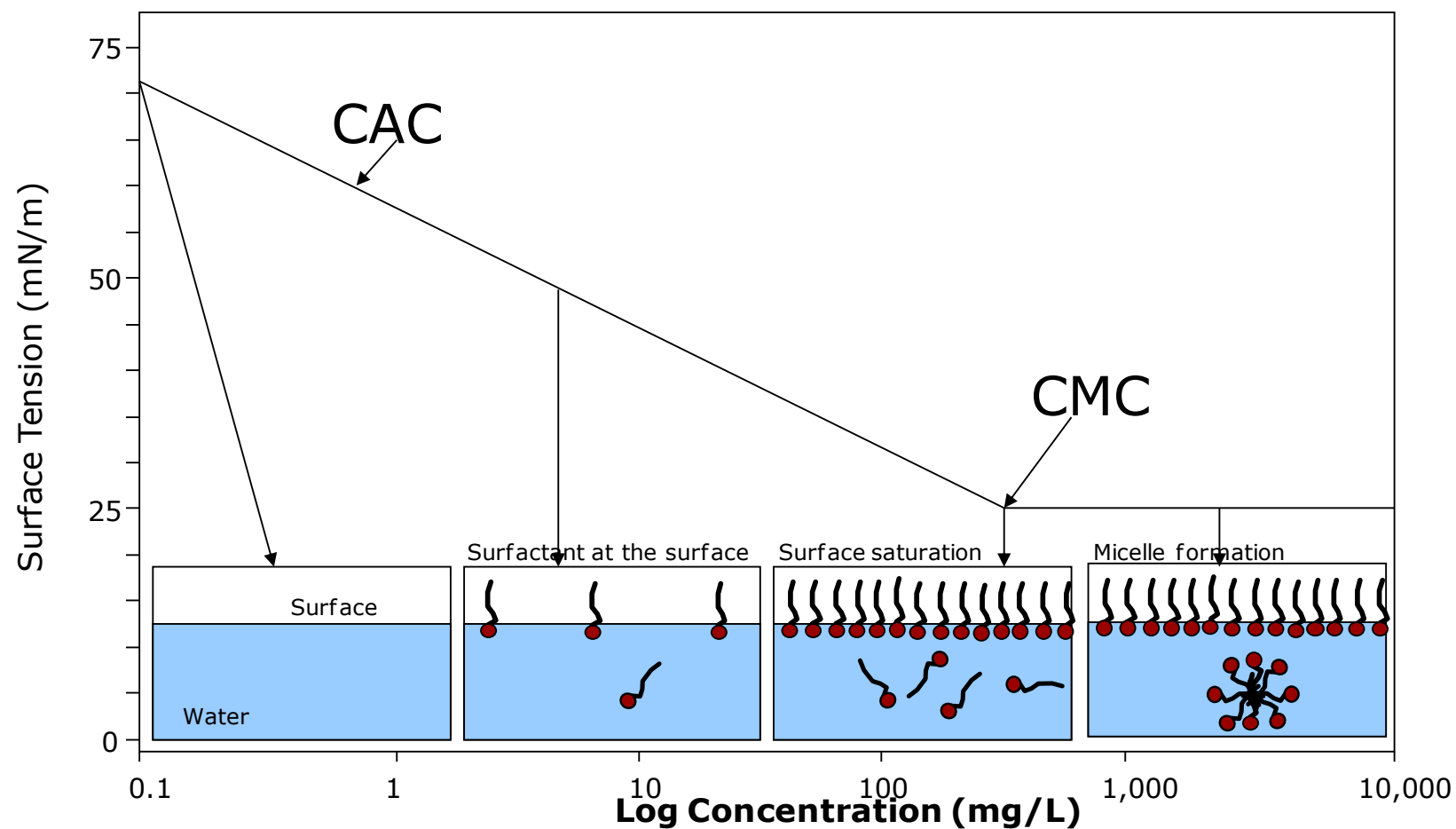


- Market looks for economical substrates of intrinsically low surface-free energies
- Surface functionalisation required prior to jetting
- Formulation of suitable 'substrate wetting packages' to provide adequate drop spread → image quality
- Wetting → pre-requisite for adhesion

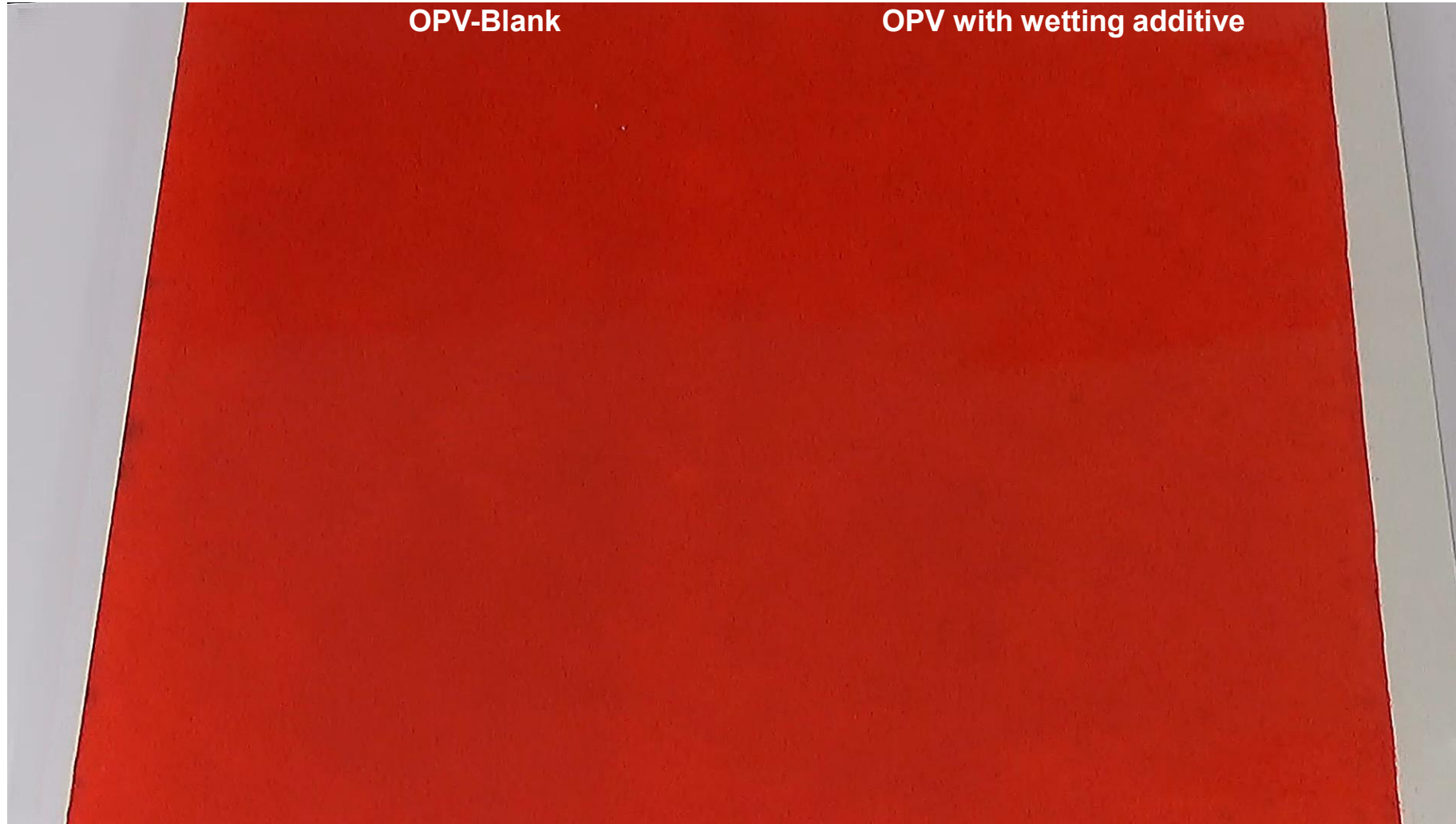
Dynamic Behavior of Surfactants in Liquid



Adding surfactant to water

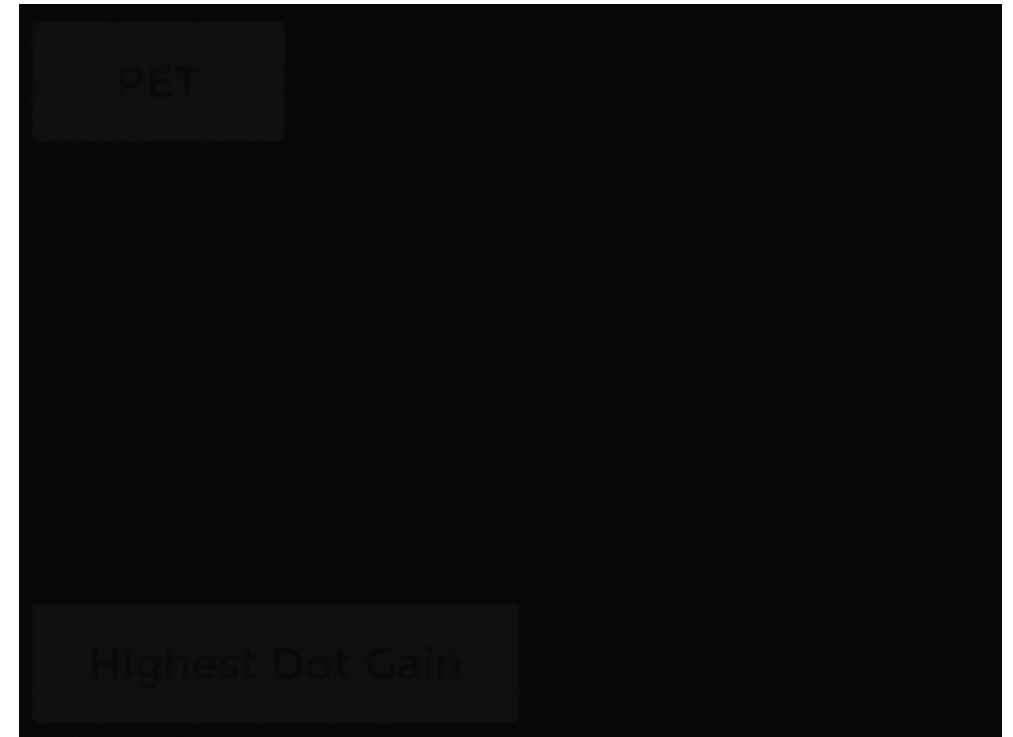
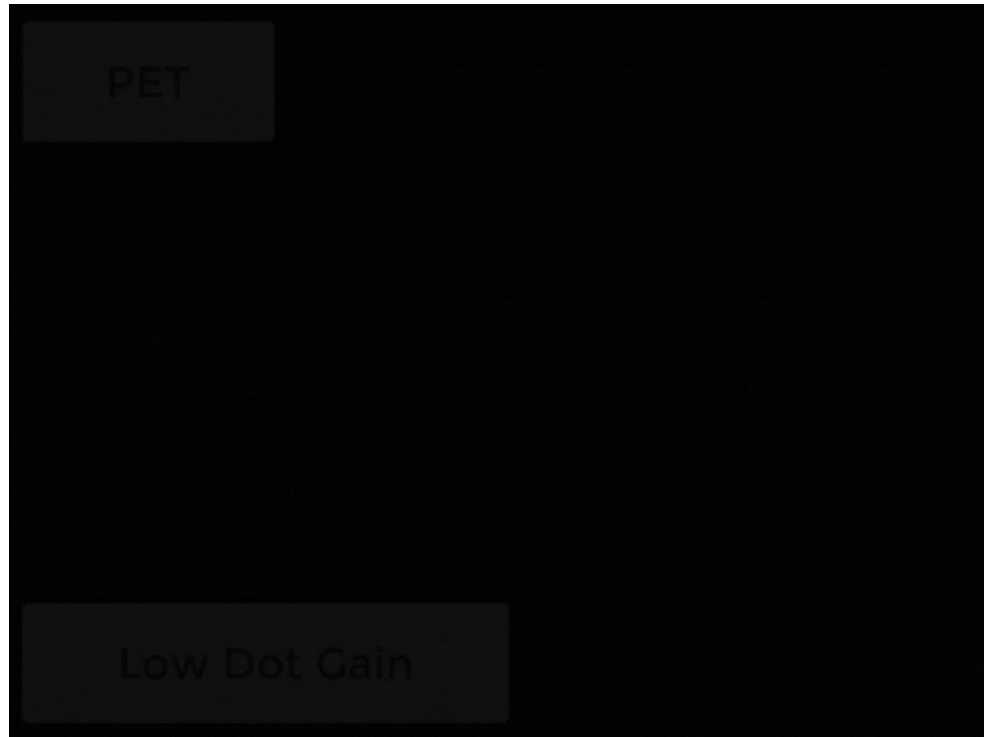


Substrate Wetting Additives Ensure Proper Wetting

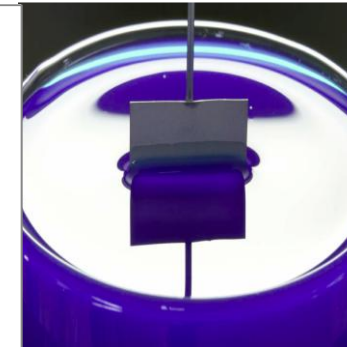
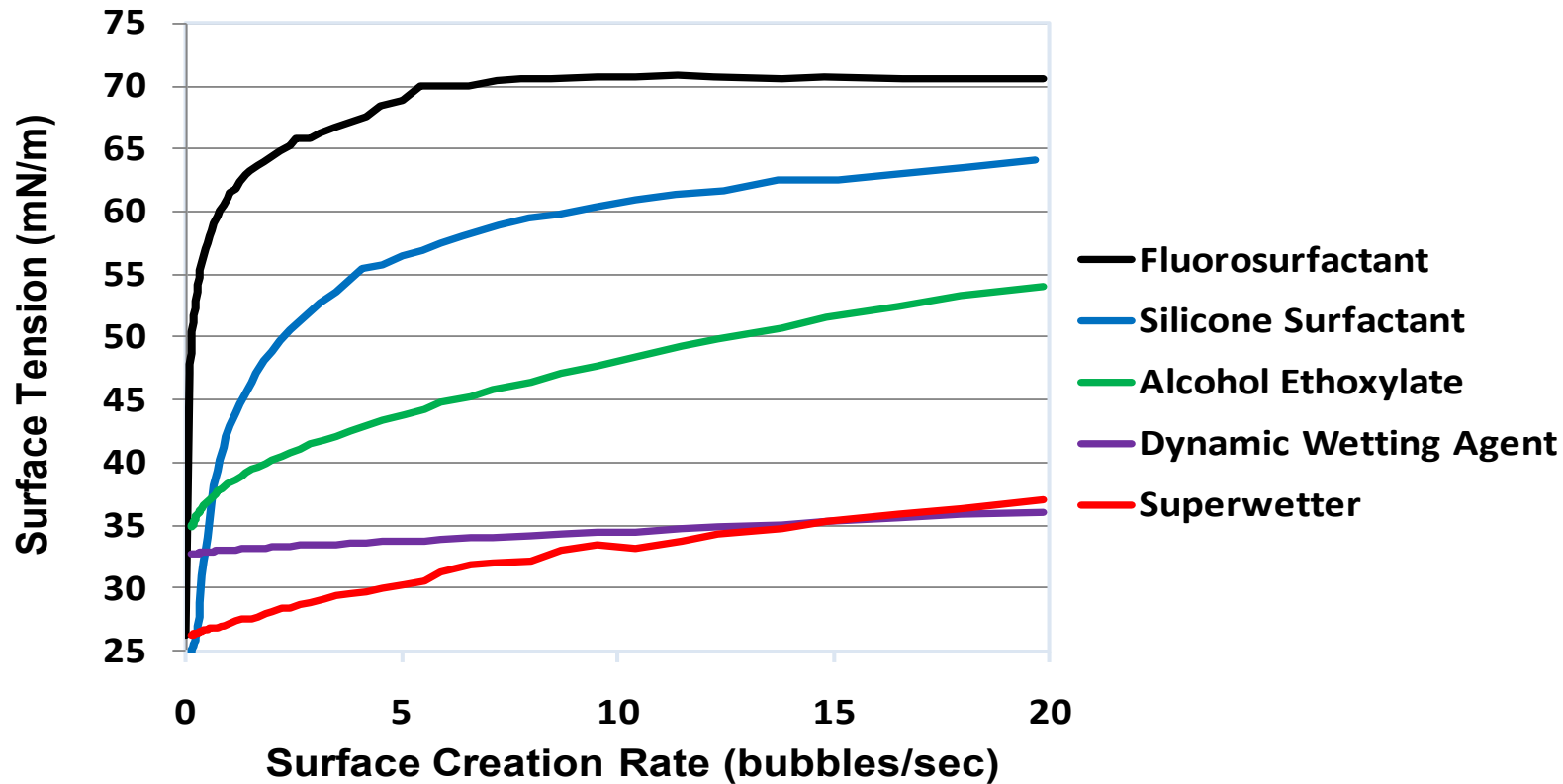


