Trends & Technologies

Understanding the role additive selection plays in seizing opportunities driven by industrial wood coatings market trends and technologies

PSCT, April 2020, Mike Toth, End Use Manager-Wood Coatings NA

Presenter

BYK

Industrial Wood Coatings
Agenda

Market Fundamentals

Common Technologies & Application Systems

Trends

How Additives Add a Competitive Advantage

Industrial Wood Coatings
Market Fundamentals

Global Furniture Epicenter
International Furniture Market High Point, NC

 Source: City of High Point, IHFC, NC Dept Cultural Resources

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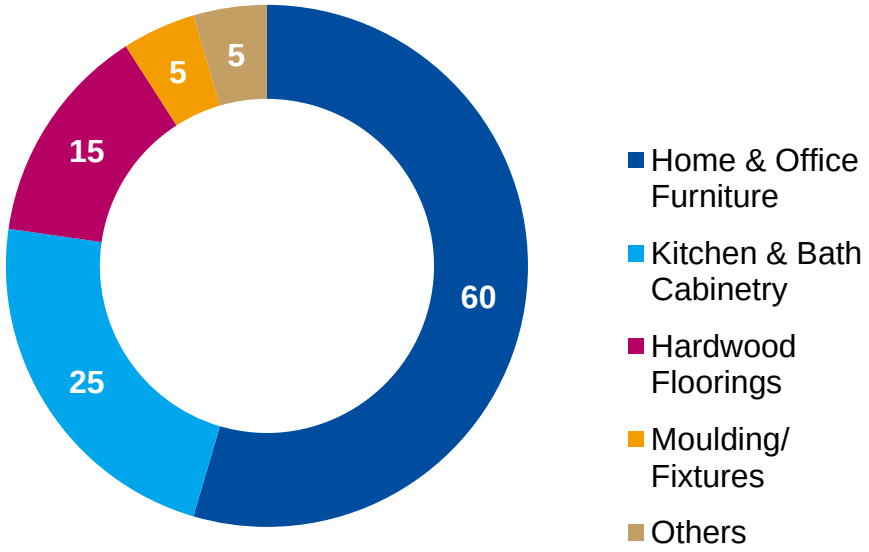
Global Shift 1990’s

VietNam News

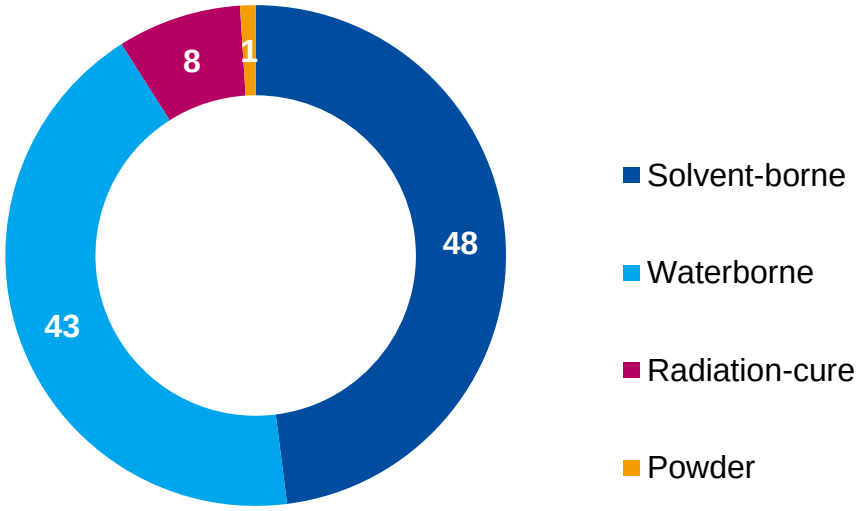
Global Industrial Wood Coatings Estimated Market Size

Estimated 10% contribution to global paint and coatings market, $8 billion USD

Wood Sub Markets [%]



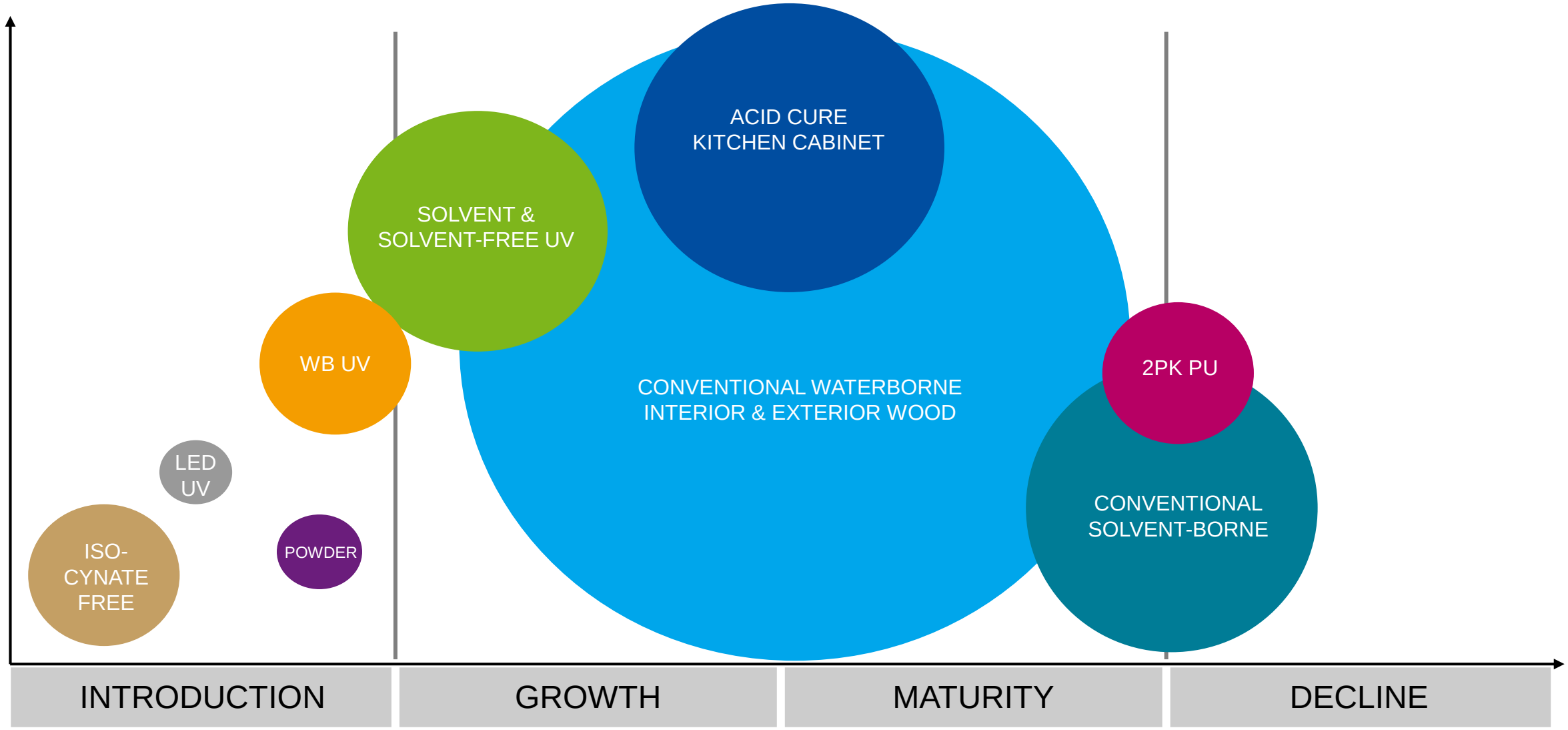
Technology [%]



Source: Allied Market Research, Freedonia, KCMA, FDMC, European Coatings Journal, Melvin Bright, Internal Database

Market Share Data Challenge

Technology Life Cycle in North America



 Source: Mike Toth Market Database

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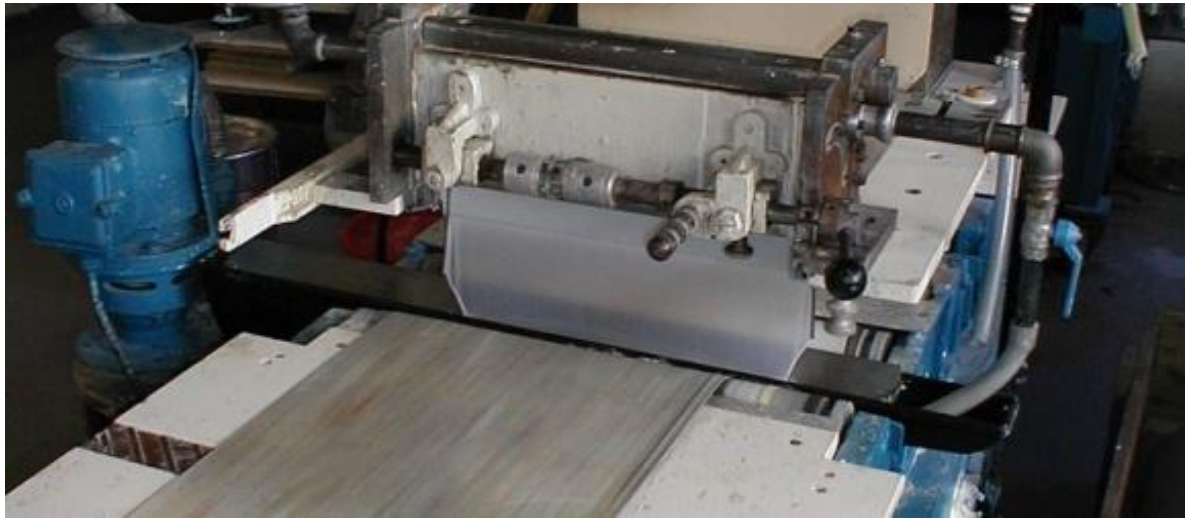
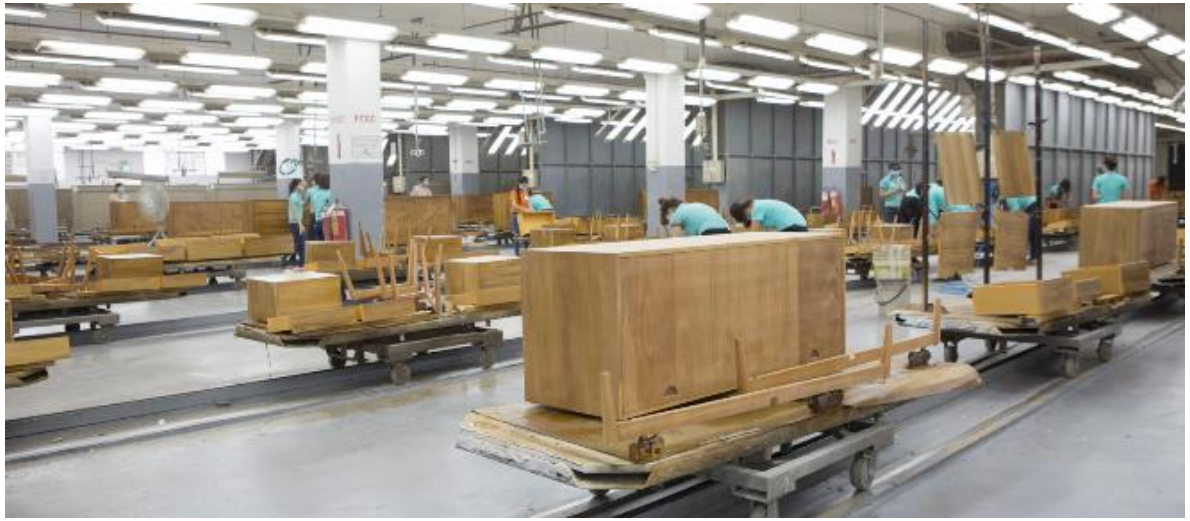
Industrial Wood Coatings
Technologies & Application Systems

Deco vs. Wood Coatings

Modern Painting & Remodeling

Industrial Application





 Source: Google images

Clear Topcoats, Sealers, Stains and Enamel Finishes

 Source: MBS Interiors, Bags in Bulk, Resin Expert, All Things Funeral

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A Few Top Wood Coatings Customers

La-Z-Boy Furniture Galleries®

Herman Miller

Shaw Floors

JELD-WEN Windows & Doors

Vaughan-Bassett furniture company

American Woodmark Corporation

Andersen AW Corporation

IKEA

Kimball

Batesville

Ashley Furniture Industries, Inc.

MasterBrand Cabinets, Inc.