Water borne OPV applied on litho ink

The Importance of Substrate Wetting Additives with Inkjet Printing



Current main technologies for wetting additives

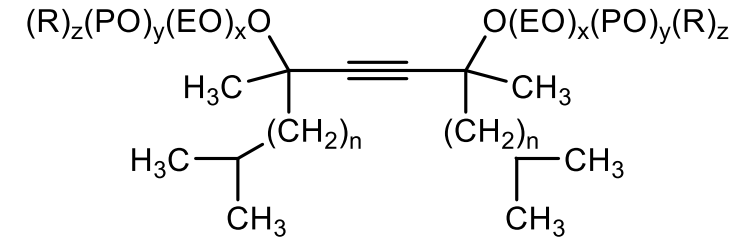
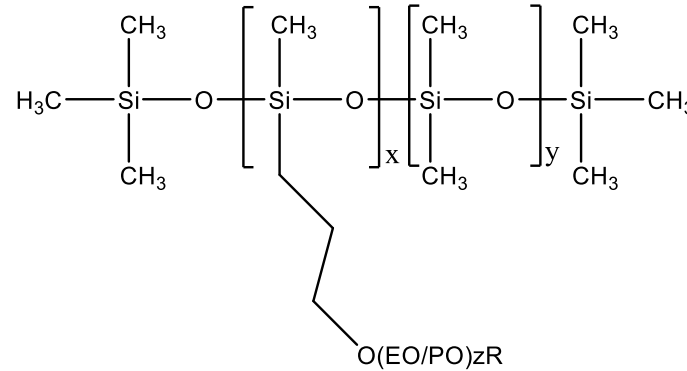
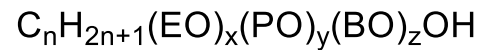


Equilibrium Surface Tensiometer



Dynamic Surface Tensiometer

Wetting Agents Lower Surface Tension in Waterborne Coatings



Alcohol Alkoxylates

- Linear or branched alcohol derivatives with EO, PO and/or BO

TEGO[®] Wet 5xx series

CARBOWET[®] Surfactants

Organo-Modified Siloxanes

- Polyether modified siloxanes
- Additional unique Gemini siloxanes

TEGO[®] Twin 4xxx series

TEGO[®] Wet 2xx series

Gemini Organic Surfactants

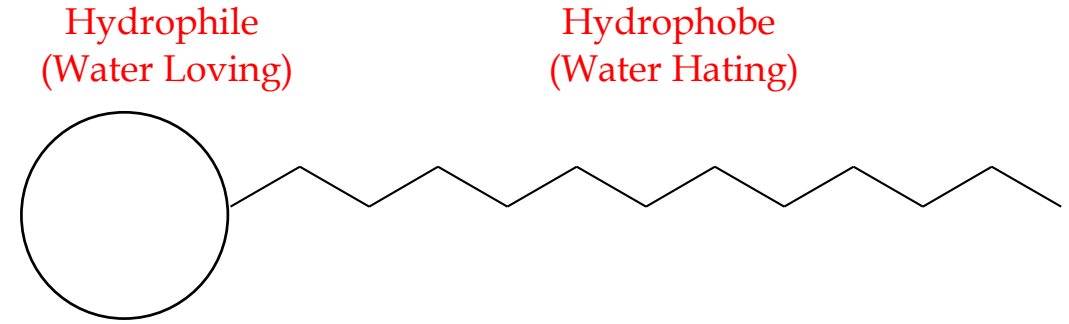
- Acetylenic diols and derivatives
- Additional unique chemistries

SURFYNOL[®] Surfactants

DYNOL[™] Superwetters

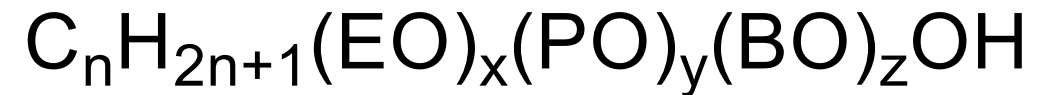
Traditional Organic Wetting Agent

- Structure with varying hydrophobe tail and hydrophile head.
- Good to moderate efficiency to reduce static surface tension, and dynamic surface tension reduction.
- Foaming could be a problem.
- Not effective in solvent borne system.



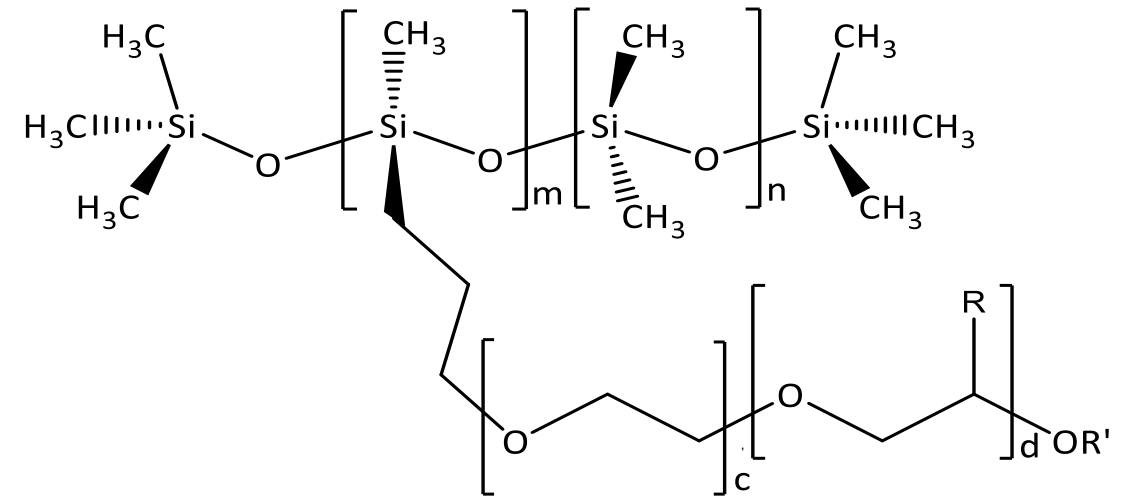
Alcohol Alkoxylates wetting agent

- Evonik TEGO® Wet 5XX series, with controlled structure of hydrophile, enable lower foaming, higher wetting efficiency.



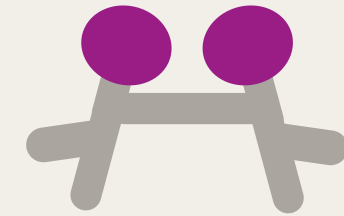
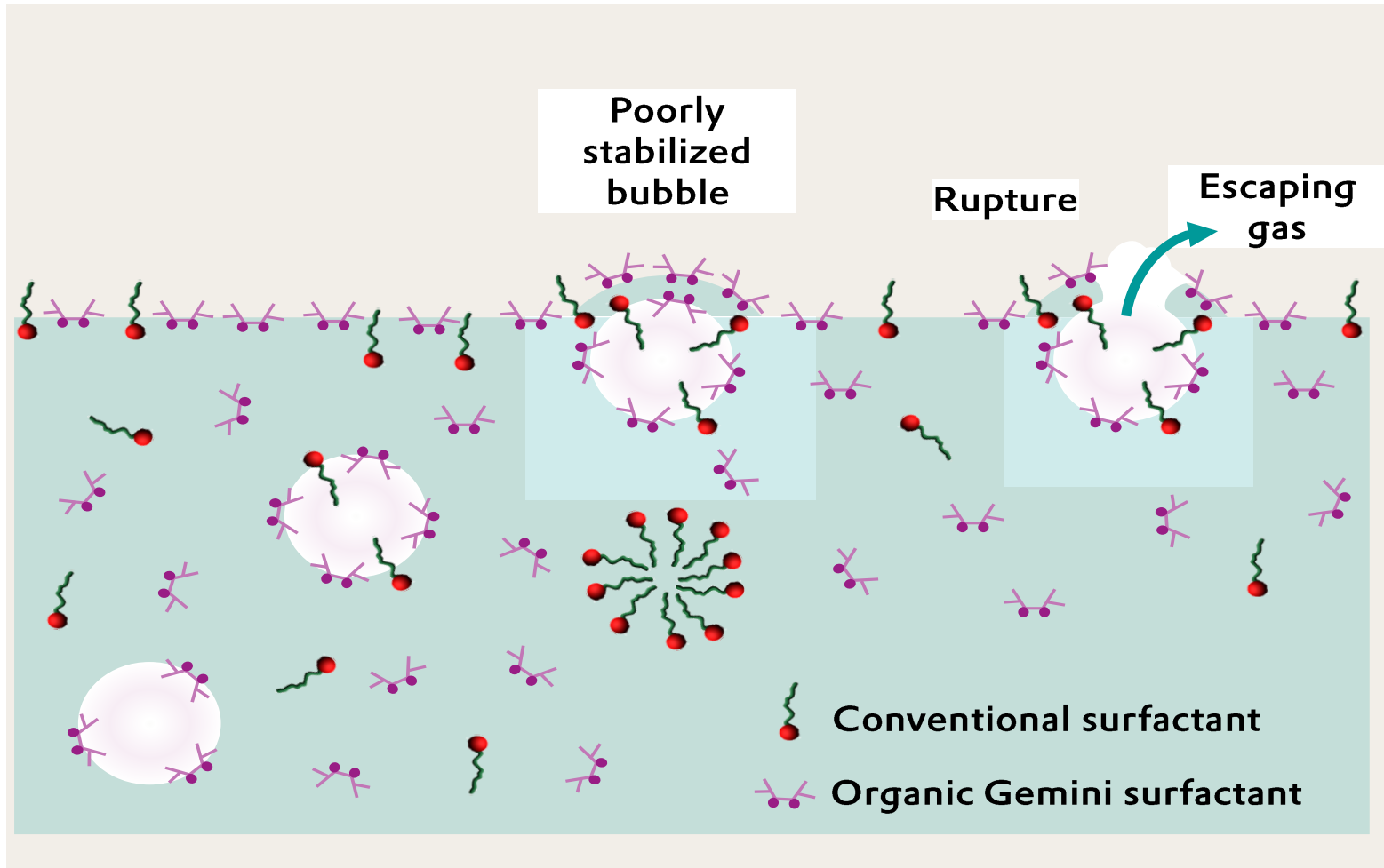
Siloxane Wetting Agents: Small Molecules with Short Siloxane Backbones

- Structure is easily tailored by varying Si-O unit and organic side chain.
- Very efficient on static surface tension reduction, while dynamic surface tension are typically high.
- Less foaming compared to traditional organic surfactant.
- Also effective in radiation curing and solvent-based system.
- Effective to solve surface defects

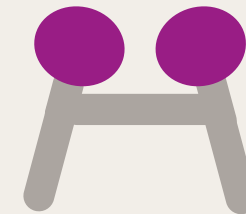


Gemini Surfactants - Organic and Siloxane-based

-Combine Excellent Dynamic Wetting and Foam Control



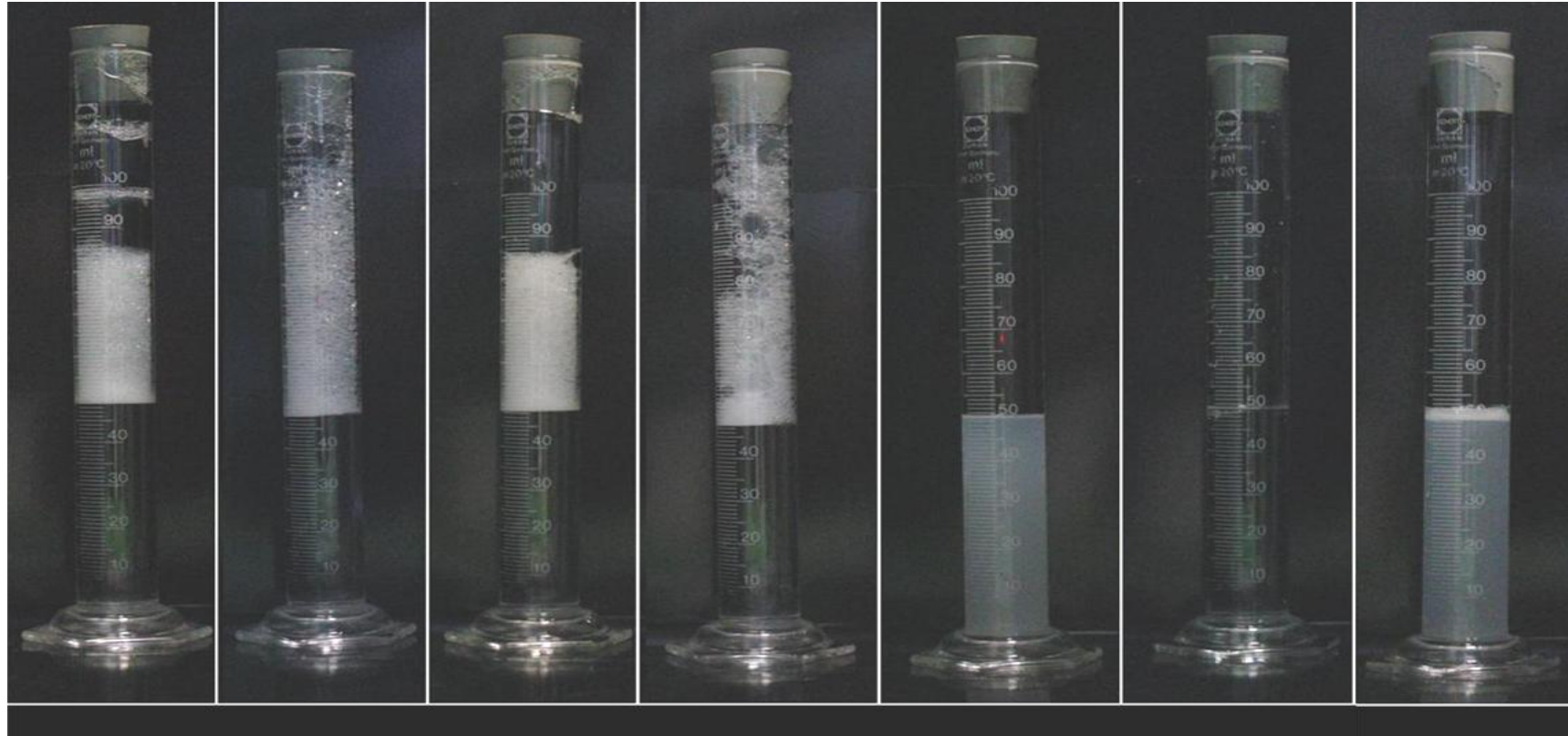
Organic Gemini
Wetting Agent



Siloxane-based
Gemini Wetting Agent

Foam Performance of Surfactant in Water

- 0.1 wt% Surfactant in water solution



Fluoro

DOSS

APE

SLS

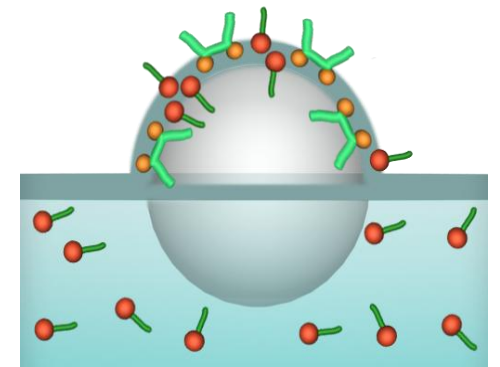
SMD20

S-AD01

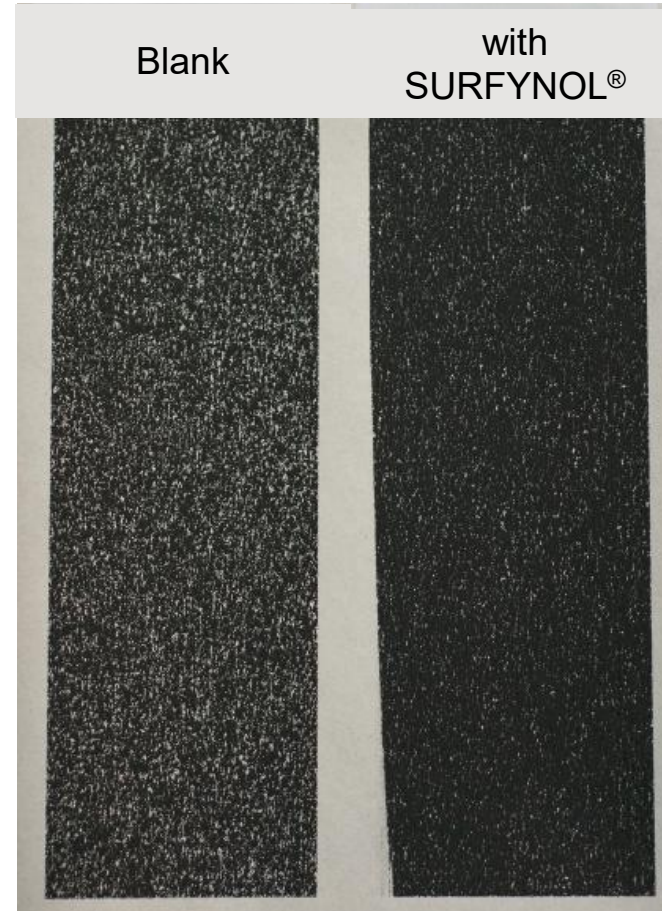
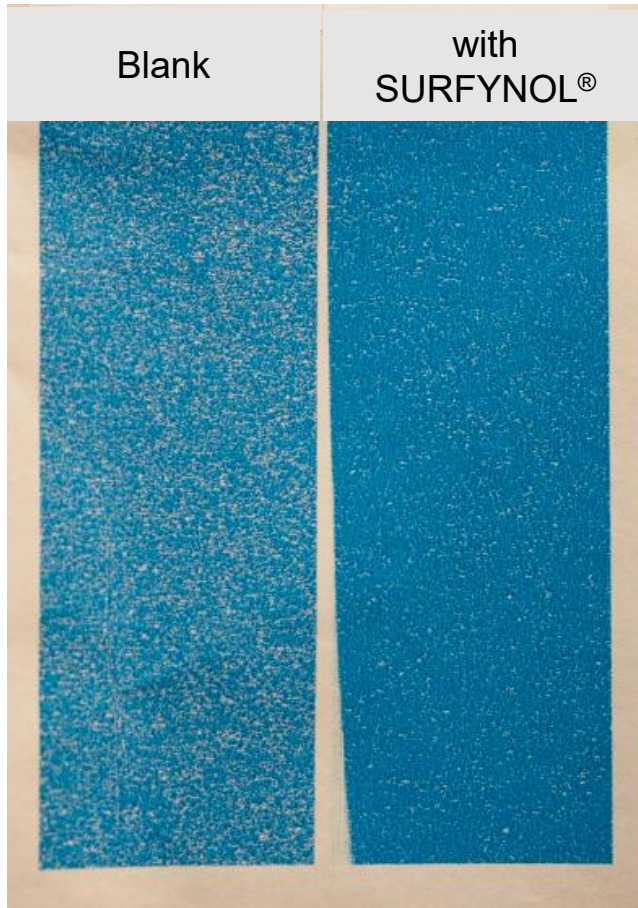
D604

Traditional Surfactant

Gemini Surfactant



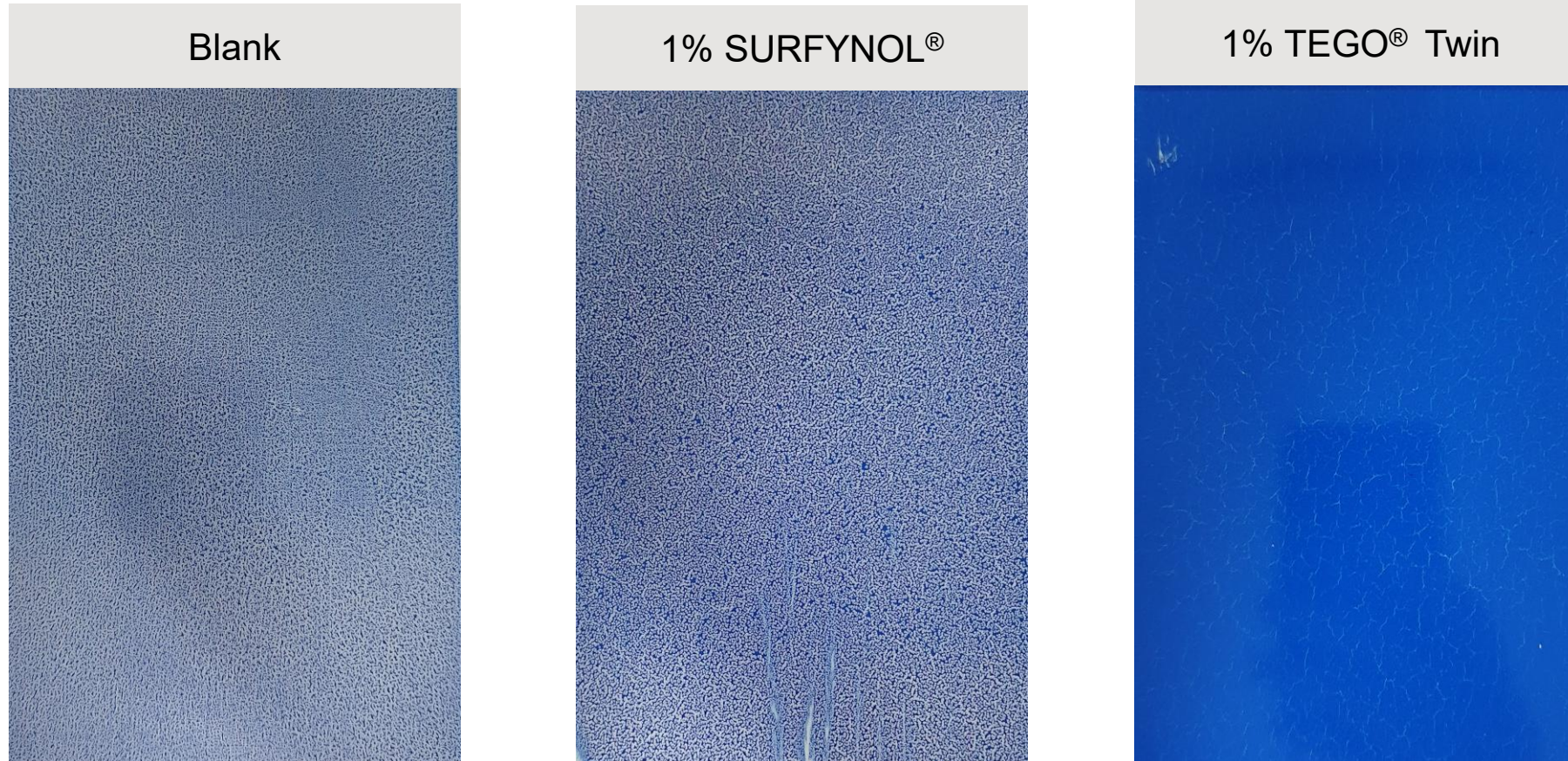
Gemini surfactant doesn't stabilize foam



System: WB acrylic Printing ink + 0.5% **SURFYNOL® 420** applied with ERICHSEN K-Proofer (70L/cm) onto paper

TEGO® Twin 4100

-Superior Wetting for Waterborne Inks on Low Energy Surface



System : WB acrylic Flexo Printing ink + 1% wetting additives. Applied with RK proofer onto linseed oil coated PET film

Superwetter to Reduce Both Dynamic and Static Surface Tension



0.8% Traditional Siloxane surfactant

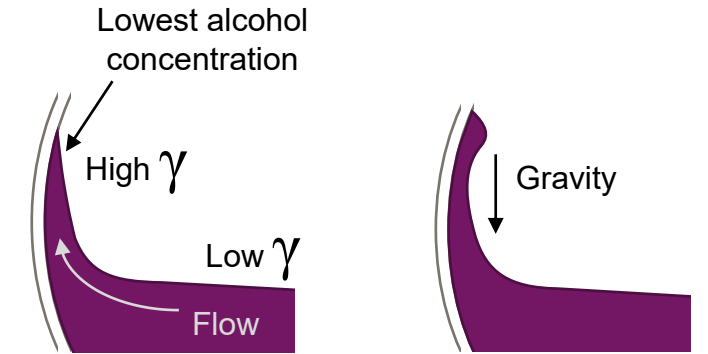
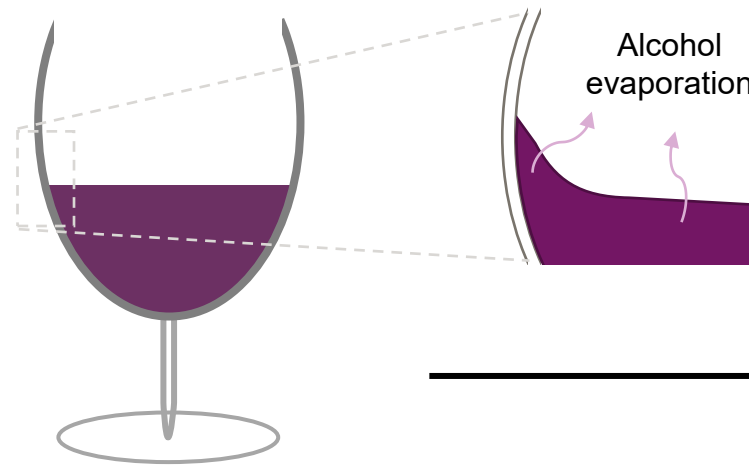


0.8% DYNOL™



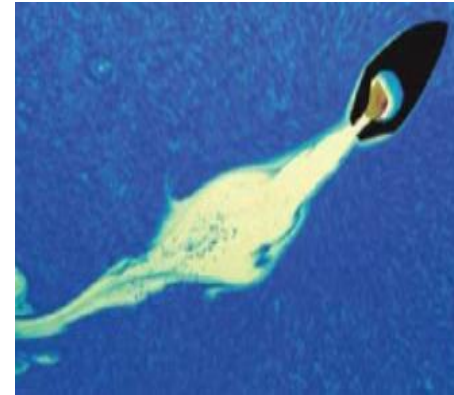
Customer example: WB Inkjet ink + 0.8% wetting additives. Printed with Epson SP R230 onto glossy photo paper.

Flow driven by Surface Tension gradients (Marangoni Effect)



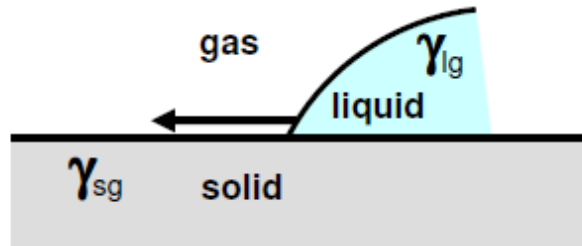
Adapted from <https://www.comsol.com/multiphysics/marangoni-effect>

Time →



IROS, 2017, 3217-3222

Defects generated by surface tension gradients



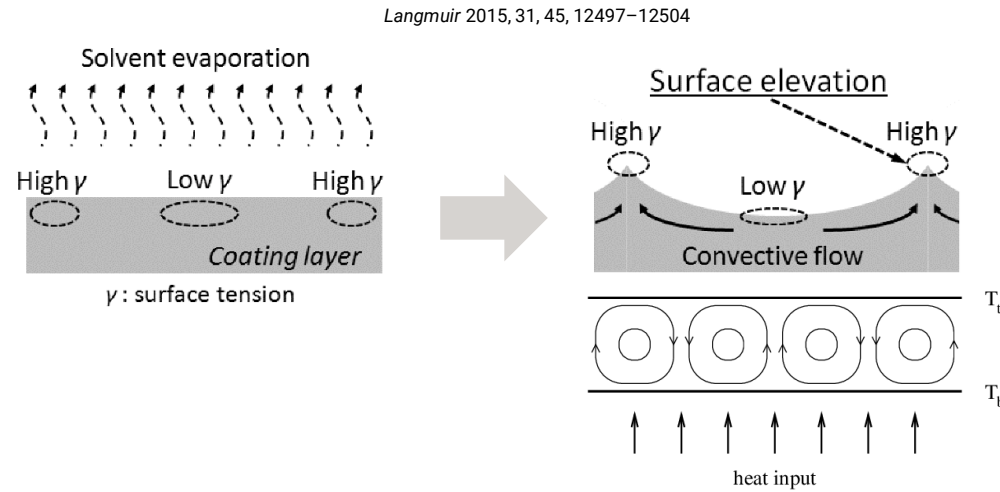
Complete wetting occurs when:

$$\gamma_{lg} < \gamma_{sg}$$

Surface tension

Surface energy

Wetting



Benard cells



Orange peel



Hammertone



Craters



CONTENT

1	Substrate wetting additives
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Wetting and Dispersing Additives

**Good Viscosity reduction
and stable viscosity**

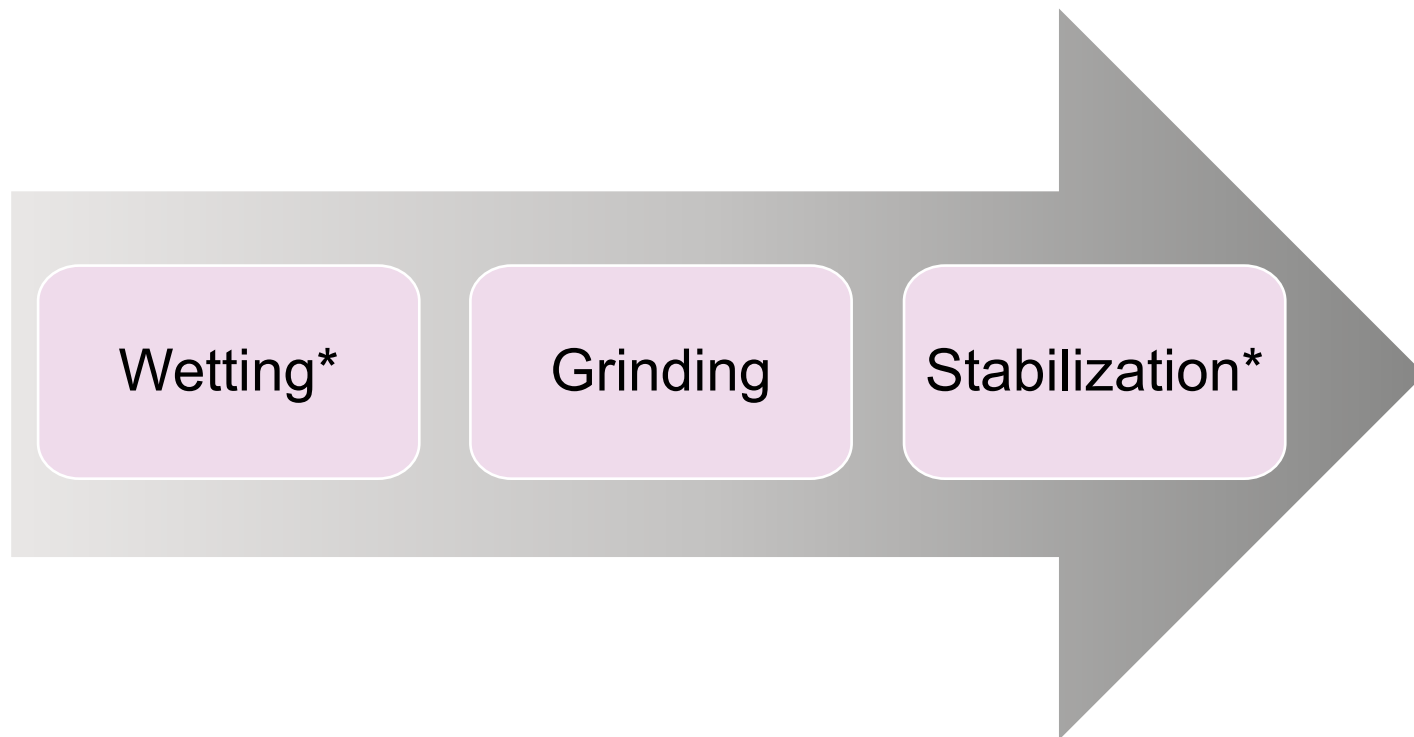
**Excellent color strength
and transparency**

Grinding Efficiency in Production





The Pigment Dispersion Process

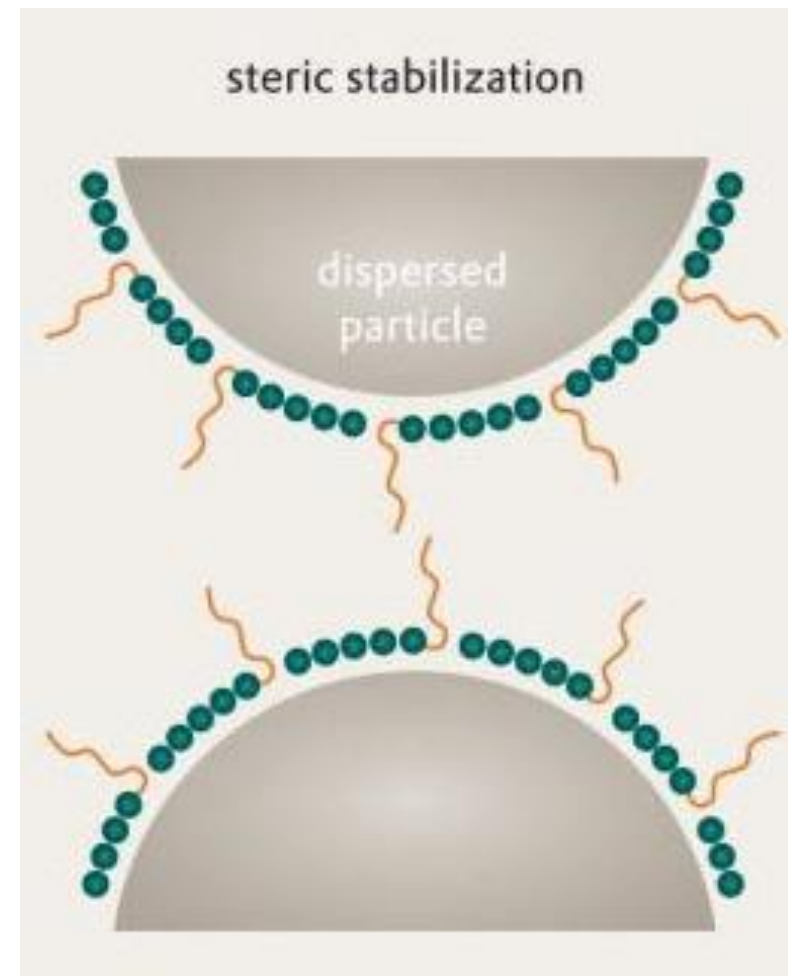


* Pigment wetting and dispersing additives significantly contribute to the pigment wetting and the pigment stabilization. They cannot replace mechanical grinding, but they can shorten grinding times.



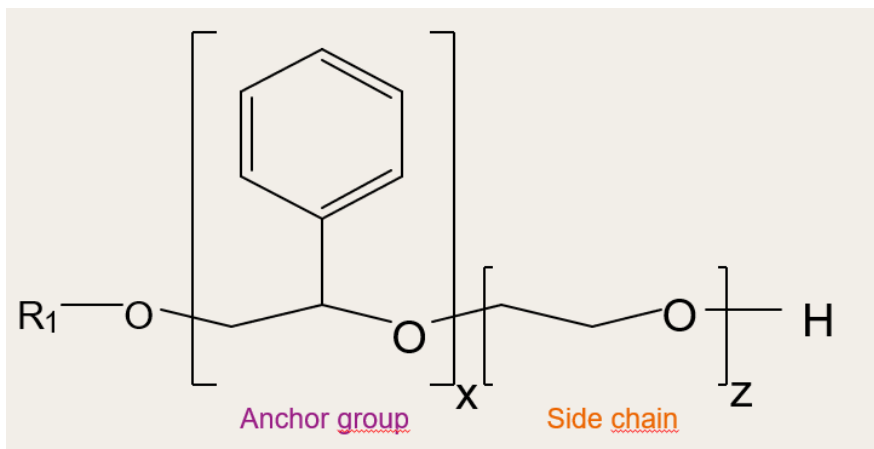


Optimum Selection of Pigment Wetting and Dispersing Additives Ensures Low Viscosity and High Color Strength/Transparency



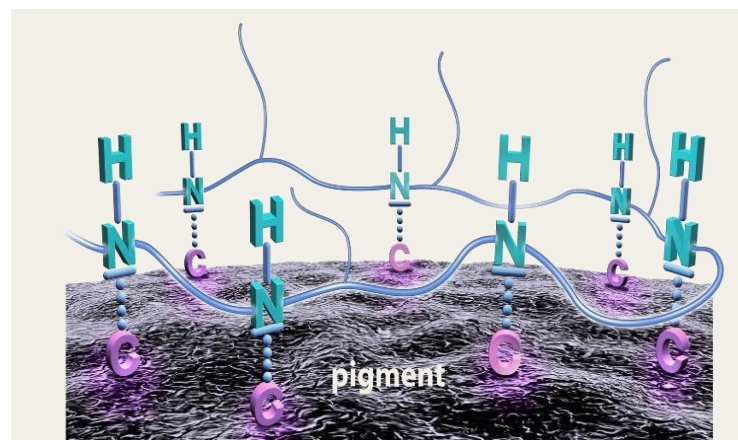
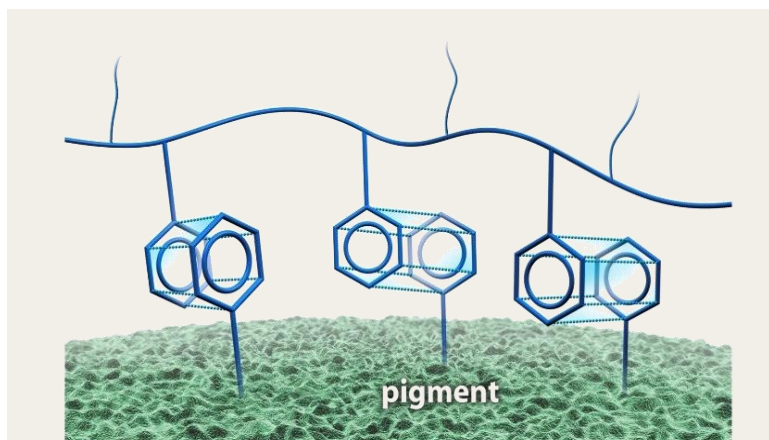


The Choice of Wetting and Dispersing Additive ...



... depends on the

- **type of pigment**
and the corresponding anchor groups of the additive
- **polarity of the ink**
and the corresponding solubility of the additive
- **presence of a grinding resin**
and the corresponding required stabilization needs





Classical (Resin-Based) vs. Resin-Free Ink Grinds

Different Requirements

Dispersants in resin-based grinds

Significantly boost the wetting properties of the resin-solution.

++

Can efficiently reduce the grinding viscosity and allow for significantly higher pigment loadings.

++

Can perform the stabilization task jointly with the grinding resin.

+

Dispersants in resin-free grinds

Provide fast and effective pigment wetting.

+

Ensure low viscosities even at high pigment loads.

+

Need to fully cover the stabilization task. For that they need to have superior stabilizing properties.

+++

Fast and effective pigment wetting

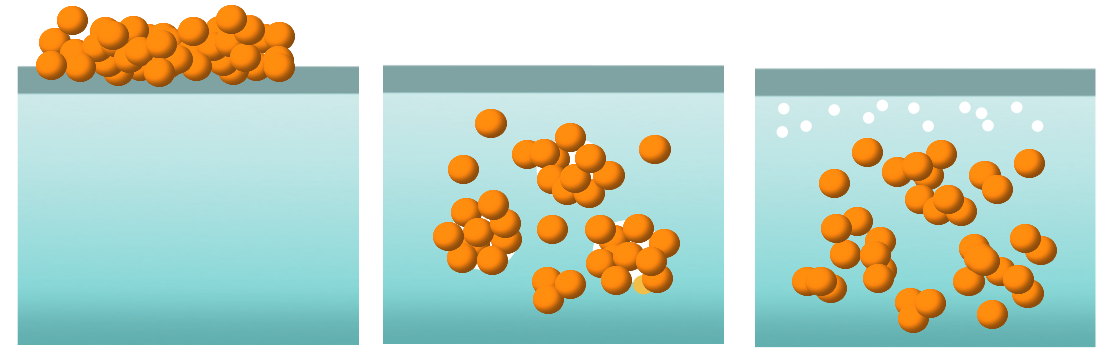
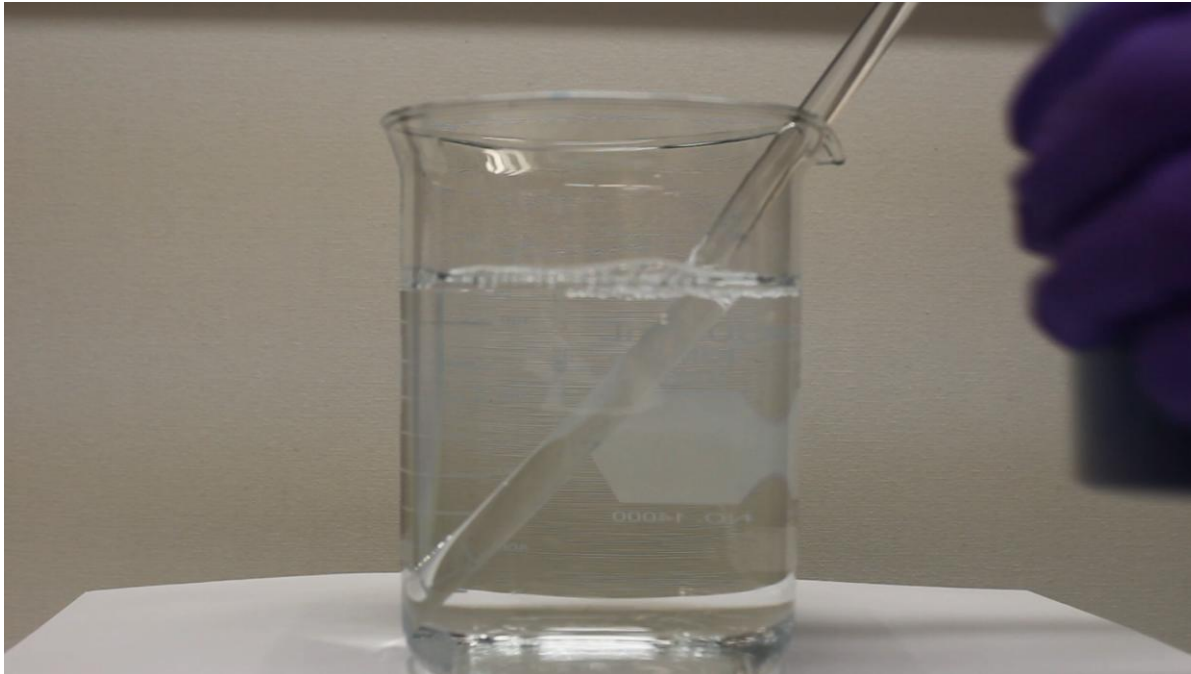
Viscosity Reduction

Long Term Stabilization



Dynamic Wetting Agents Enable Efficient Pigment Wetting and Grinding

PB15:3 pigment is ineffectively wet by an aqueous styrene-acrylic resin solution, but addition of a low foam dynamic wetting agent enables immediate wetting and deaeration



- A liquid with low surface tension wets a particle surface better than a liquid with a high surface tension
- Wetting Agents aid pigment and particle wetting
 - Improves pigment “cut-in” time
 - Enables more efficient milling and grinding
 - Reduces microfoam and optimizes grind density