Pottery Barn

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Common Substrates

Source: Cabinet Doors and More, Amazon, Home Depot, Indiamart

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Common Coating Technologies (Durability & Performance)

Nitrocellulose Lacquers $

Wipe, No-Wipe Spray Stains $$

Pigmented Enamels, Waterborne Primers & Topcoats $$

Pre-catalyzed Lacquers $$

Acid Catalyzed Conversion Varnish $$$

2-Pack Polyurethane $$$$

100% Solvent-borne & Waterborne UV $$$$$

Industrial Wood Coatings
Trend Evolution

Serious Threat to Wood Industry

#1 Labor

- Finding and retaining qualified help
- Drive demand for automation?
- Labor from Correctional institutions

Finishing Automation

 Source: IWF, Youtube

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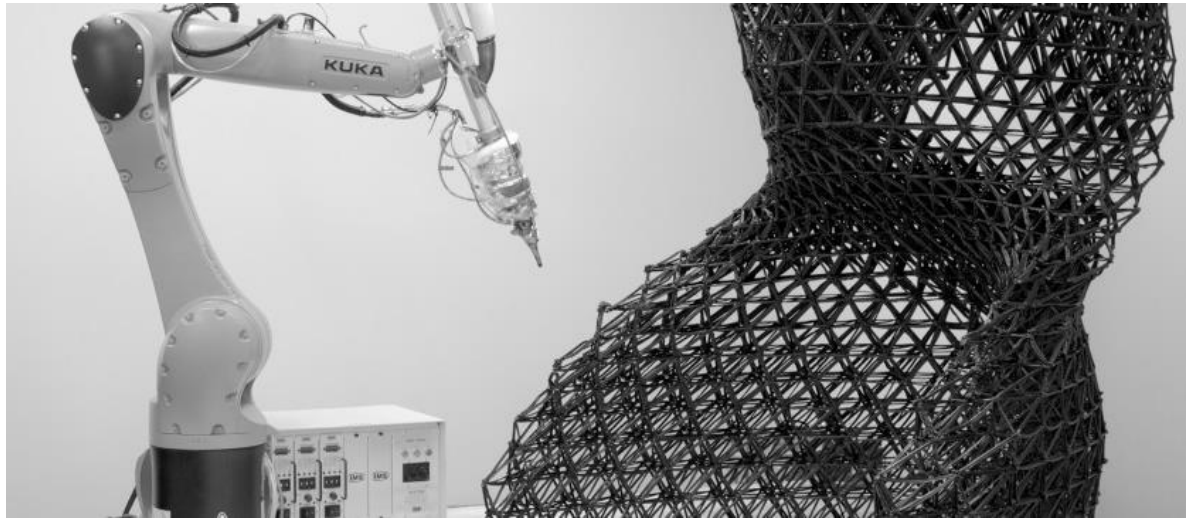
3D Printing Wood Plastic Composite (WPC)



Source: IWF; Webb analytics, Michigan Technology University

Advancements in 3D Printing - Wood Plastic Composite (WPC) Boat

Worlds Largest 3D Printed Boat

- 50% Wood fiber
- Made in 72 hours
- 25 ft. long
- 5,000 lbs.

https://www.youtube.com/watch?v=34F71XqvOjg

Time-lapse video

Source: Woodworking Network, University of Maine

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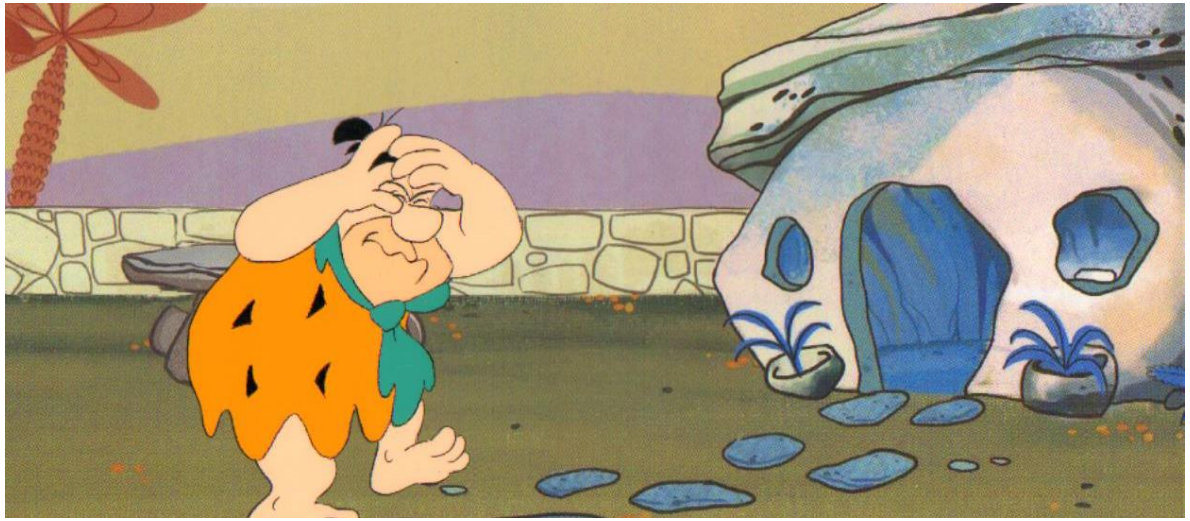
3D Printed Residential Homes – Unlimited Design Ideas



Source: Business Insider, Engadget, Gigazine, Google image s

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Construction Evolution – 8 Hour Framing Assembly
Hour 6

Entekra, Katerra

Cross Laminated Timber (Pac NW & Europe)

KATERRA

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Color


Color of
the Year
2019
PANTONE®
Living Coral
16-1546


Color of
the Year
2017
PANTONE®
Greenery
15-0343


Color of
the Year
2020
PANTONE®
Classic Blue
19-4052


Color of
the Year
2018
PANTONE®
Ultra Violet
18-3838

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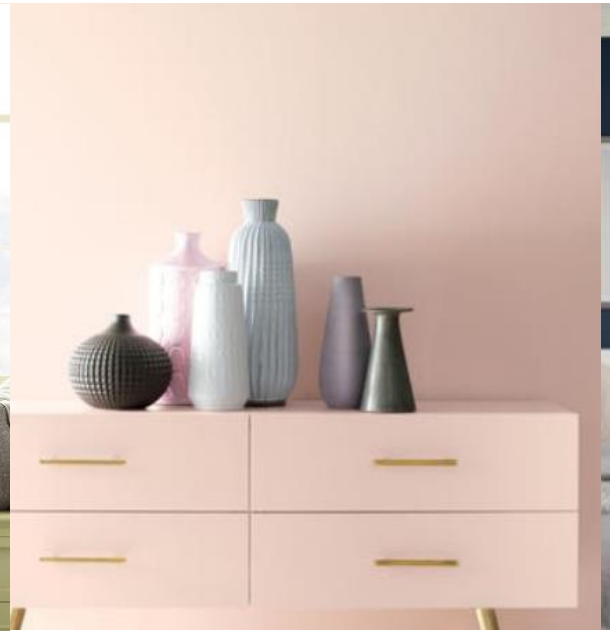
A Look at the Trends – 2020 Color of the Year

Fashion and fabrics trending to blue

Behr	Benjamin Moore	Sherwin Williams	PPG
			
Back to Nature	First Light	Naval SW	Chinese Porcelain

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A Look at the Trends – 2020 Return to Wood Colors

Source: AHFA, KCMA, Medallion Cabinetry, High Point Market Fall

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Heart of the Home
Enamel Finishes Approx. 65% of Portfolios.

 Source: Google Images

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A Look at the Trends – 2020 Go Bold or Go Home

Source: H&G Jennifer Ebert Feb 2020; Heather Jones Furniture trends 2020; NARI National Assoc. Remodeling

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Kitchen Cabinets
Floor to ceiling

Google images

Kitchen Cabinets
Open shelving

Picture credits

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Kitchen Cabinets
Open pantry and storage optimization

Picture credits

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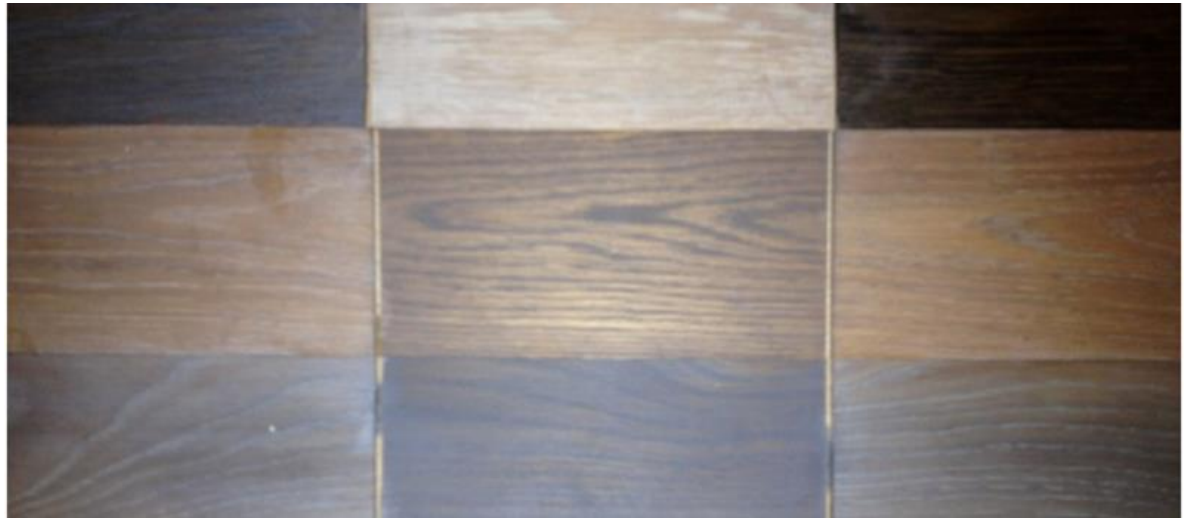
Outdoor Kitchens & Living Spaces

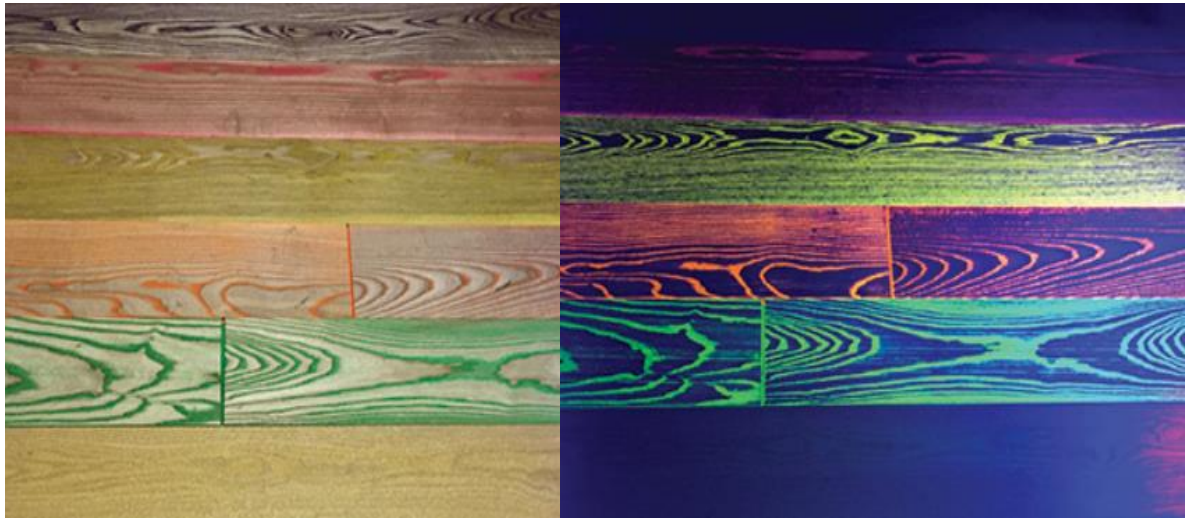
Toll Brothers

Furniture Trends

 TiSource: Expand Furnuture; Pinterest; Buzznick.com:

Trends





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Hempwood®

LVT/LVP Flooring (UV Topcoat)
Non-Wood Substrate **-** Ultimate in Waterproofness

 TitSource: Armstrong Flooring, Flooring America

LVT to Hardwood?
AQUADORA™ Real hardwood veneers with SPC core

 Source: Flooring America"