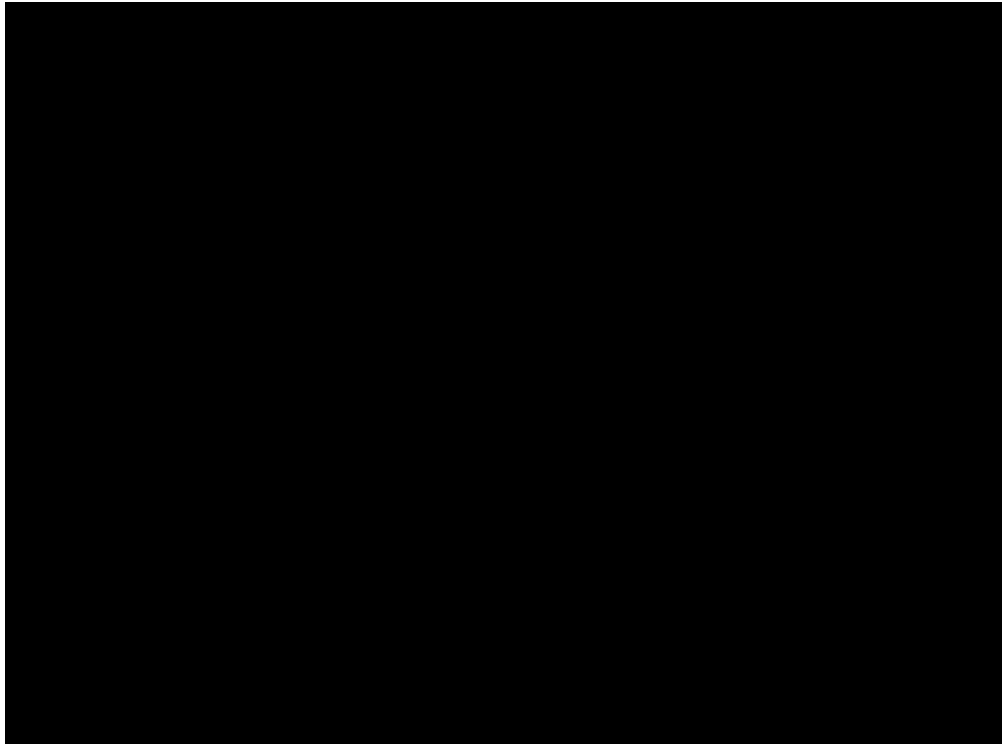
Video

Minimized risk of pigment shocking



Addition of a Low Foam Dynamic Wetting Agent Improves Wetting and Eliminates Microfoam in the Grind and Yields Excellent Prints

The first dispersion contains a conventional pigment wetting & dispersing additive; the second one additionally contains a low foam dynamic wetting agent



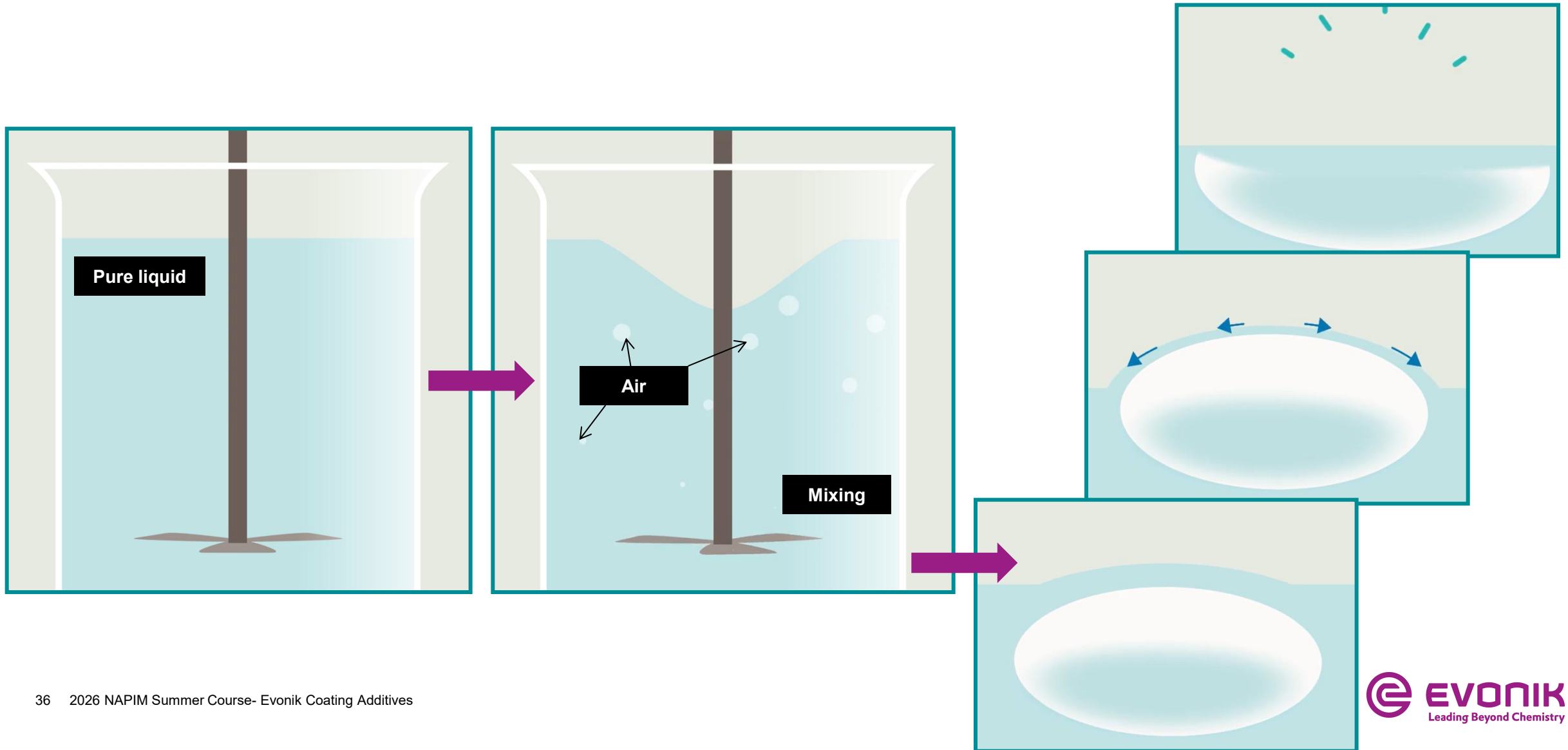
Waterborne flexible packaging inks applied on BOPP



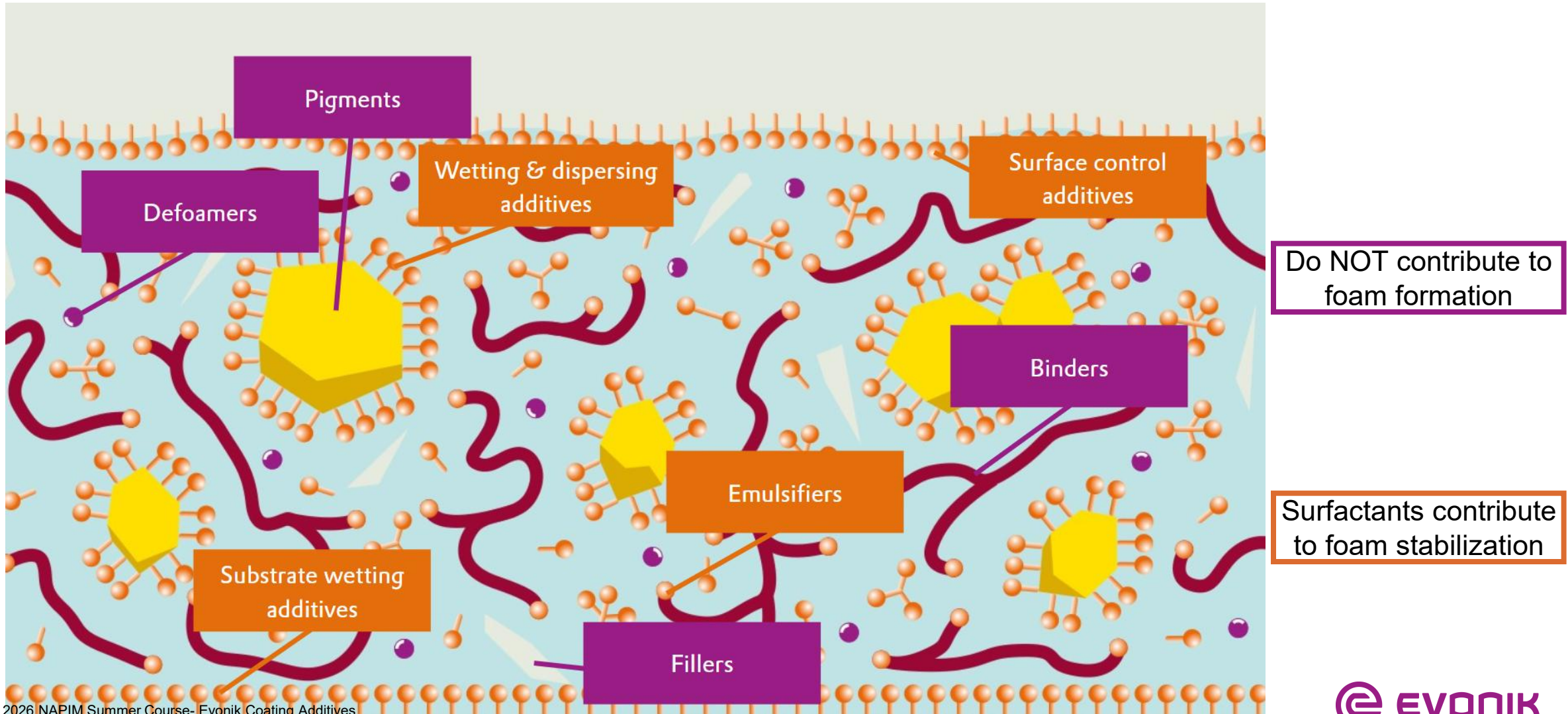
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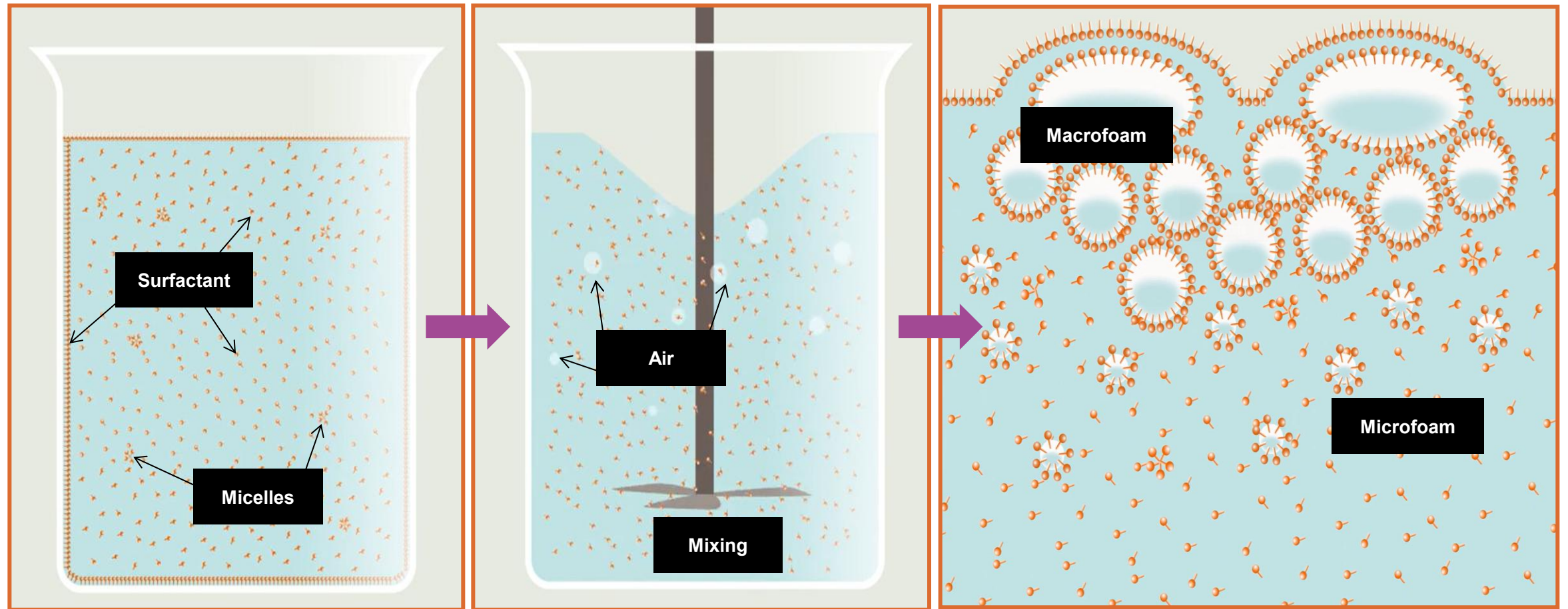
Bubble in pure liquid



Surfactants in coating formulations



Surfactants in liquids. Foam stabilization





Defoamers/Deaerators

Act via a controlled incompatibility with the ink/varnish matrix. Generally, they

- are hydrophobic
- are surface active
- have limited solubility in the ink/varnish

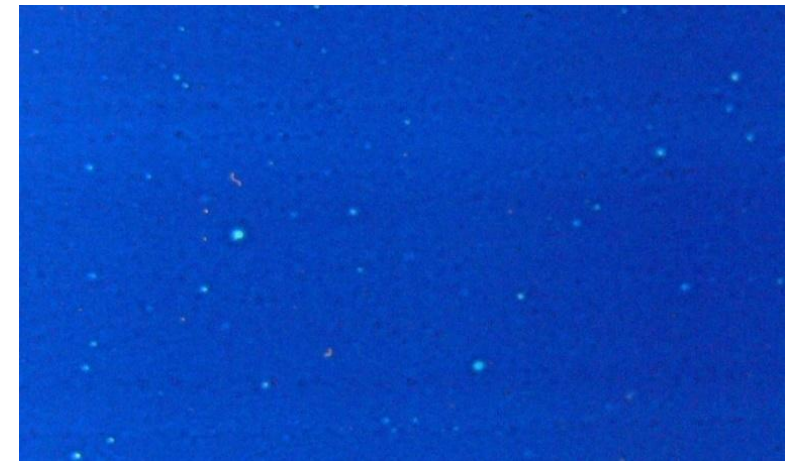
Typical ingredients for defoamers are:

- Hydrophobic polyether siloxanes, mineral oils, natural oils
- Polymers
- Emulsifiers to ease incorporation
- Solid particles (e.g. SiO_2 , urea, wax,...) to boost efficiency

Most defoamers for waterborne inks and varnishes are insoluble in water, i.e. they need to be incorporated with sufficient shear.

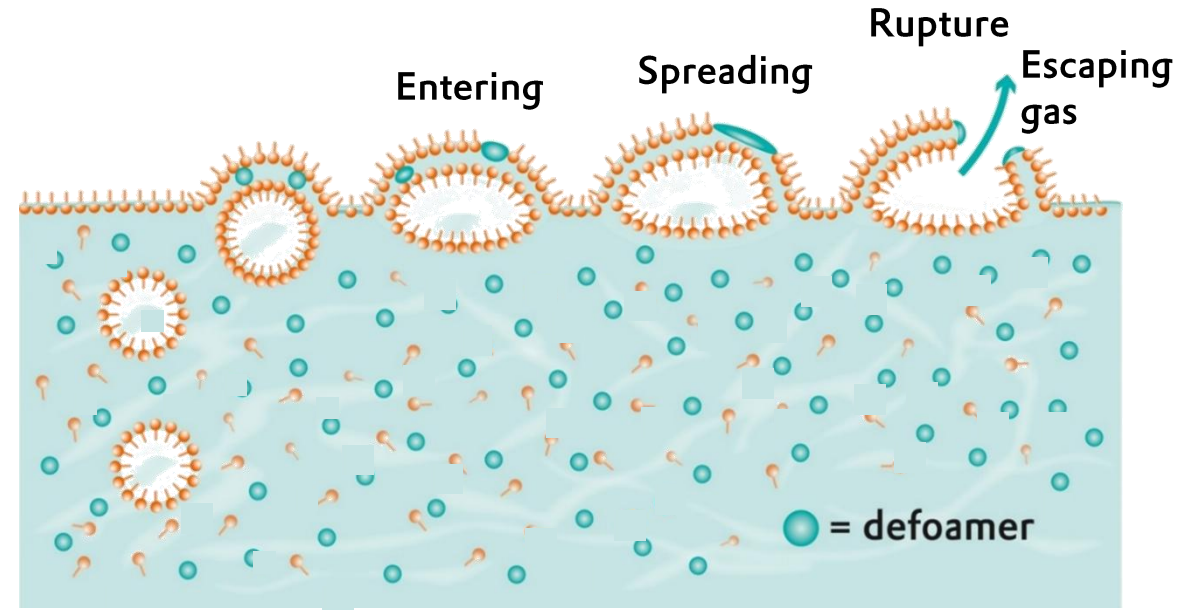
Defoamer emulsions are the first choice for low shear incorporation.

*Getting the balance right.
Sufficient defoaming power
vs. avoidance of surface defects.*



Foam Control with Conventional Defoamers

- Conventional defoamers' mode of action:
 - They must be incompatible with the system and, hence, form oil droplets
 - Their surface tension needs to be lower than that of the matrix
 - These droplets enter and spread within the foam lamellae and hence cause bubble rupture
- Conventional defoamer attributes:
 - Optimal defoamer droplet size is important
 - Generally strong defoamers with good “knock-down” (post-defoaming)
 - Defoaming strength and system (in)compatibility needs to be balanced to avoid defects in the coating



Thermodynamic requirements:

Entering coefficient: $E = \gamma_l + \gamma_{l/o} - \gamma_o > 0$

Spreading coefficient: $S = \gamma_l - \gamma_{l/o} - \gamma_o > 0$

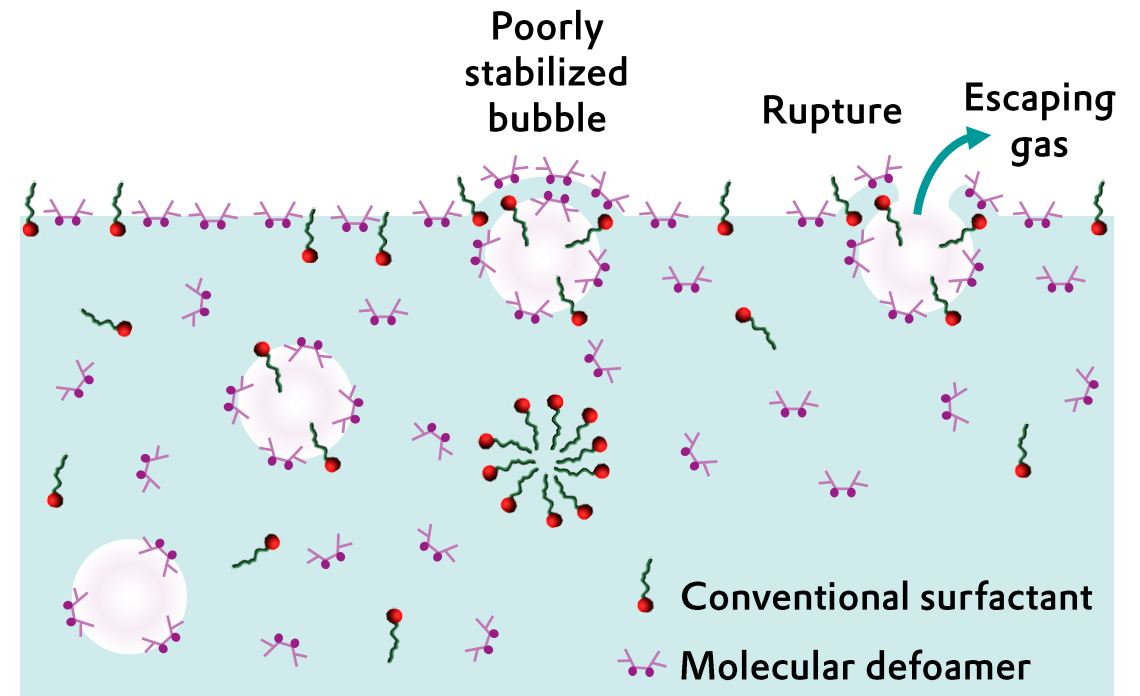
γ_l = Surface tension of liquid

$\gamma_{l/o}$ = Interfacial tension liquid/oil

γ_o = Surface tension of oil

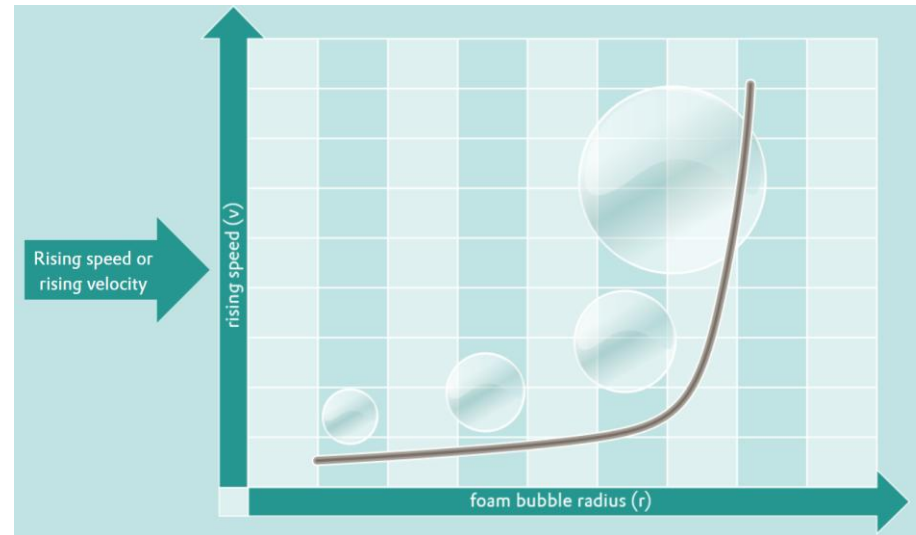
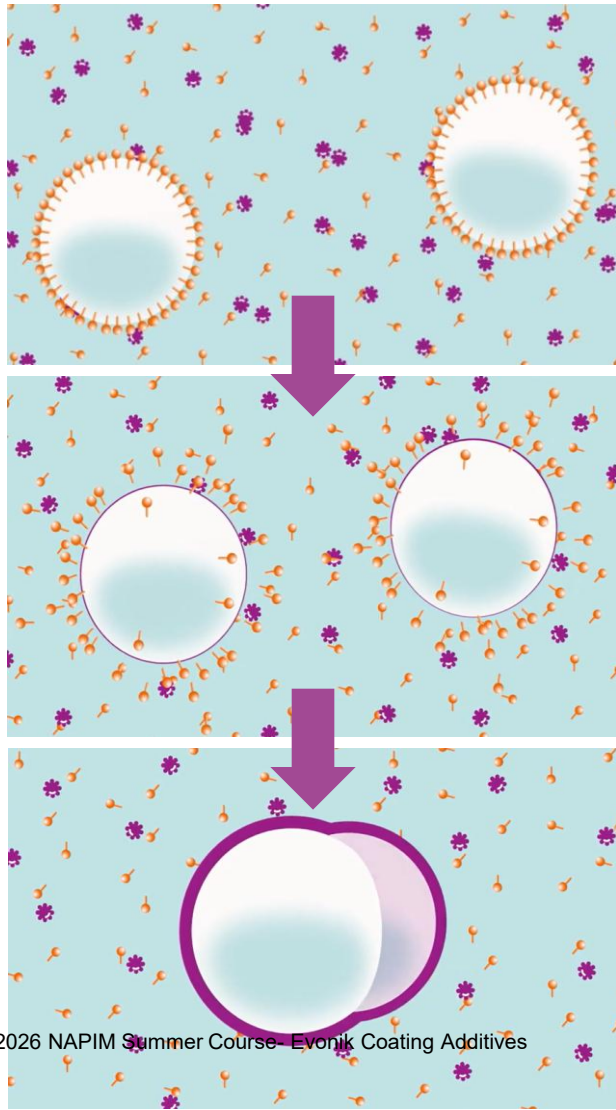
Foam Control with Molecular Defoamers

- Molecular defoamers act as surfactant anti-foams:
 - They must be sparingly soluble in the system without forming micelles like other surfactants
 - Mechanistic possibilities:
 - They have considerably faster surface tension dynamics than conventional surfactants
 - Their stronger adsorption coefficients drive molecular defoamers to new interfaces, displacing other surfactants
 - They are unable to stabilize foam lamellae; hence, the bubbles rupture even before foam can develop
- Molecular defoamer attributes:
 - Highly-branched, low molecular weight and hydrophobic (often Gemini-type) surfactants
 - Generally efficient prevention of foam formation (“hold-down”; anti-foaming)



Mechanism of deaeration

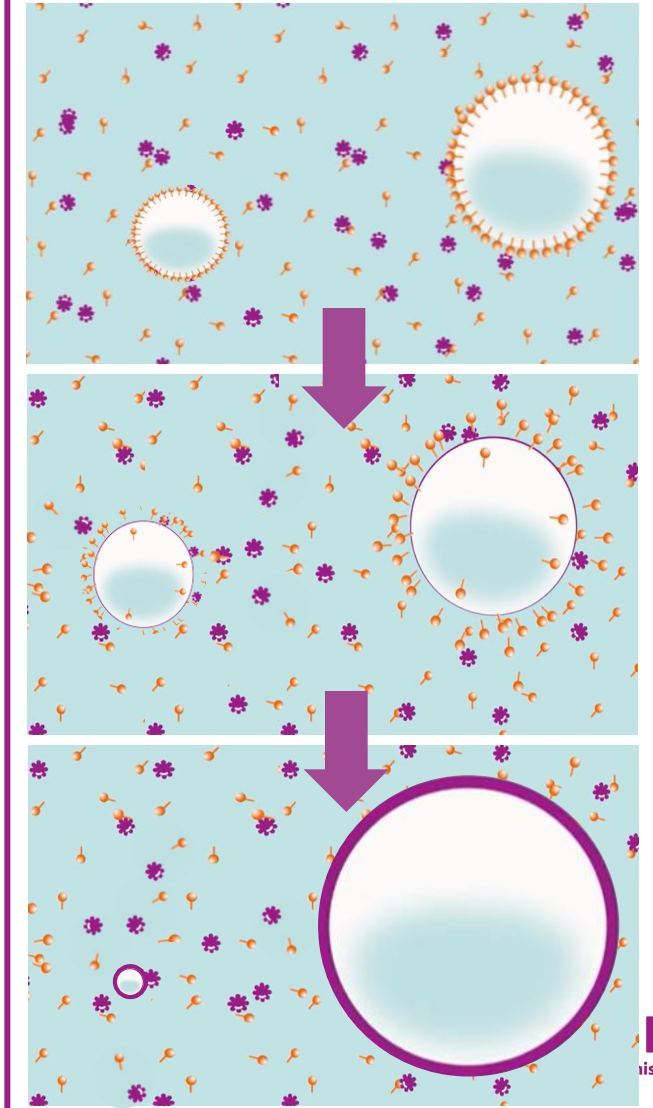
Coalescence



$$V \sim \frac{r^2}{\eta}$$

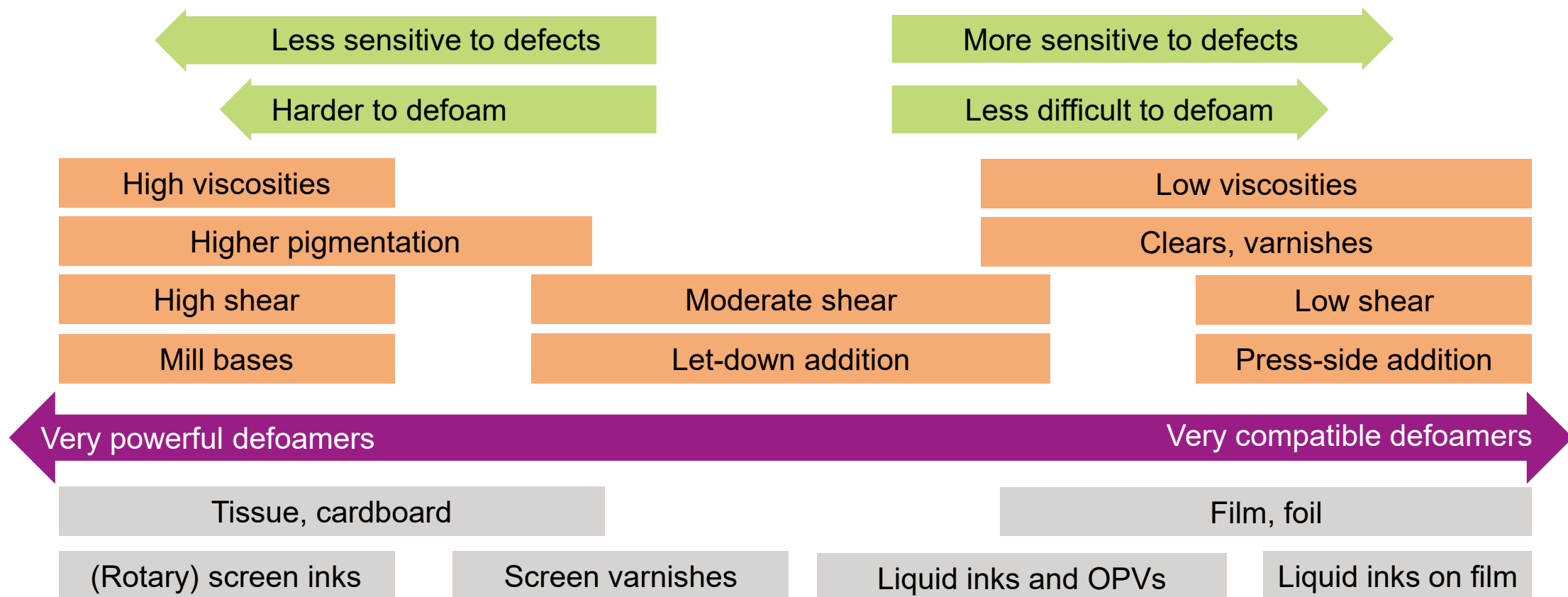
V = velocity of rise
 r = bubble radius
 η = viscosity