Industrial Wood Coatings

How Additives Add a Competitive Advantage

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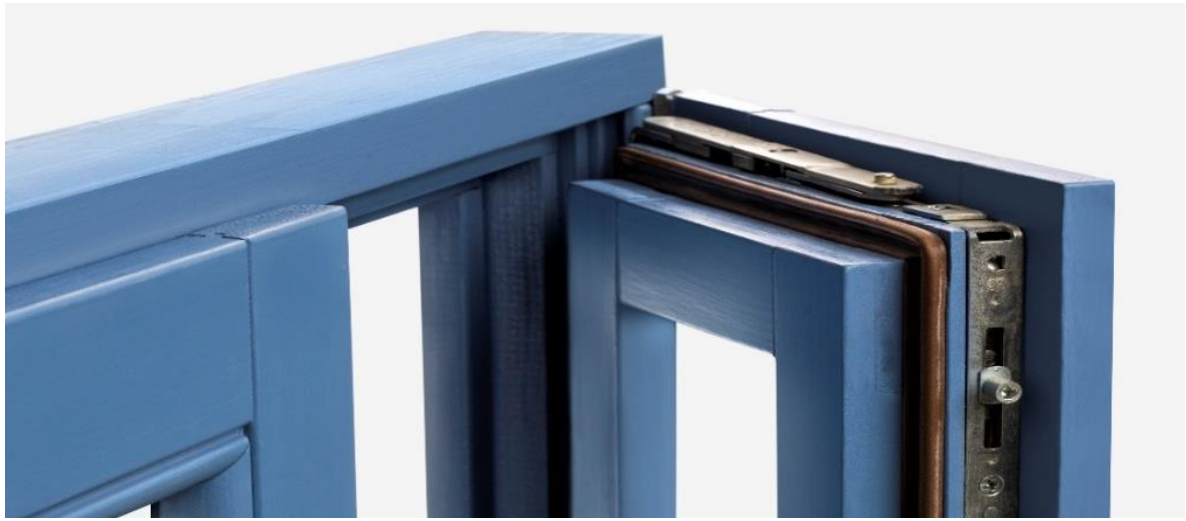
Customers Want…



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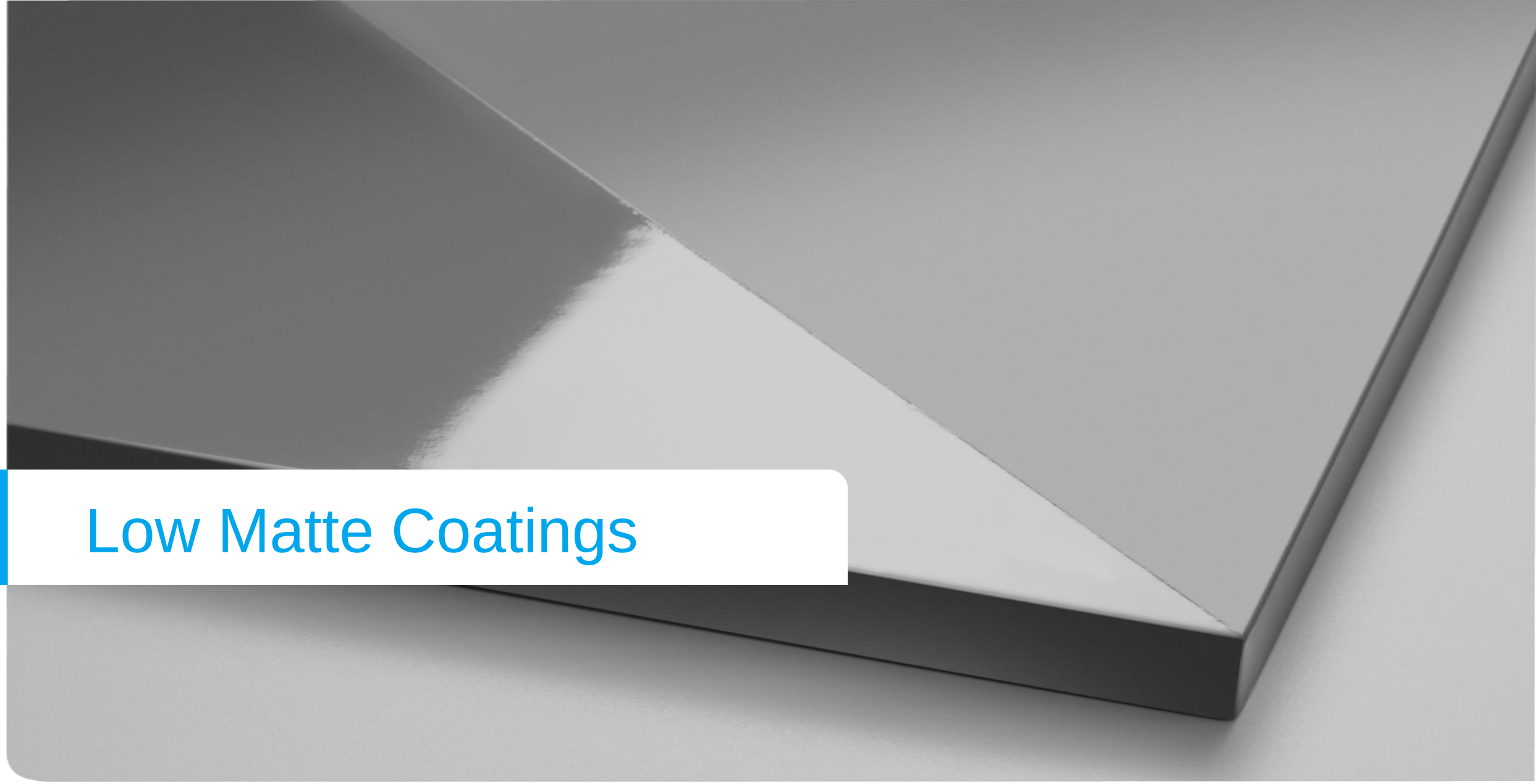
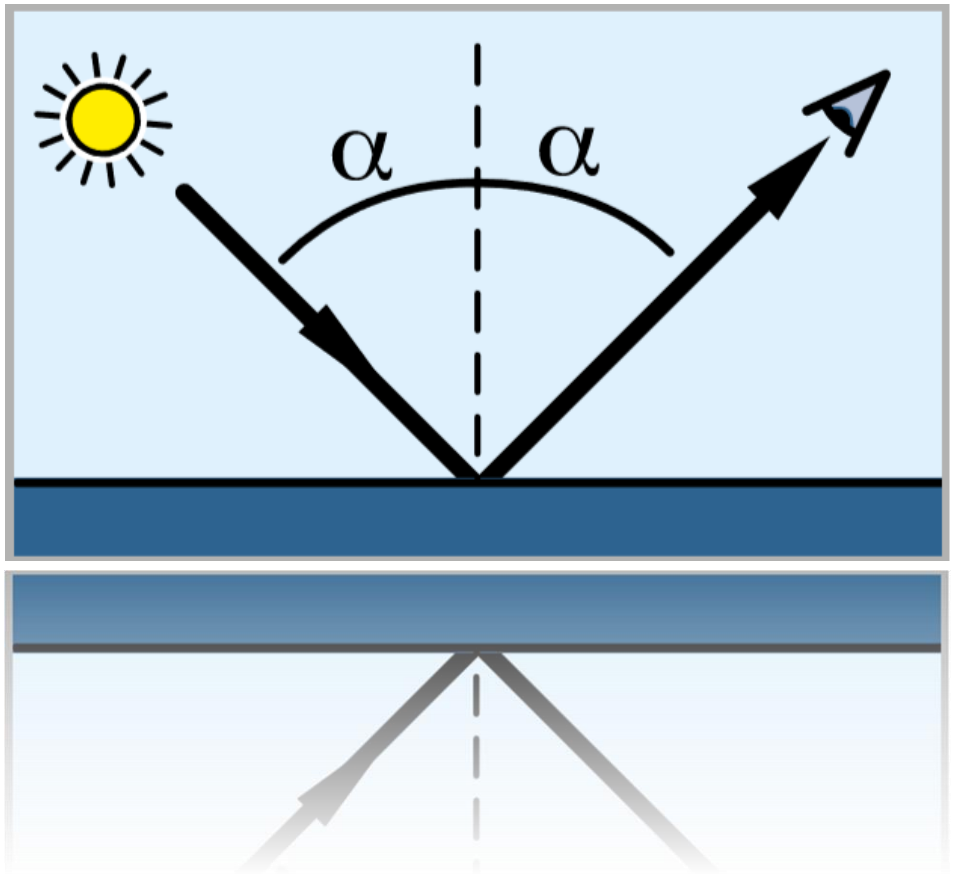


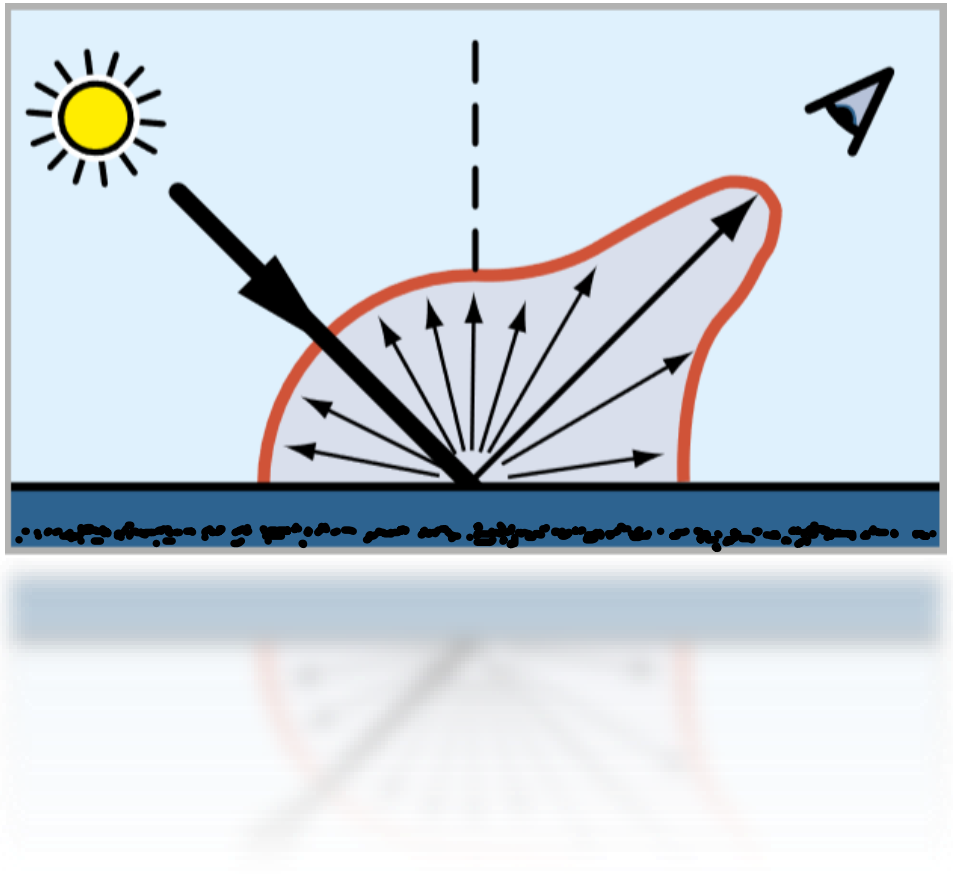
Low Matte Coatings

Matting Fundamentals Reflection of Light

Specular reflection. High Gloss surface

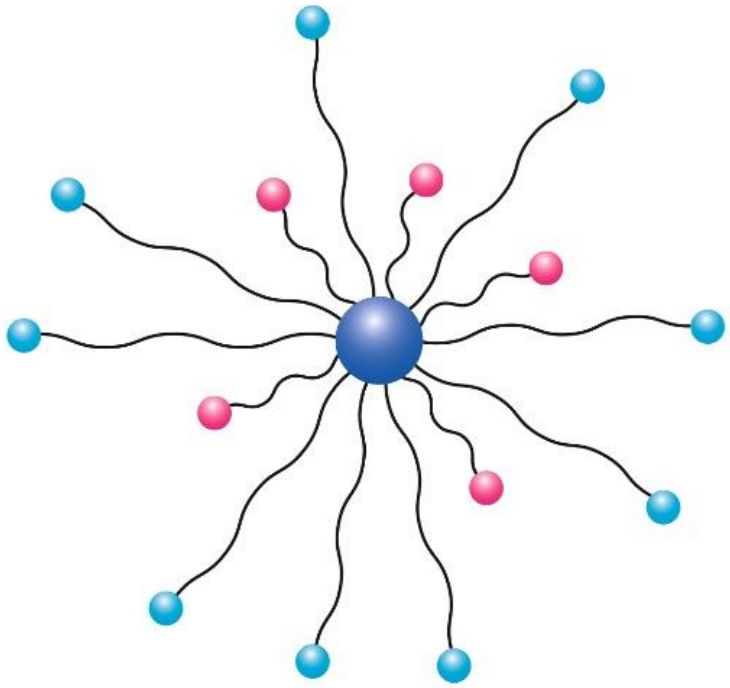


Diffuse reflection. Flat surface



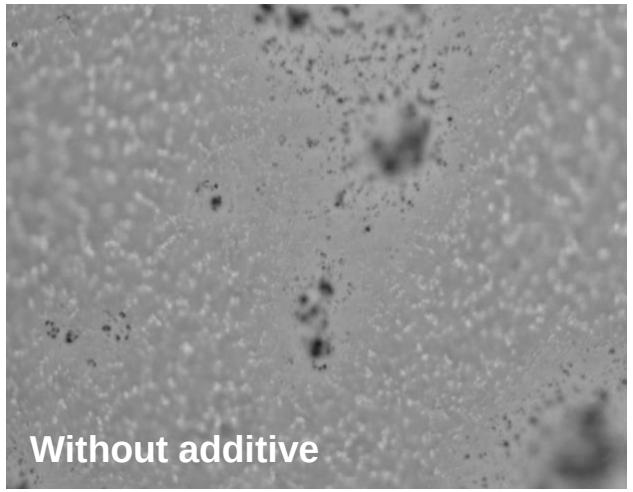
Commercial Dispersant D1 – Solventborne & Solvent-free UV

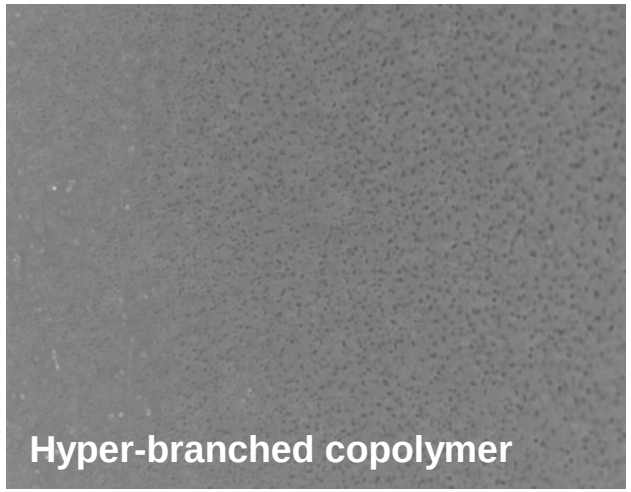
Hyper-branched co-polymer based on a hyper-branched core shell structure

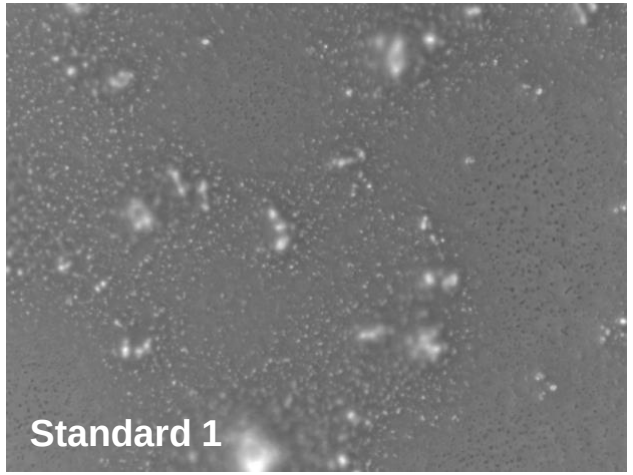


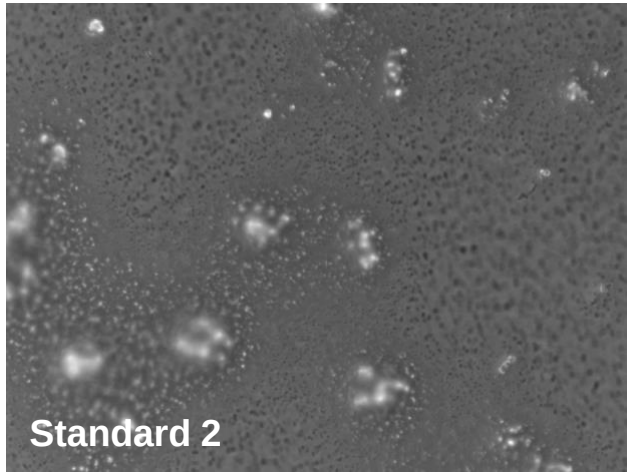
- Hyper-branched core provides excellent interaction with matting agent surface
- Additional functional groups attached to the core improve affinity to silica particles
- Functional groups at the shell lead to improved anti-settling properties

Hyperbranched Copolymers – Stabilizing & Orientation of Silica









Test system:
Solvent-free UV-curing system based on un-saturated polyester acrylate

Raw Material	[%]
UV Resin	38.7
DPGDA	39.55
Photoiniator	5.5
Hyperbranch Copolymer	1.25
Untreated Silica	15
	100

Additive dosage:
8.5% solids on matting agent

Microscopic images:
Light optical microscope 100x magnification

Improved Matting and Clarity in a Solvent-borne Coating

10% active on silica. (<5° gloss)
D1 hyper-branch copolymer provides high matting efficiency without imparting haze or reducing clarity

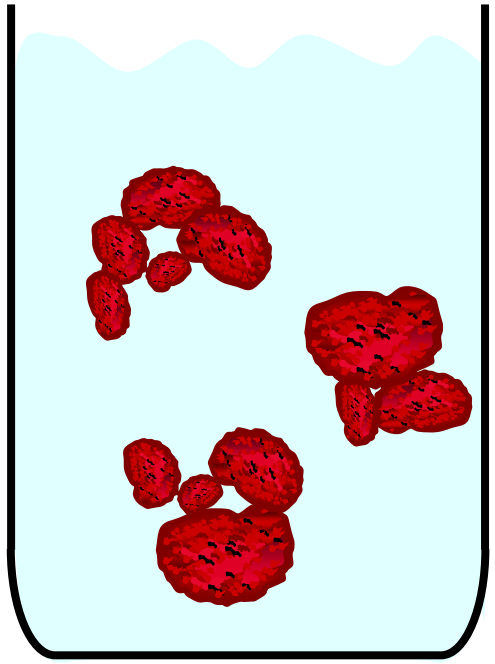
Improving Color + Matting Efficiency

Wetting & Dispersing Process
1. Pigment Wetting

Pigment wetting

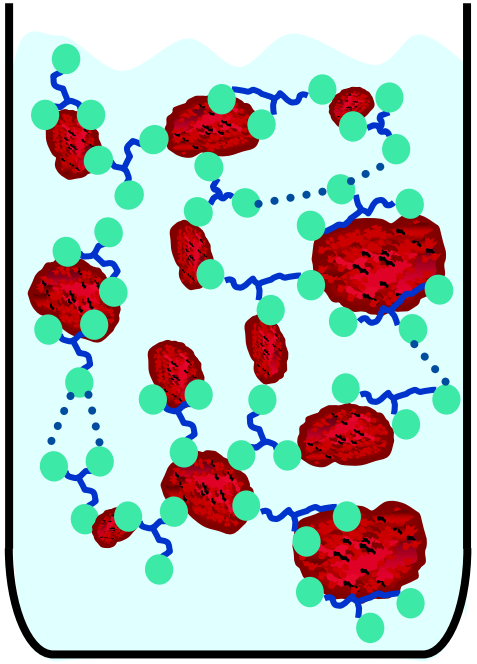
Wetting & Dispersing Additives
Controlled Flocculation vs. Deflocculation

Flocculation



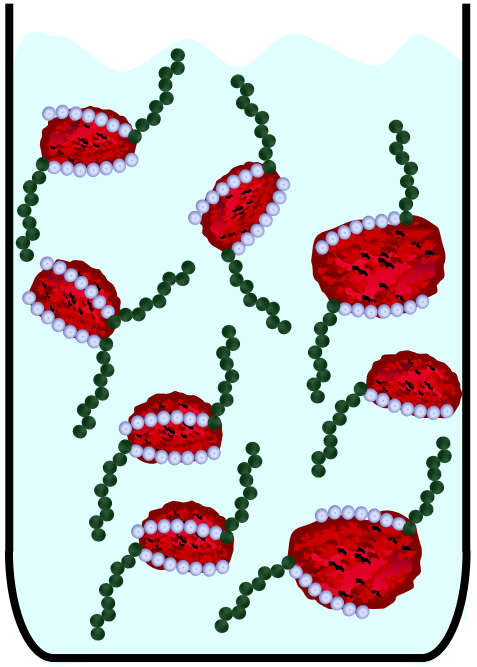
Particles not separated

Controlled flocculation



Particles separated
Additive molecules form network

Deflocculation



Particles separated
No network formation

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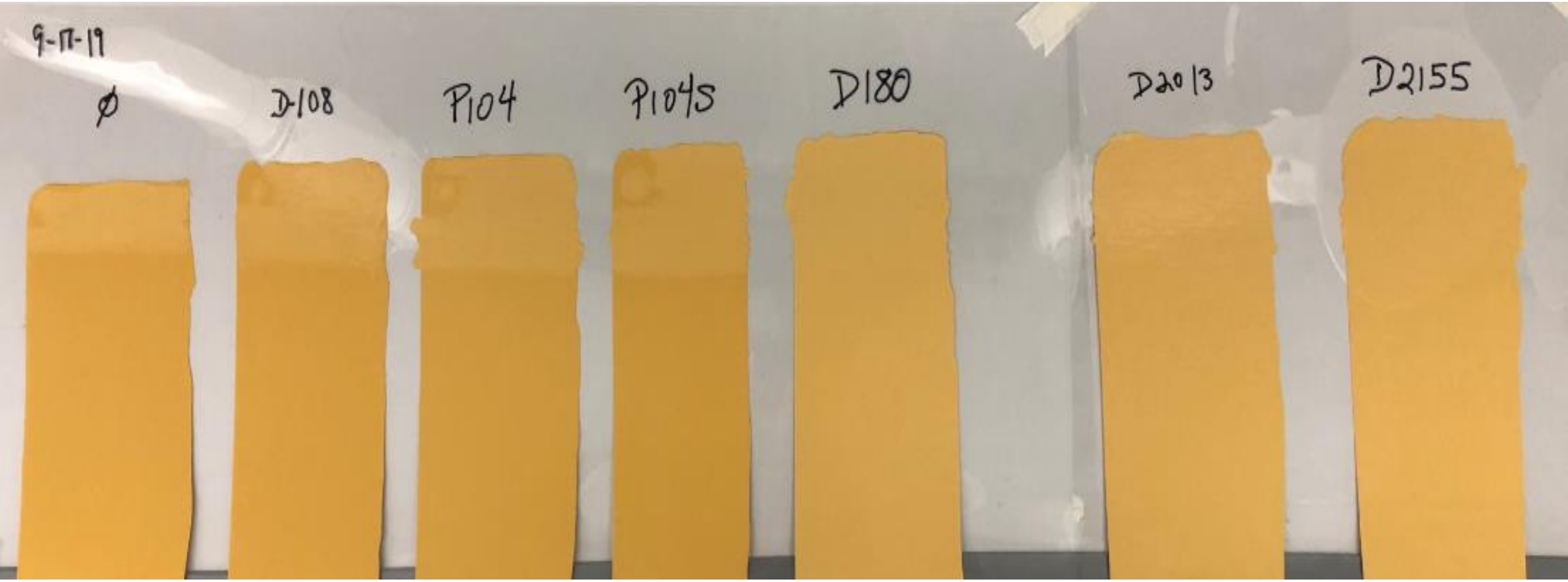
Remember these?

Wetting & Dispersing Additives

Eliminate Flooding & Floating in a Solvent-borne 2 Pack



ΔE 5.28 to ΔE 0.35

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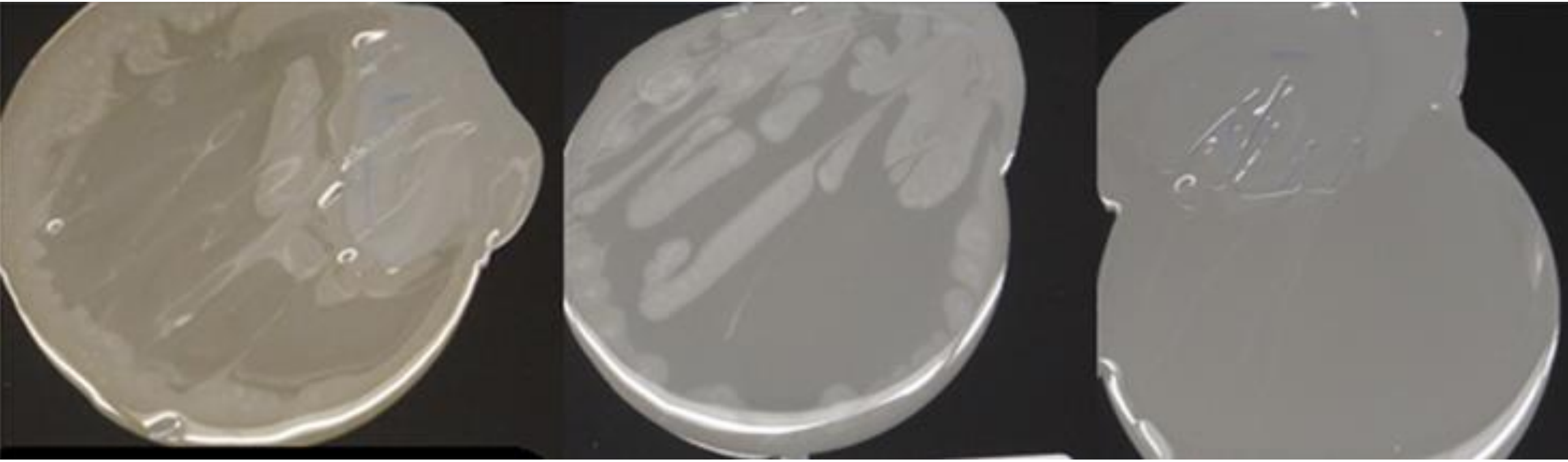
Wetting & Dispersing Additives