Ostwald ripening





Defoamer Selection Criteria



Test Method – Stir Test



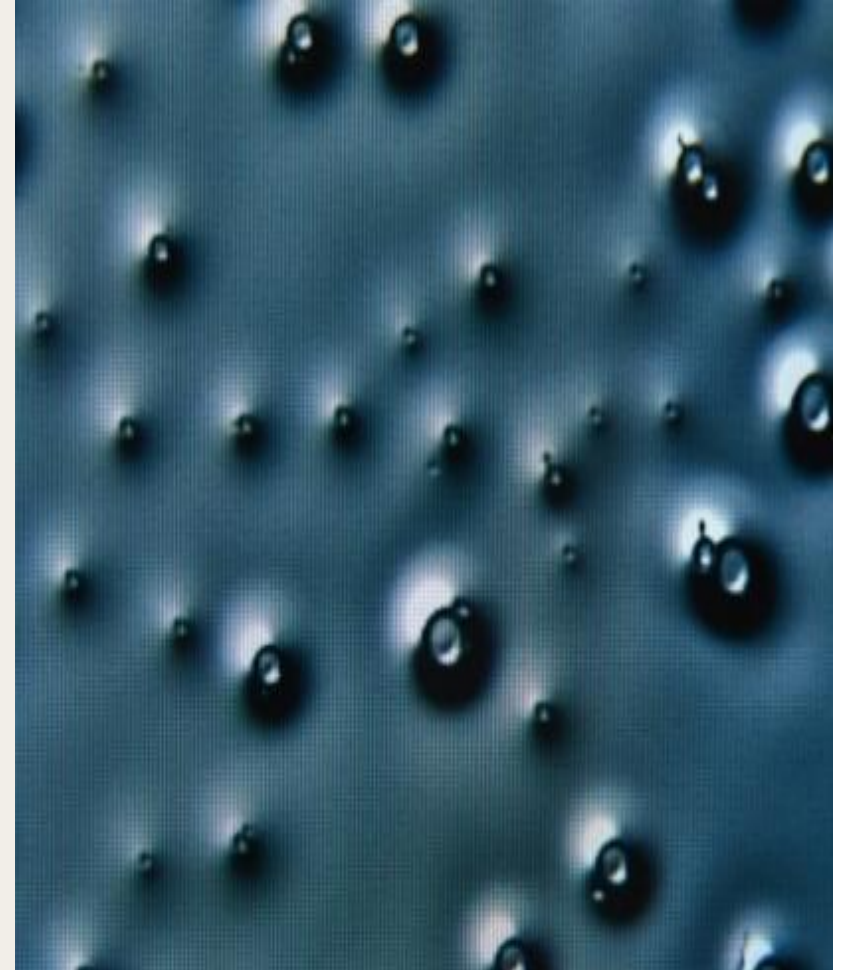


Check on Compatibility



Defoamers and Deaerators: Helpful Advice

- Often the best results are achieved with a combination of defoamer and deaerator
- Add the more incompatible defoamer / deaerator to the grind
- Add the more compatible one to the let down
- Add concentrates to the grind
- Add emulsions to the let down
- Incorporate incompatible defoamers / deaerators with high shear forces
- For some defoamers / deaerators, incorporation / compatibility may be improved by pre-diluting
- Wetting agents can improve the compatibility of defoamers / deaerators



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Slip Additives

Excellent and defined slip properties

High scratch and rub resistance

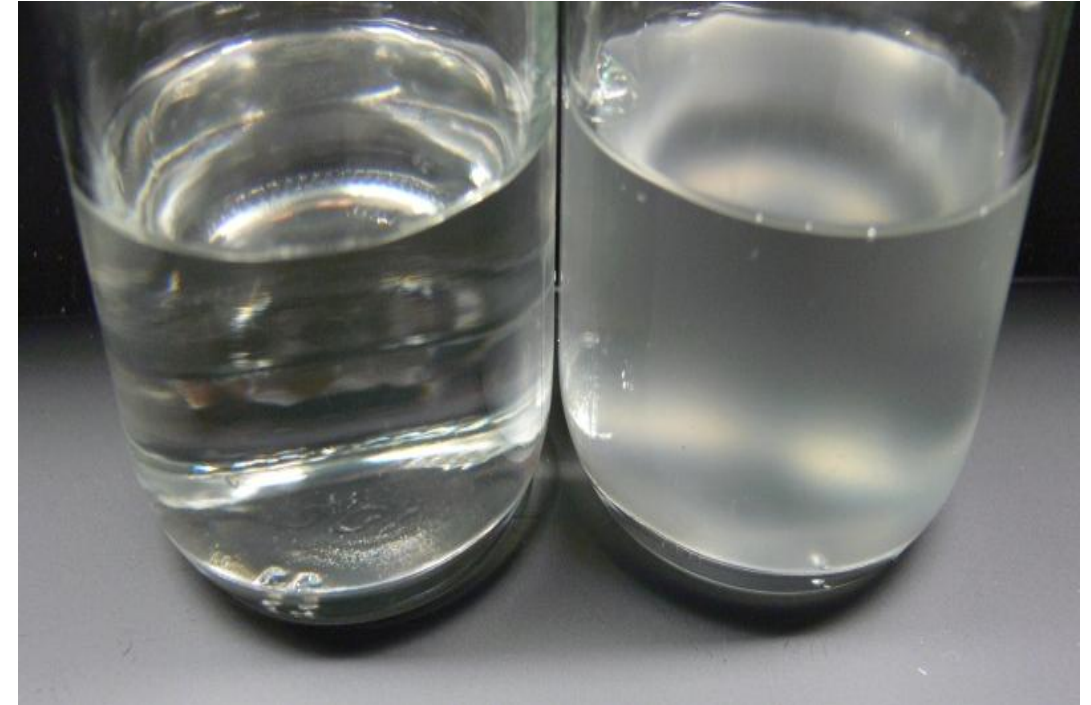
Easy tape release



Siloxane-based additives for RC coatings and inks

RC

- Most common: polyether siloxanes
>> TEGO® Wet, Flow, Glide
- Higher polarity improves solubility in UV matrix.
- Desired properties can be tailored by structural variation
- Additionally reactive groups can render the additive crosslinkable in order to achieve longer lasting surface effects and minimize migration.
>> TEGO® Rad



UV clearcoat with 0.3 % addition of
polar polyether siloxane **non-polar** polyether siloxane

Tailoring Performance

Organomodified siloxanes



TEGO® Wet

TEGO® Flow

TEGO® Glide

①

Dimethylsiloxane backbone

Creates surface tension reduction, slip and release – but also, incompatibility and insolubility.

②

Organic modification

Renders the copolymer more compatible and can vary in chemical nature, M_w , polarity and number of modifications

Tailoring Performance

Organomodified siloxanes and silicone acrylates



TEGO® Rad

①

Dimethylsiloxane backbone

Creates surface tension reduction, slip and release – but also, incompatibility and insolubility.

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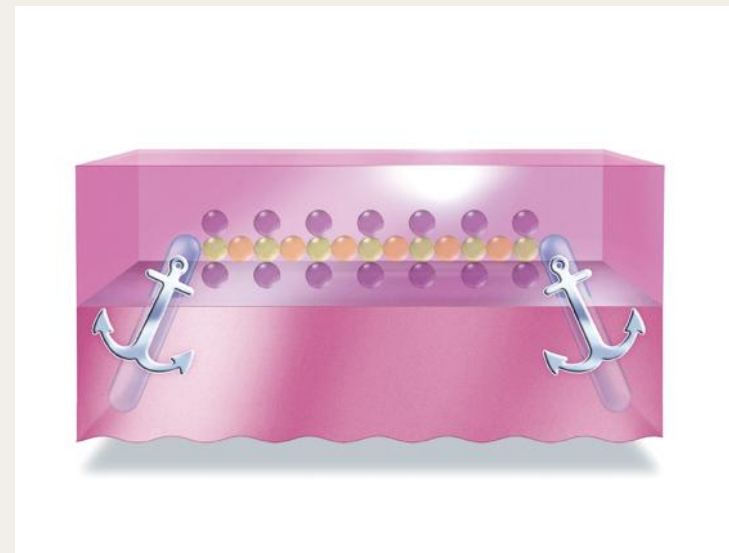
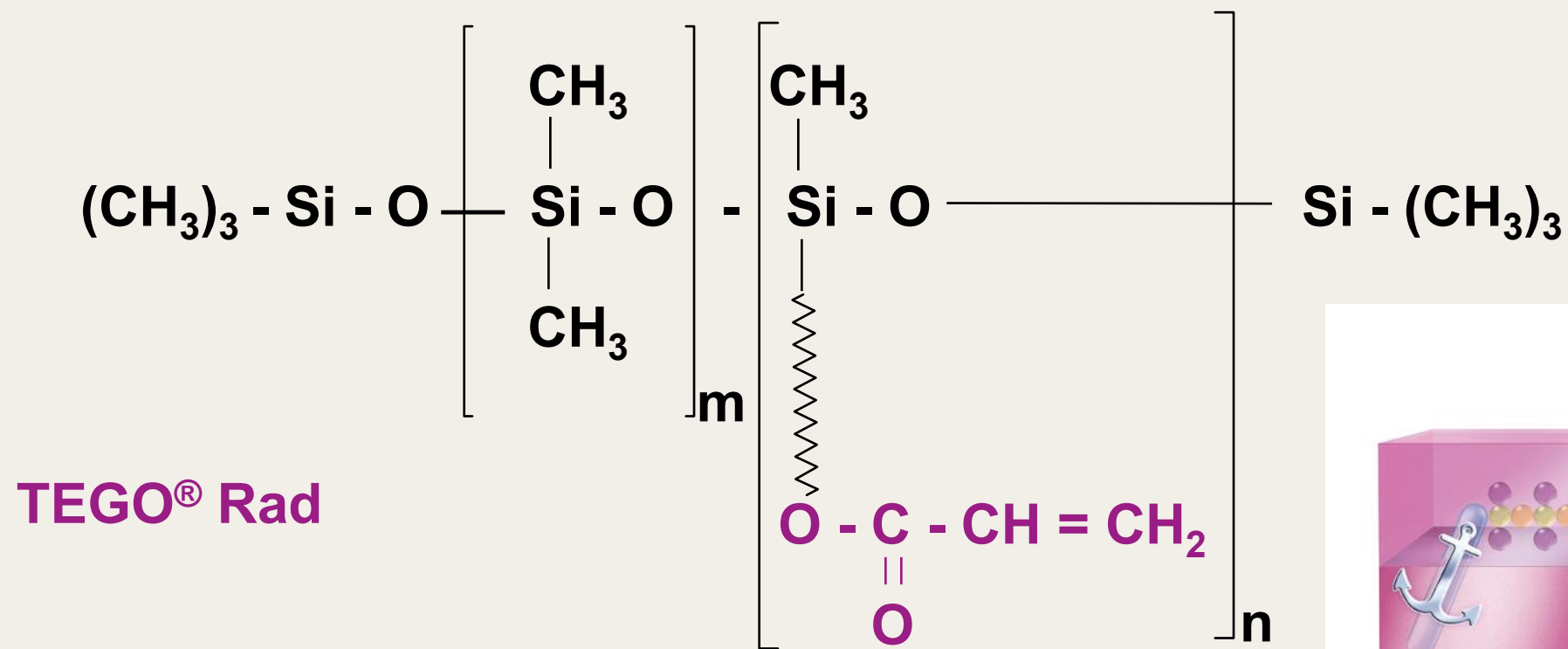
③

Reactive acrylate group

Renders the additive cross-linkable and creates permanent surface effects, such as release properties.

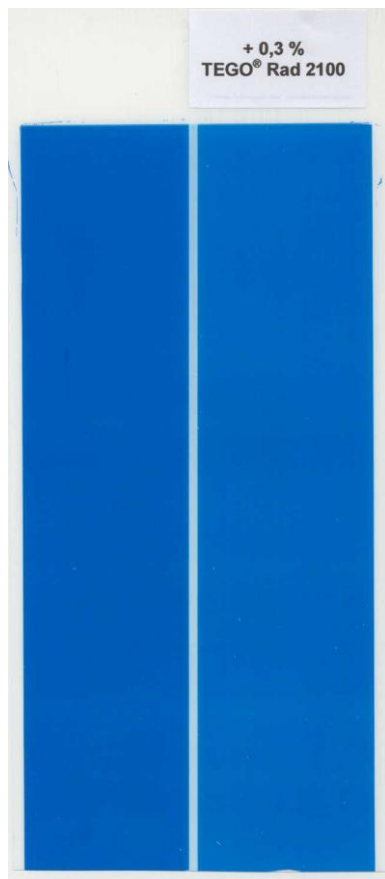
TEGO® Rad : Modified polysiloxane with reactive acrylate groups

RC





Please note: Powerful Slip or Release and Easy Reprinting May Exclude Each Other

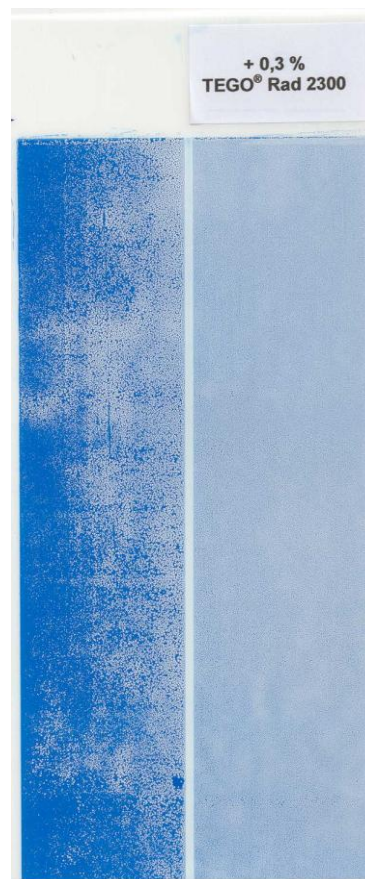


White screen ink with 0.3 % of cross-linkable glide additive.

Reprinted with blue flexo ink.

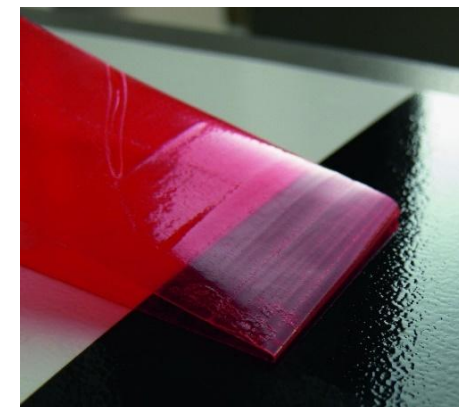
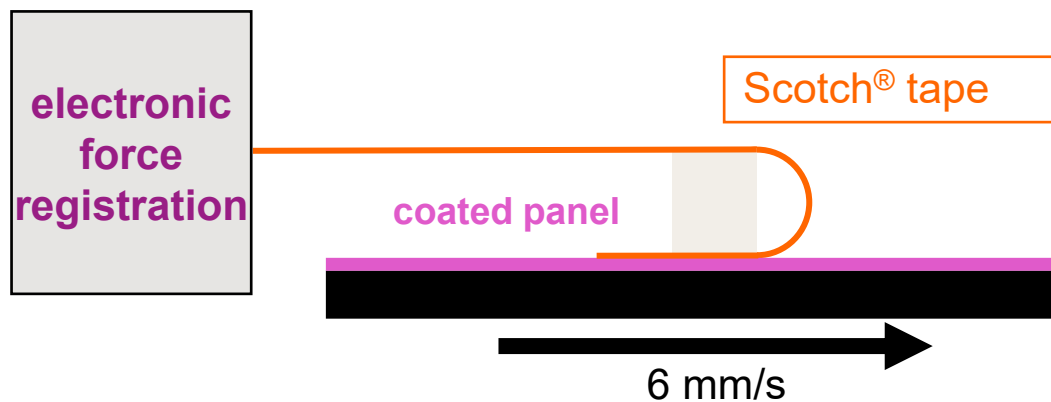
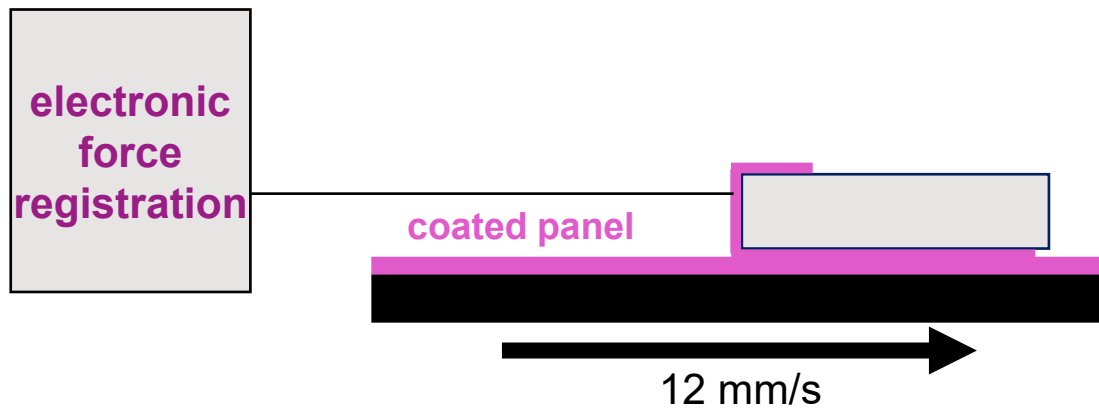
Left: re-printable TEGO® Rad

Right: strong slip TEGO® Rad





Measurement of Slip and Release properties



The best choice of additive

RC

is determined by the balance of desired properties and possible side effects.

substrate wetting



foam stabilization

slip



recoatability

release



clarity and leveling

defoaming



clarity and leveling



Other additives

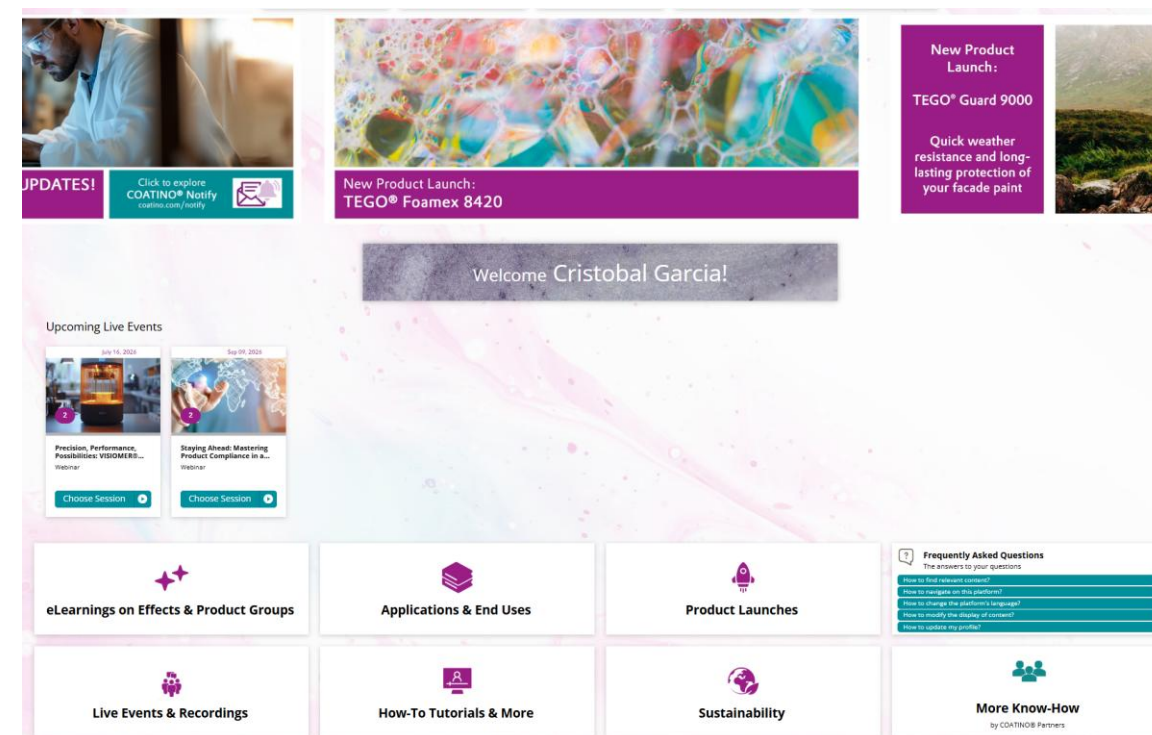
- There are many other specialty additives for coating and ink applications that are not covered by this short course
 - ✓ Matting agents
 - ✓ Rheology modifiers
 - ✓ Co-binders
 - ✓ Adhesion promoter
- The additives could interact with other components in the formulation and please reach out to Evonik if you have any question.

CONTENT

1	Substrate wetting additives
2	Pigment wetting and dispersing additives
3	Defoamer/Deaerator
4	Slip Additives
5	Coatino Campus

Welcome to COATINO® Campus

A lot of valuable information – on product groups, launches and many ink-related topics. 24/7, free of charge



campus.coatino.com

NEW

Discover the Wow in Know-How!

COATINO® Campus - The new standard for knowledge transfer in the coatings and inks industry.

It's never been so easy to learn how additives work – how to test, choose, and handle them. Get access to information that simplifies your formulation work, saves time, and leads to better coating and ink performance. Join live seminars or train yourself via e-Learnings at any time. Your latest learning platform is just a click away!





eLearning

COATINO® Campus Dashboard

The dashboard features the Evonik logo and tagline 'Leading Beyond Chemistry' in the top left. The top right contains navigation icons for search, email, user profile, and a menu. The main content area includes several promotional banners and a grid of interactive tiles.

Top Row:

- eLearning:** A banner showing a computer monitor with the word 'eLearning'.
- Welcome on COATINO® Campus!** A purple banner with white text.
- TEGO® Foamex 852:** A banner with an image of hands holding a glass sphere, with the text 'The Rule Breaker with broad food contact compliances'.
- COATINO® Campus Global Digital Conference:** A purple banner with the text 'Click here for the next event June 23rd, 2021'.
- Global Digital Conference:** A banner with a blue background and various icons representing digital technology.

Second Row (Navigation Tiles):

- Continue:** Launch TEGO® Foamex 852.
- My Courses:** Enrollments.
- Catalog:** All Courses.
- Latest News:** Keep up to date.
- Polls & Surveys:** Vote on the latest topics.
- Support:** Contact Support Team.

Third Row (Topic Tiles):

- Effects & Product Groups**
- Applications & End Uses**
- Product Launches**
- Prove Your Knowledge**

Fourth Row (Topic Tiles):

- Experts4U**
- How-To Tutorials**
- Coating & Ink Technologies**
- Sustainability**

Fifth Row (Topic Tiles):

- Live Events**

COATINO® Campus Dashboard

Welcome Cristobal Garcia!

Upcoming Live Events



Precision, Performance,
Possibilities: VISIONER®...
Webinar

Choose Session



Staying Ahead: Mastering
Product Compliance in a...
Webinar

Choose Session



eLearnings on Effects & Product Groups



Applications & End Uses



Product Launches



Live Events & Recordings



How-To Tutorials & More



Sustainability



More Know-How

by COATINO® Partners



Frequently Asked Questions

The answers to your questions

How to find relevant content?

How to navigate on this platform?

How to change the platform's language?

How to modify the display of content?

How to update my profile?

Printing Ink Related Topics



← APPLICATIONS & END USES

[Catalog](#) > Applications & End Uses

Search in Applications & End Uses

Search by course name...

Subcategories

Architectural Coatings 16

Floor Coatings 6

High Throughput Equipment 2

Industrial & Transportation ... 33

Inkjet Inks 7

Pigment Concentrates 7

Powder Coatings 5

Printing Inks 36

Technology Basics 2

Thermal Management 3

Wood Coatings 16

Filter by

Course type ▾

Language ▾

Status ▾

Tags ▾

Sort by

Newest first ▾

View as

Grid ▾

133 courses



Recording: Enhancing efficiency in coating...

Online course · 45m

★ ★ ★ ★ ★ (0)

Enroll



DigiCon: Free your inks...of performance and...

Online course · 2h 15m

★ ★ ★ ★ ★ (0)

Enroll



Recording: ACE your MATT coating surfaces for wood...

Online course · 1h 10m

★ ★ ★ ★ ★ (1)

Enroll



Recording: Go for the Perfect Finish!

Online course · 55m

★ ★ ★ ★ ★ (0)

Enroll



Recording: Regulatory topics for decorative...

Online course · 55m

★ ★ ★ ★ ★ (0)

Enroll

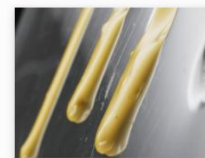


Recording: A new small particle sized SPHERILEX®...

Online course · 1h 10m

★ ★ ★ ★ ★ (1)

Enroll



Recording: Be in control of your waterborne...

Online course · 35m

★ ★ ★ ★ ★ (0)

Enroll

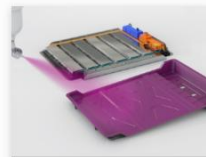


Recording: SPHERILEX® DP-0117: A new larger particl...

Online course · 35m

★ ★ ★ ★ ★ (0)

Enroll



TEGO® Therm for BEV

Online course · 5m

★ ★ ★ ★ ★ (1)

Enroll



Formulation synergy for floor coatings

Online course · 55m

★ ★ ★ ★ ★ (9)

Enroll



Recording: TEGO® Guard 9000 - Quick weather...

Online course · 35m

★ ★ ★ ★ ★ (1)

Enroll



Recording: High performance siloxane...

Online course · 40m

★ ★ ★ ★ ★ (2)

Enroll



Recording: New sustainable defoamers for ink...

Online course · 35m

★ ★ ★ ★ ★ (1)

Enroll



Recording: Unleash the Full Power of Your Powder...

Online course · 35m

★ ★ ★ ★ ★ (1)

Enroll

A Lot of Information on Ink Topics Already Today... ... and There is Much More to Come

← PRINTING INKS

[Catalog](#) > [Applications & End Uses](#) > [Printing Inks](#)

Search in Printing Inks

Search by course name...



Subcategories

trainINKS

14

Filter by

Course type ▾

Language ▾

Status ▾

Tags ▾

Sort by

Newest first ▾

View as

Grid ▾

36 courses



Recording: High performance siloxane...
Online course · 40m

★★★★★ (2)

Enroll



Recording: New sustainable defoamers for ink...
Online course · 35m

★★★★★ (1)

Enroll



Recording: Unlock new possibilities by using...
Online course · 55m

★★★★★ (3)

Enroll



Recording: Inkjet Printing
Online course · 1h 25m

★★★★★ (0)

Re-enroll



Quiz: Inkjet printing
Online course · 10m

★★★★★ (0)

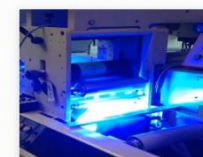
Completed



Quiz: Printing processes for packaging inks
Online course · 10m

★★★★★ (0)

Completed



Recording: Formulation of Radiation Curing inks
Online course · 1h 10m

★★★★★ (0)

Start



Recording: DEGACRYL® Heat Seal Coatings for...
Online course · 40m

★★★★★ (1)

Enroll



Recording: Dispersion Week 4: How to formulate...
Online course · 45m

★★★★★ (1)

Enroll



Recording: Printing technologies
Online course · 1h

★★★★★ (0)

Re-enroll



Recording: Digital regulatory tool for...
Online course · 30m

★★★★★ (1)

Enroll



Recording: Waterbased ink formulation
Online course · 45m

★★★★★ (0)

Re-enroll



Recording: Dancing together in colorful world...
Online course · 50m

★★★★★ (1)

Enroll



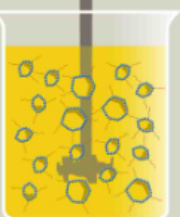
Quiz: Formulation of solventborne inks
Online course · 7m

★★★★★ (0)

Completed

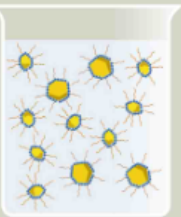


eLearning Courses



eLearning: Dispersion of Pigments, Part 2 - Practice
Online course · 1h
★★★★★ (28)

Completed ✓



eLearning: Dispersion of Pigments, Part 1 - Theory
Online course · 1h 30m
★★★★★ (47)

Completed ✓



eLearning: Rheology Basics
Online course · 1h 30m
★★★★★ (44)

Completed ✓



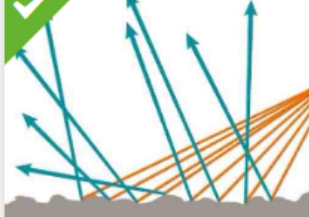
eLearning: Substrate Wetting Basics
Online course · 1h 30m
★★★★★ (46)

Completed ✓



eLearning: Regulatory Universe
Online course · 2h
★★★★★ (36)

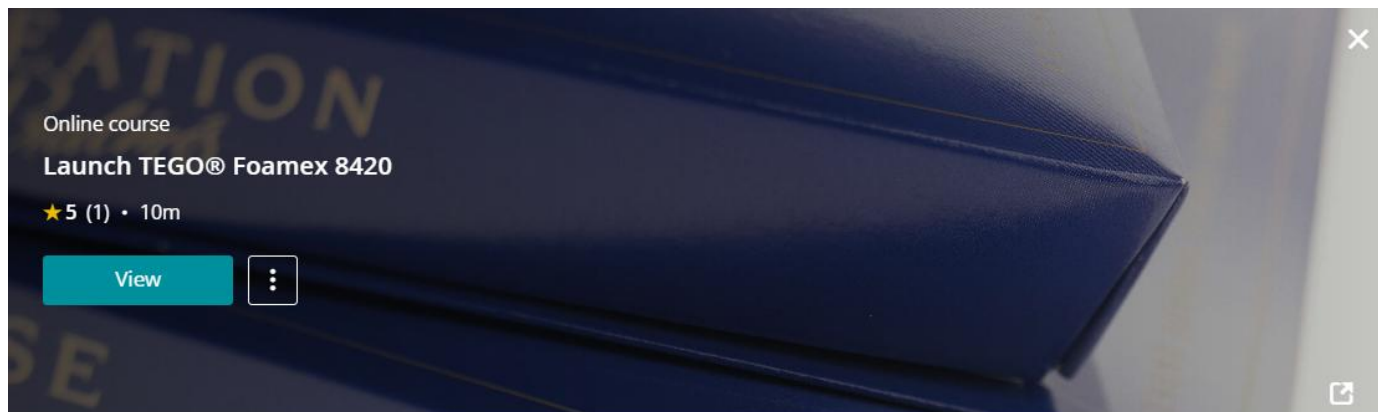
Completed ✓



eLearning: Matting Agents Basics
Online course · 1h 30m
★★★★★ (37)

Completed ✓

Product Launch Packages



Overview **Lessons** Reviews

Chapter 1:

1

Product Presentation

approx 7 min

In this chapter, our technical expert explains how TEGO® Foamex 8420 enhances performance of your inks formulations with a very complete set of data.

[Read less](#)

Chapter 2:

1

Fact sheet

Brief and powerful information about handling and benefits of TEGO® Foamex 8420.

Live Events



Staying Ahead: Mastering Product Compliance in a Rapidly Evolving Regulatory Landscape for Printing Inks

Webinar

Course Content

Sessions

Upcoming Sessions



SEPTEMBER 2026

9

Option 1 of 2

9:00 AM - 10:00 AM (GMT+2)

Location: GoToWebinar

Not Enrolled

Enroll

Starts: September 9, 2026 9:00 AM GMT+2

Ends: September 9, 2026 10:00 AM GMT+2

- New Delhi: 12:30 PM – 01:30 PM IST
- Singapore: 03:00 PM – 04:00 PM SGT
- Berlin: 09:00 AM – 10:00 AM CEST

Presenter:

Gerald Albrecht / Dr. Susanne Ruppel

Regulatory Representative at Coating Additives / Head of Applied Research and Technology Printing Inks



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Free your inks of undesired performance and regulatory limitations!



Questions? Get in Contact with Us!

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Senior Scientist, Printing Inks,
Americas

Coating Additives

Mobile +1 484-862-9451
cristobal.garcia@evonik.com





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