Carbon Black/Red/Yellow- Color Acceptance in Acid Cat Enamel



Dispersant and rheology combination helped yellow, red & black color acceptance and rheology additive helped by increasing the low shear viscosity eliminating remaining pigment float

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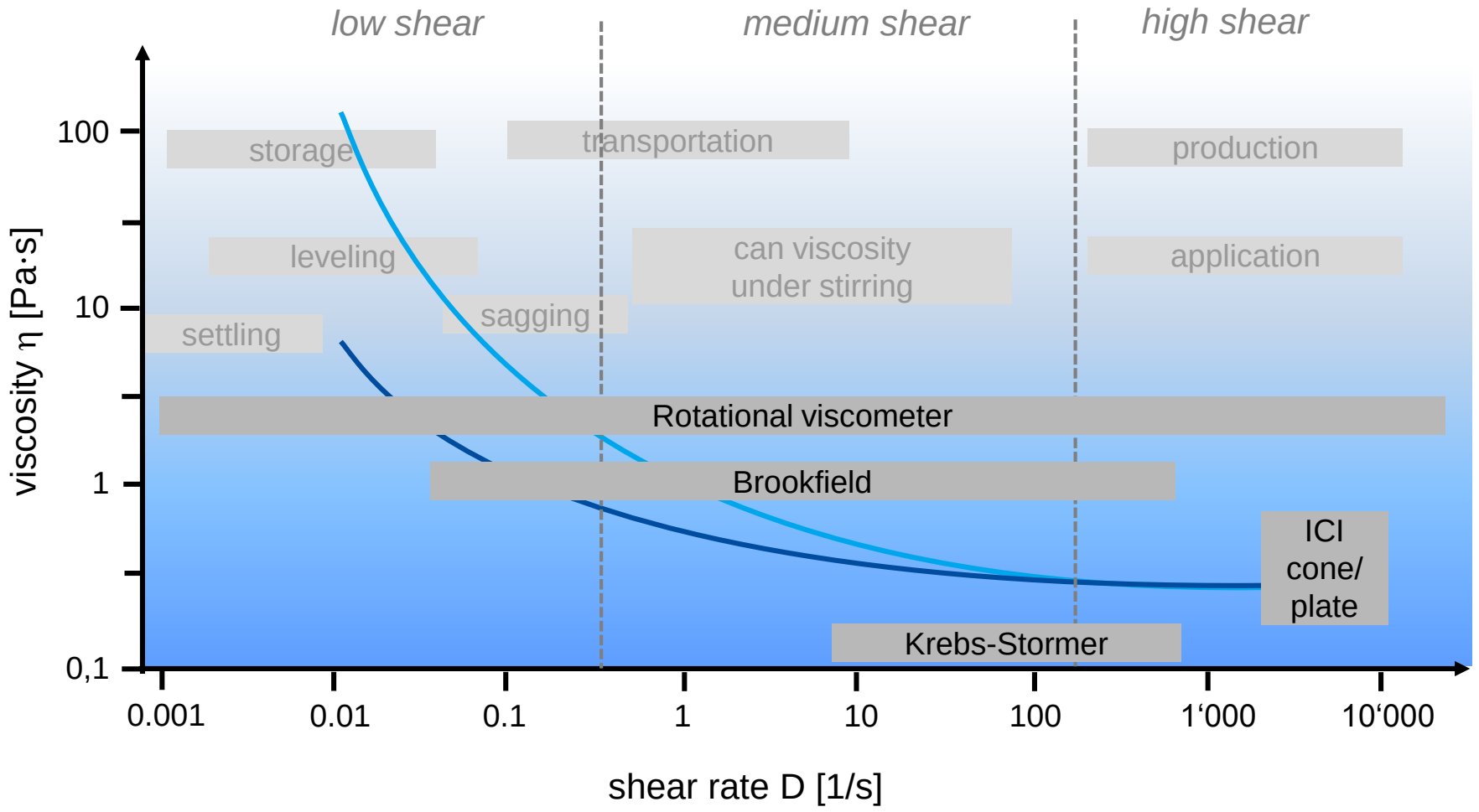
Rheology Benefits

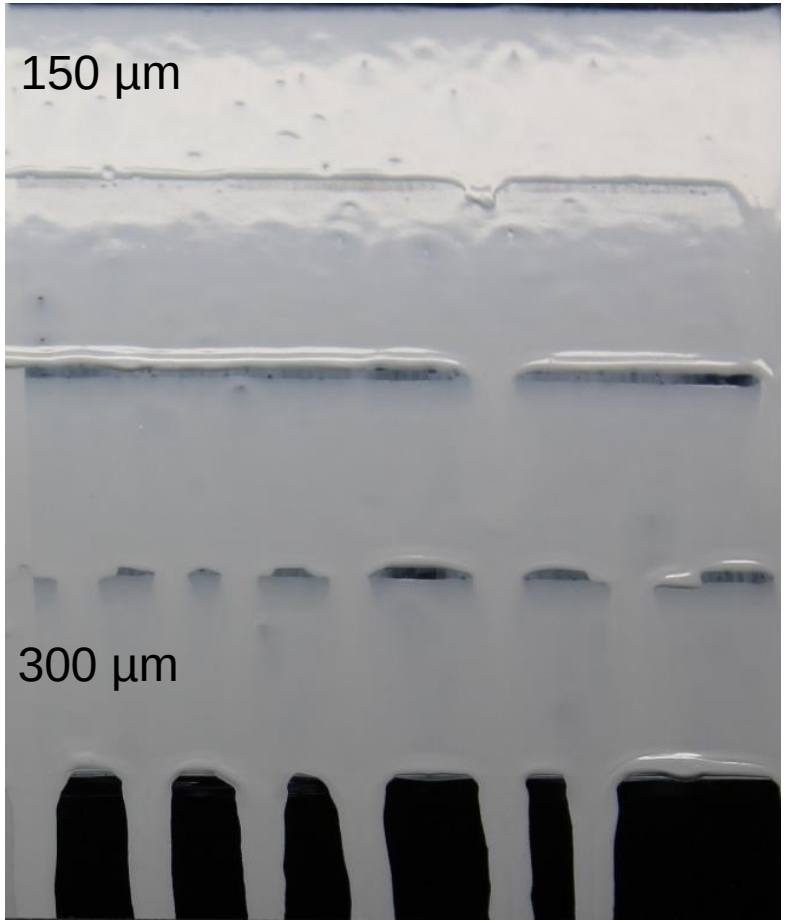
Anti-Syneresis in High Gloss Acrylic Emulsion Lacquer

1. Control
2. R1 1% delivered
3. R1 0.8% delivered + R2 0.2% delivered

Viscometry
Equipment Selection



Waterborne Rheology for Pigmented Furniture Coating (Synthetic Clay)



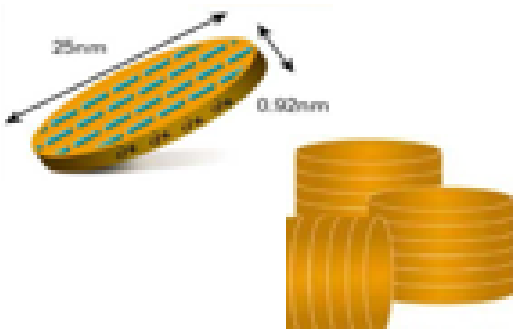
0.4% R1 Associative Thickener

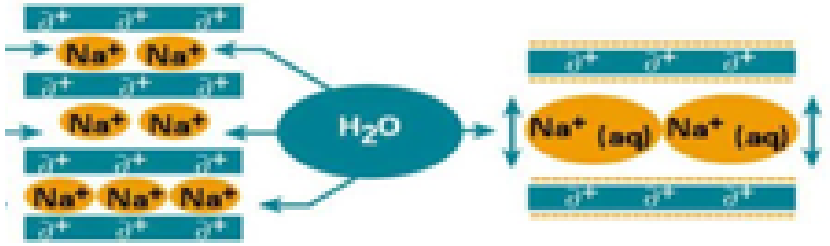
0.5% R1 dosage increase

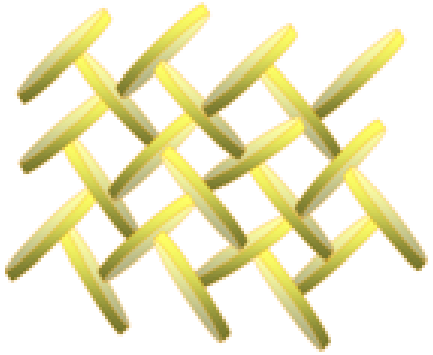
0.3% R1 reduced dosage + 0.2% Synthetic Clay

Synthetic Clays – Working Mechanism

Gel grades



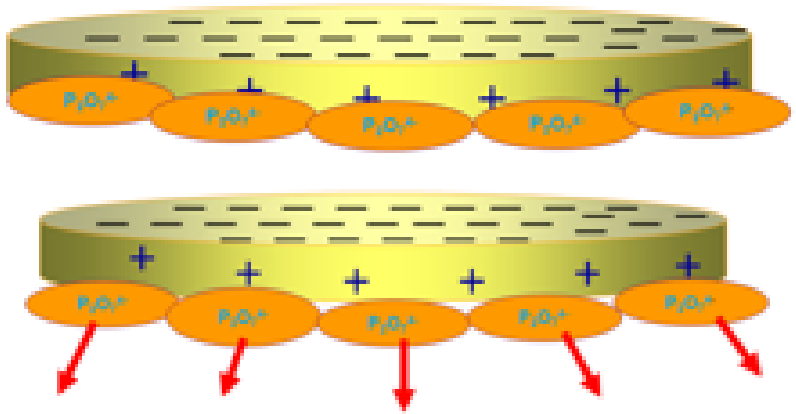


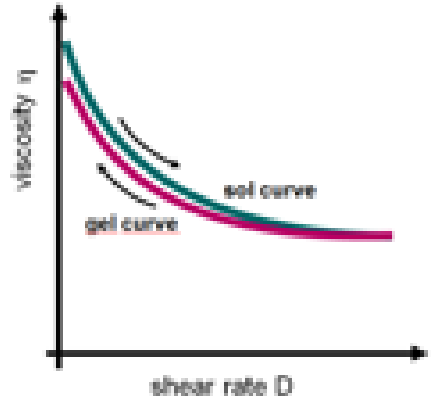


Incorporate into water → **Swelling-delamination** → **“House of Cards”**

Sol grades

Primarily pseudoplastic, Sol grades become active by phosphate anions adsorption into the formulation’s matrix,





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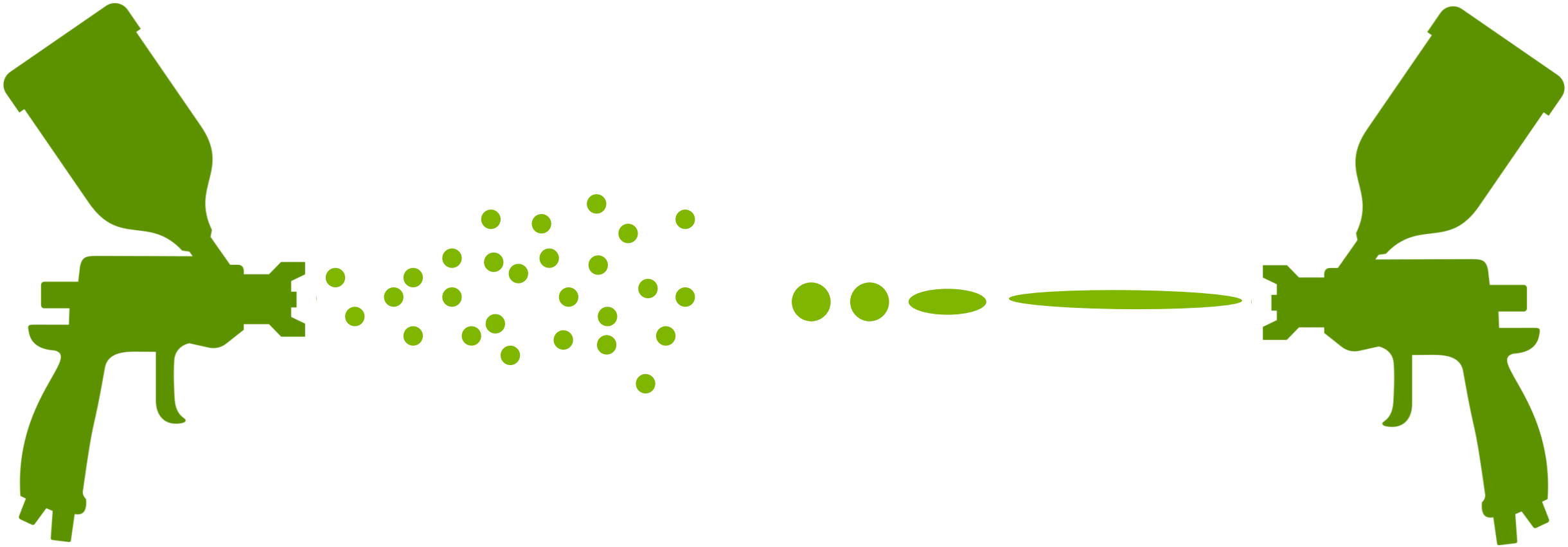
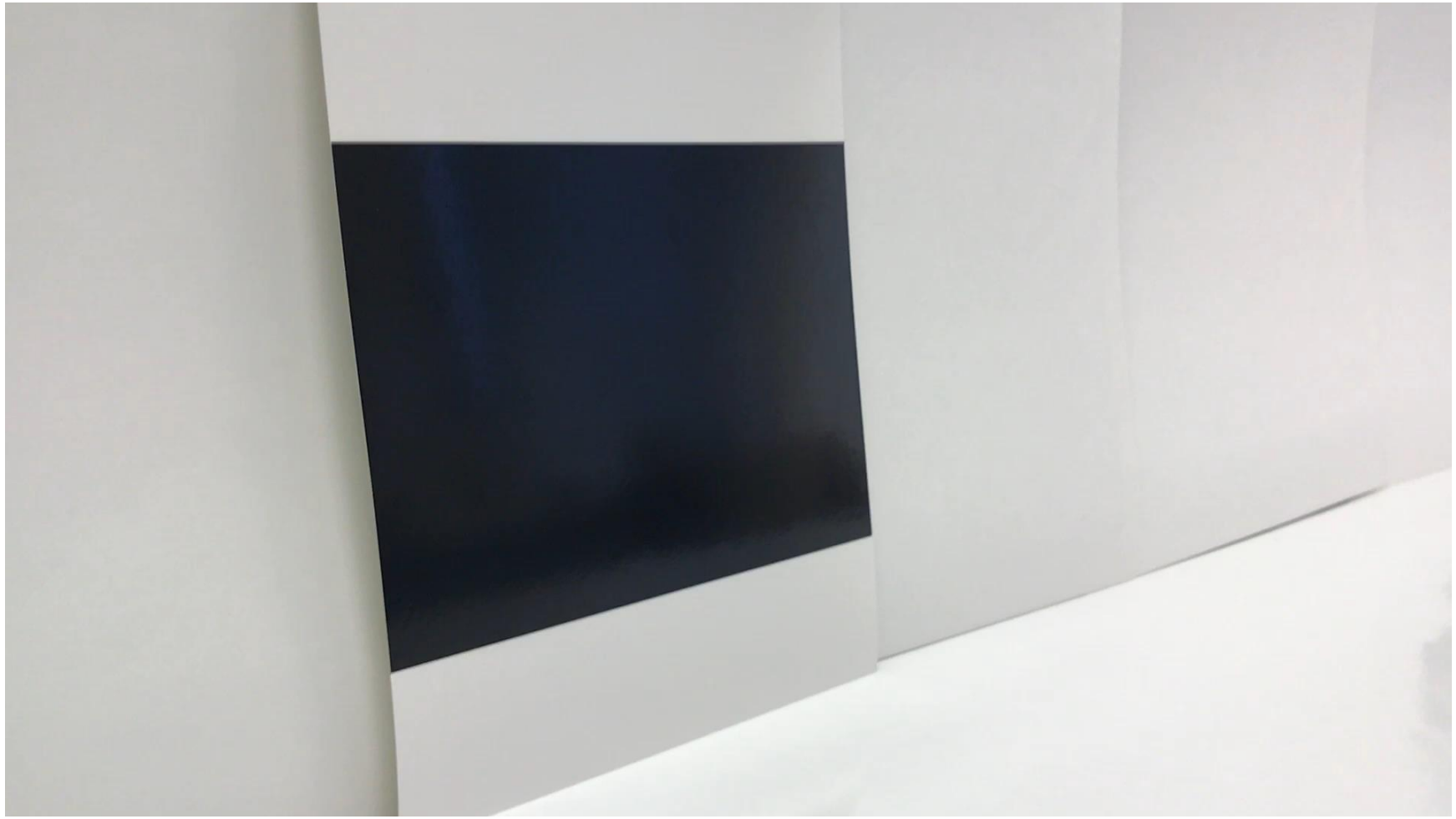
Synthetic Clay Droplet Formation

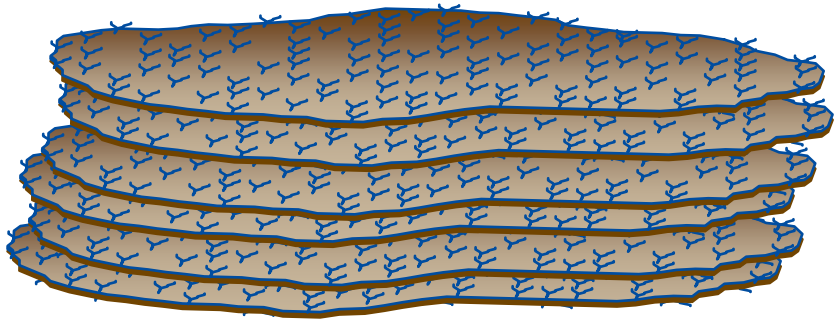


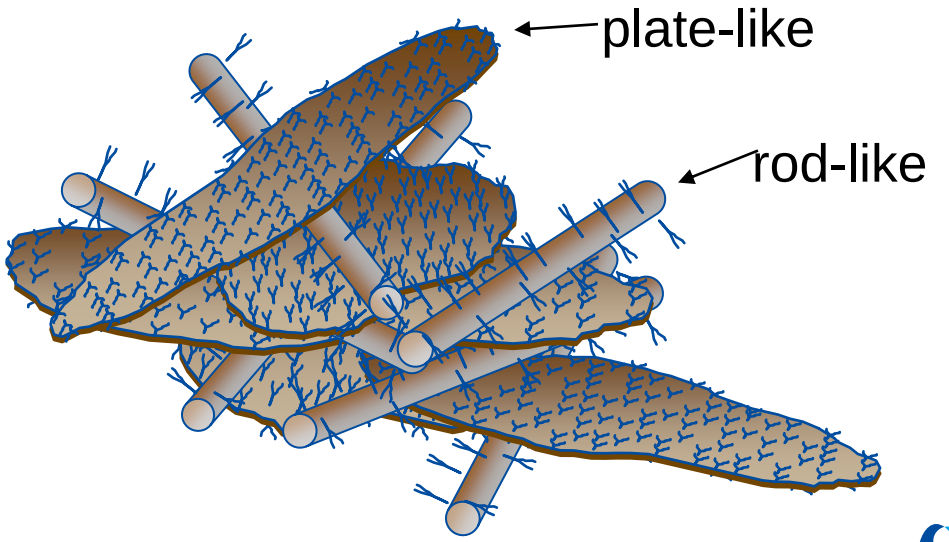
Synthetic Clay-Waterborne Rheology



MMT Advantages – For Solvent & Solvent-free

Conventional Organoclay: montmorillonite	MMT Additives: mixed minerals
Stacked platelets	Loosely packed
Tightly packed	Easy to disperse
Difficult to disperse	





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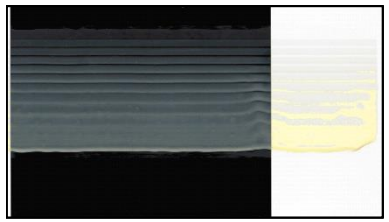
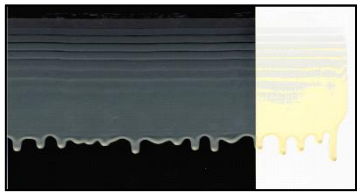
MMT Advantages vs. Pyrogenic Fumed Silica

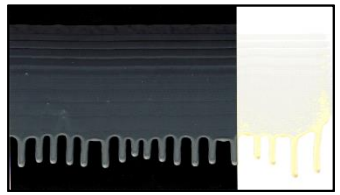
sag resistance & shear thinning viscosity



0.3 % MMT

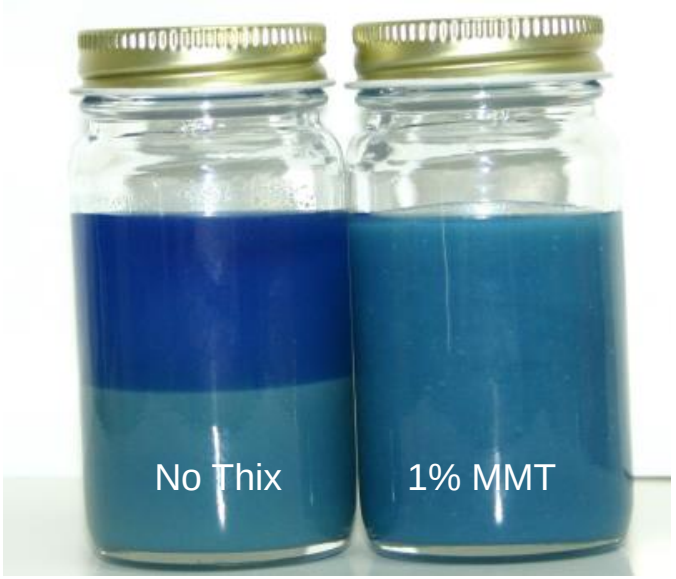


0.5 % Fumed Silica



0.5 % Conv O-clay

Syneresis control



UPR – ortho resin formulation – 45% calcium sulfate @ 3 days

Anti-Sag and Flow Properties

Filler / pigment suspension

Storage Stability

MMT Bulk Density & Less Dusting

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Complimentary Wax Additives

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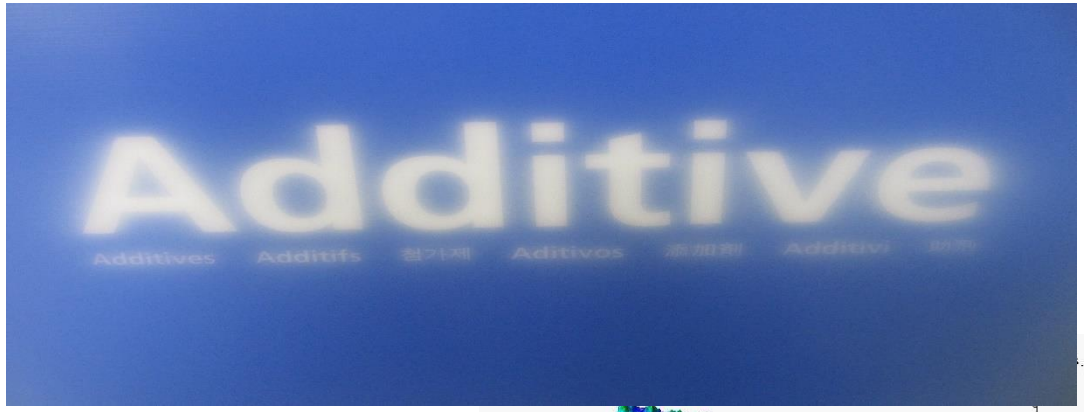
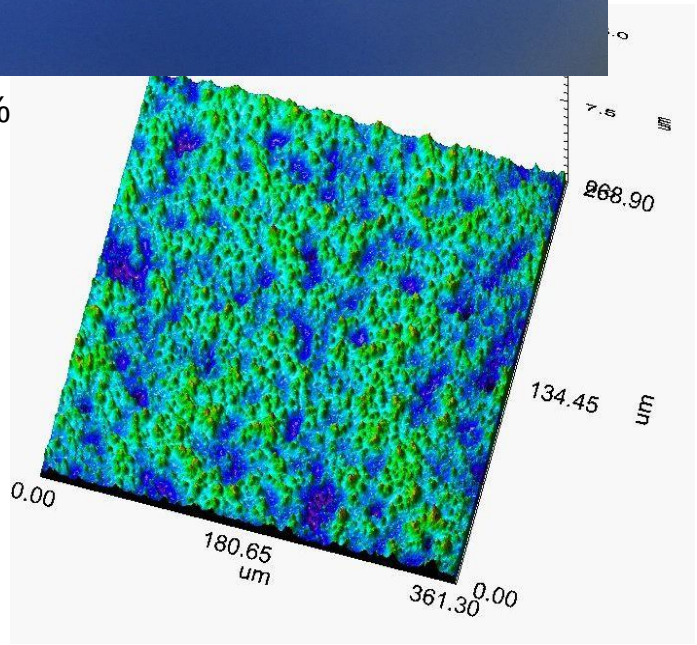
Micronized Polymers – Exceptional Clarity with Matting & Soft Feel



Silica Matting Agent at 10%

Silica Matting Agent
rough



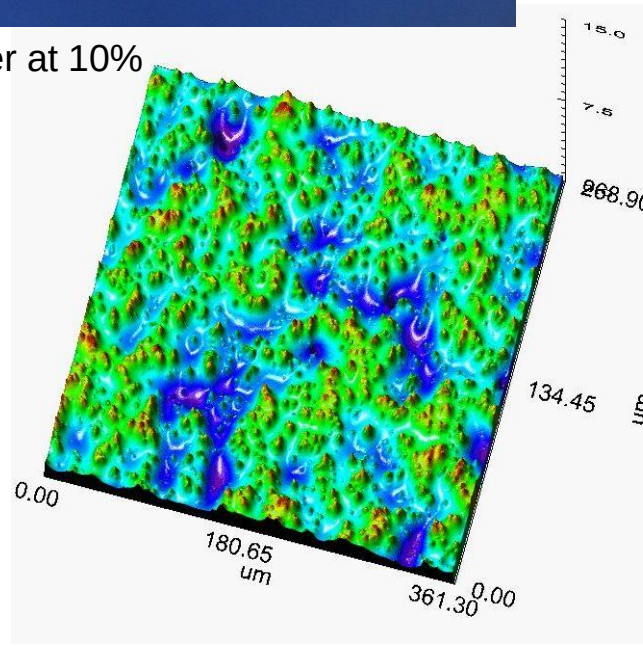
Micronized biorenewable polymer at 10%

Micronized Wax
soft, smooth

Excellent Particle Distribution
Microscope Magnification 500x

Highest Clarity

Smoothest Touch
Microscope Spy Topo 3D



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No Foam Stabilization – 1 minute on Shaker

Control	10% Micronized Wax A	10% silica matting agent	10% liquid matting agent

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Micronized Wax Additive Based on Bio-polymer

Gloss reduction at high transparency

Haptic, smooth, wax-like, soft touch

Improved film properties

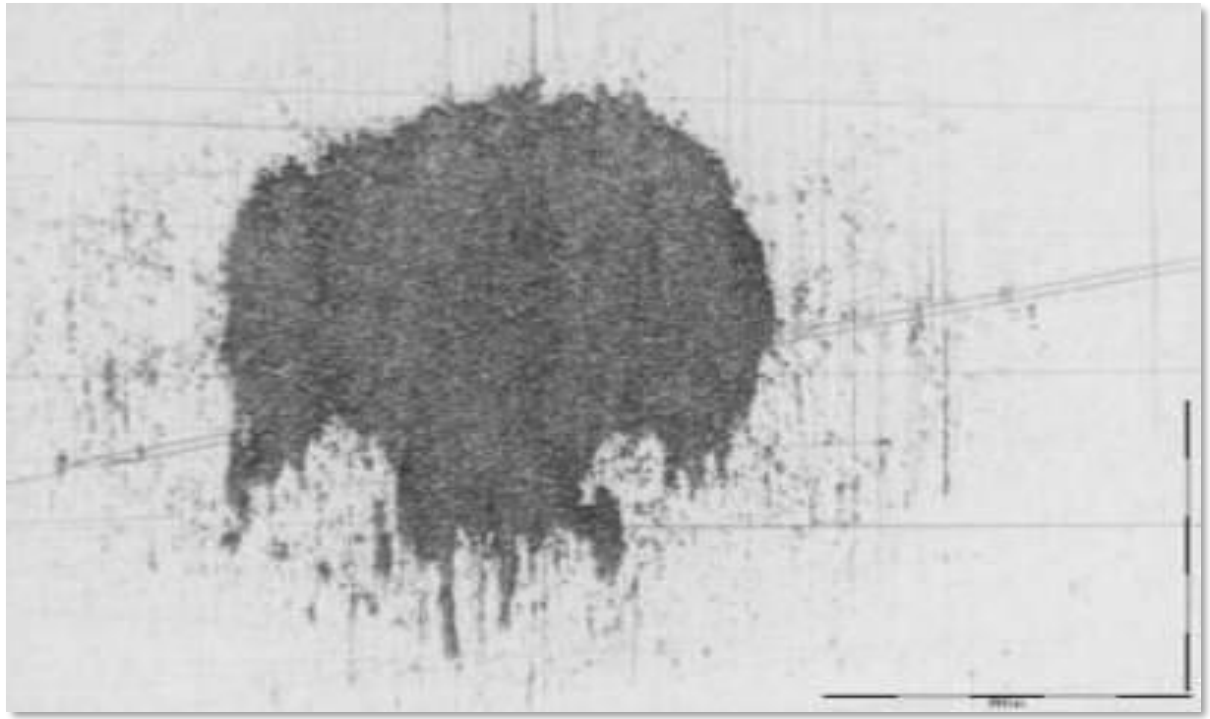
Easy to incorporate

No influence on viscosity

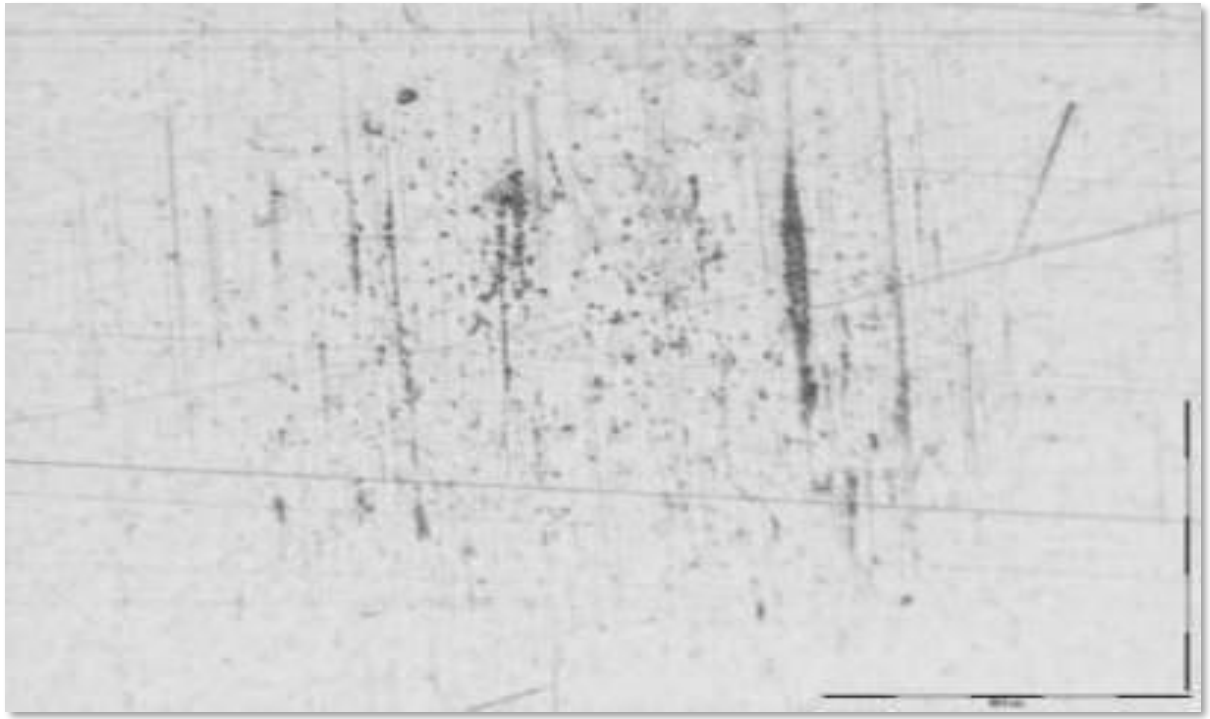
No foam stability

Radiation Curing	Aqueous	Solvent-free	Solvent-borne
✓	✓	✓	✓

Improved Scratch & Abrasion Resistance Solvent-borne Coating



2% silica



1% silica + 1% Micronized Wax

WAZAU RCA rub tester: pressure 3.5 N at 300 cm paper

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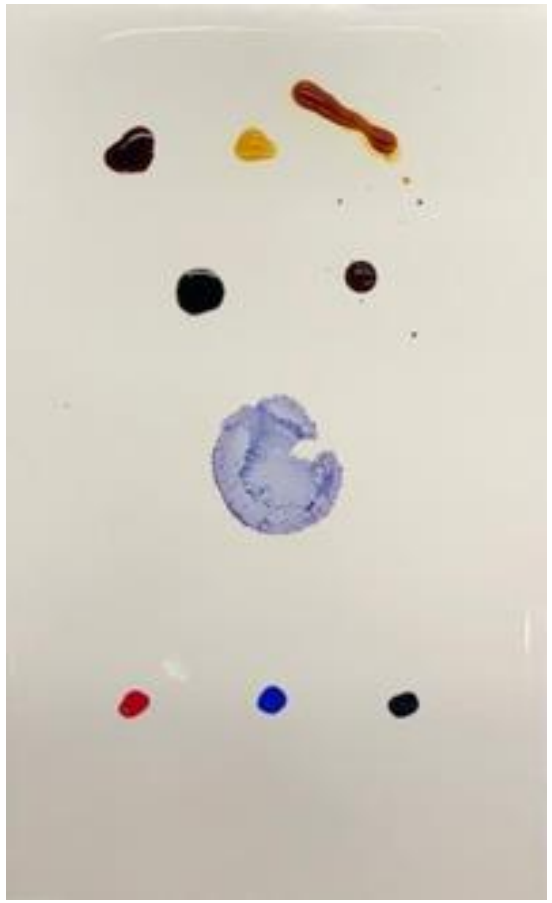
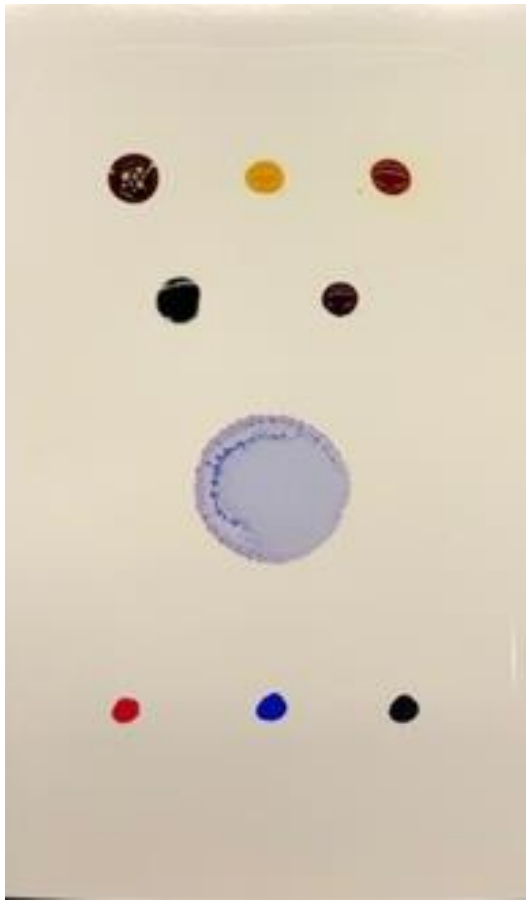
Stain Resistance – Micronized Wax for 100% UV Coatings

Reagents: Iodine, mustard, Lugols, black dye, red food color, Wrights, red marker, blue marker & black marker



100% UV Control Stain Map

100% UV Control 2 hour IPA Wipe



Micronized Wax Stain Map

Micronized Wax Wipe 2 hour

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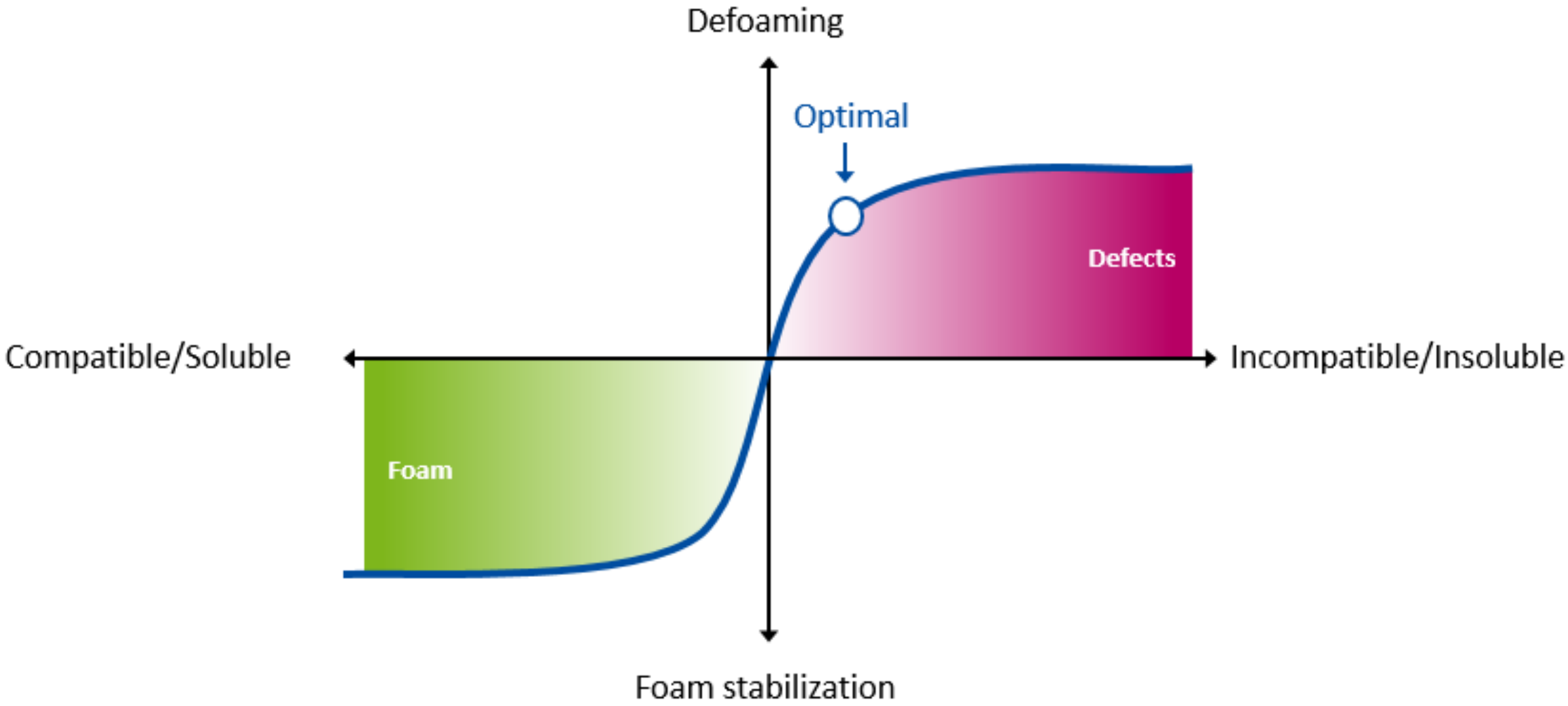
Defoamers & Surface Additives

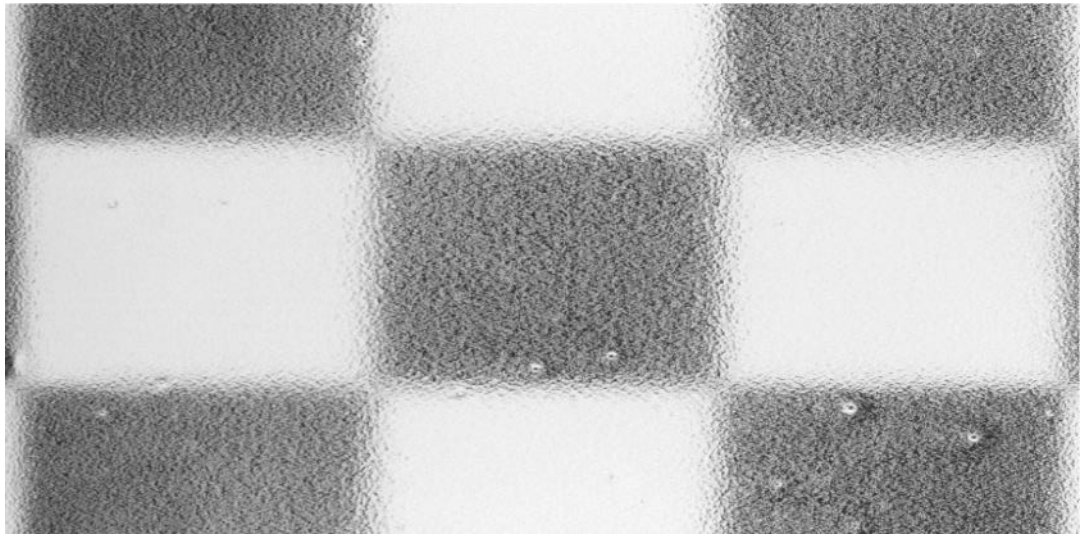
Defoaming - Requirement



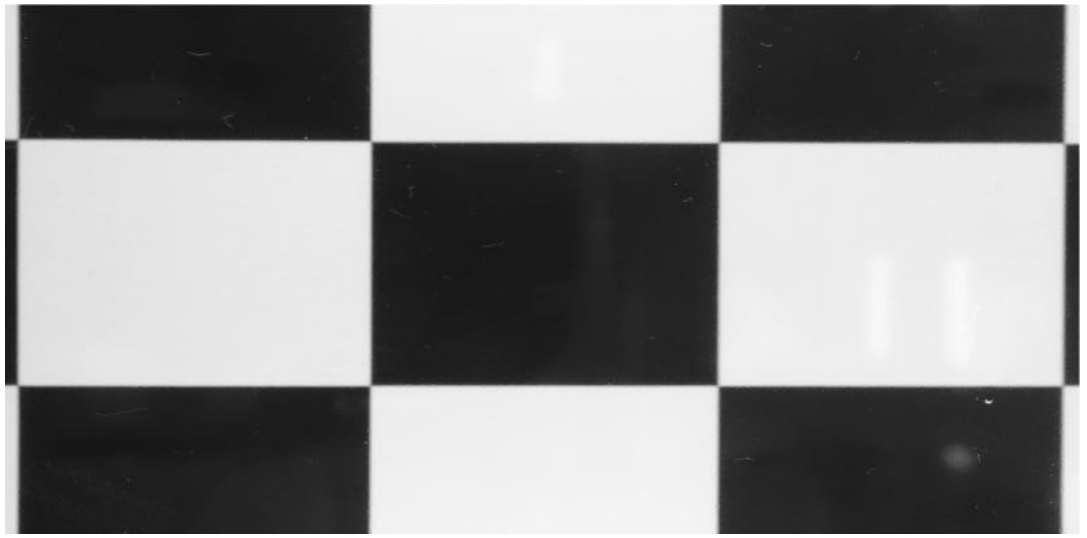
1 Defoamer in 3 Solvents (Polarity)

Foam Test

Hot Item- Waterborne Production Foam



Control



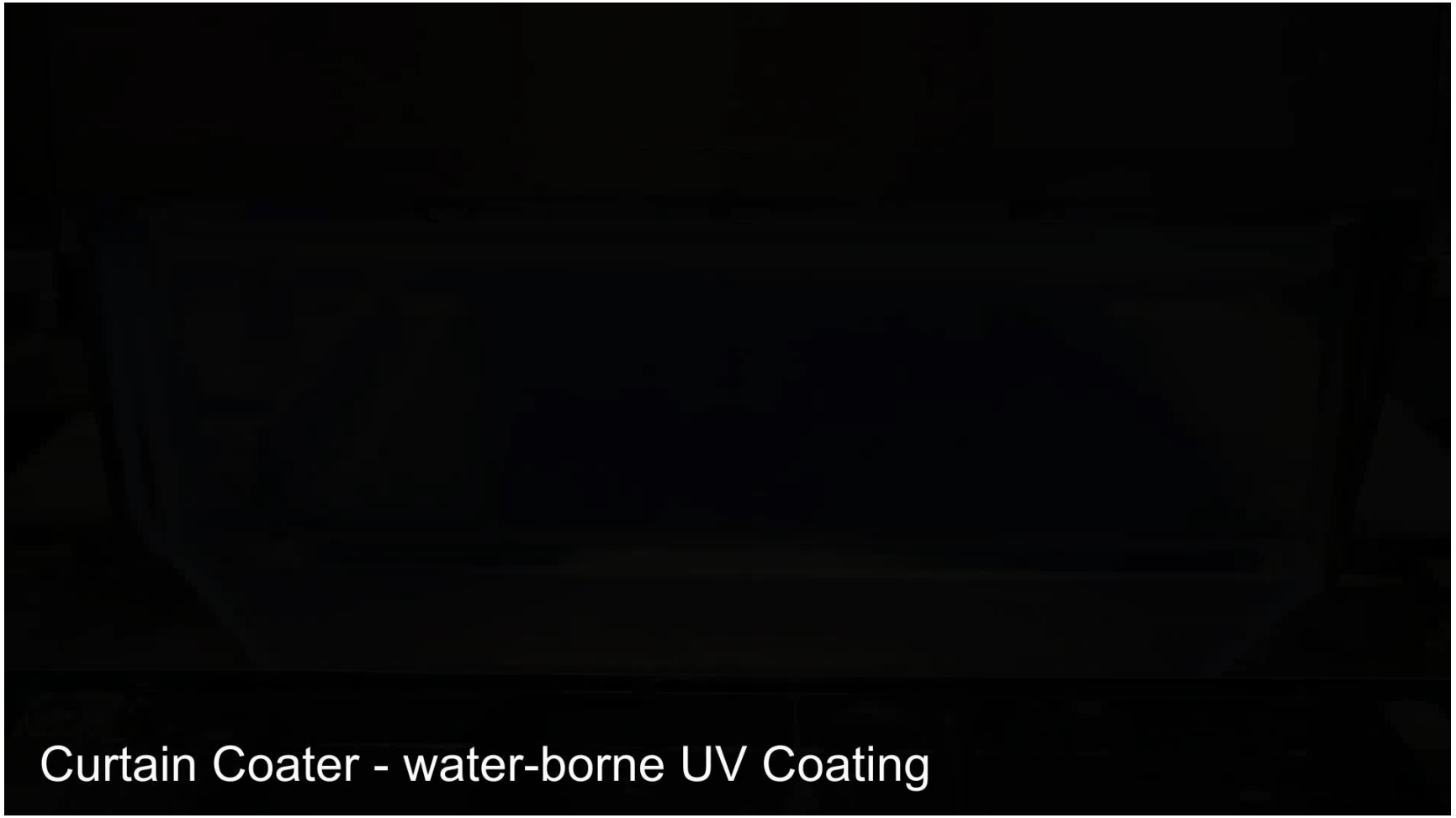
0.3% D1

Waterborne Production Foam, from manufacturing process

(micro & macro foam) issues

Replicated again during spray applications, must be controlled

Problem Solving– Foam Waterborne UV



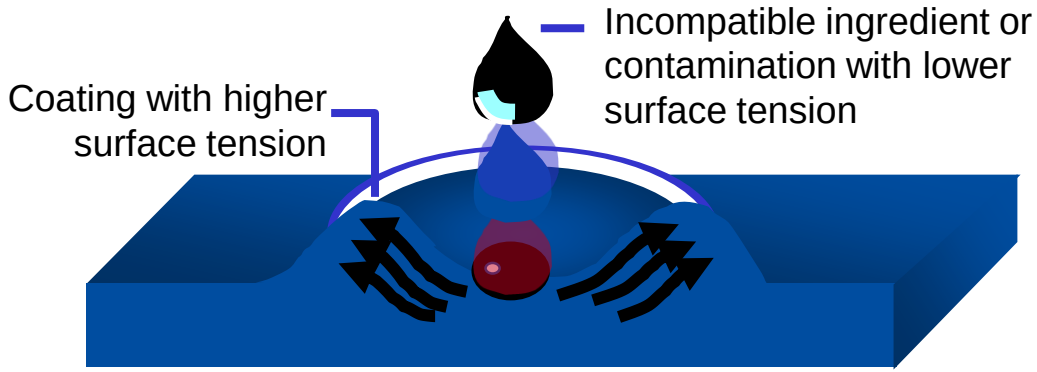
Surface Additives: Troubleshooting in Coatings

Potential Reasons for Cratering

Cratering is typically caused by:

incompatible or insoluble substances

ingredients with low surface tension



If defoamer is too incompatible

- stronger or longer mixing after the addition of the defoamer

If ingredients are incompatible or contamination

- surface tension reduction is the best tool.
- reduce the surface tension of the coating just <u>below</u> the surface tension of the crater causing substance

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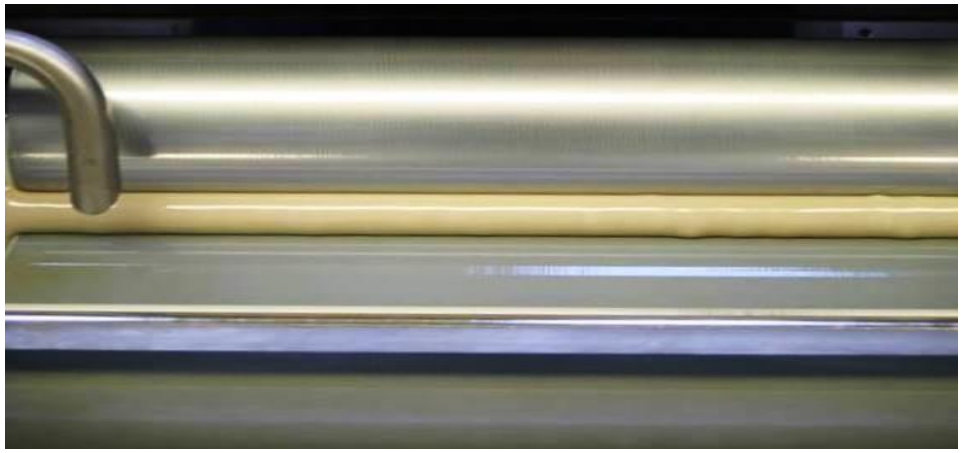
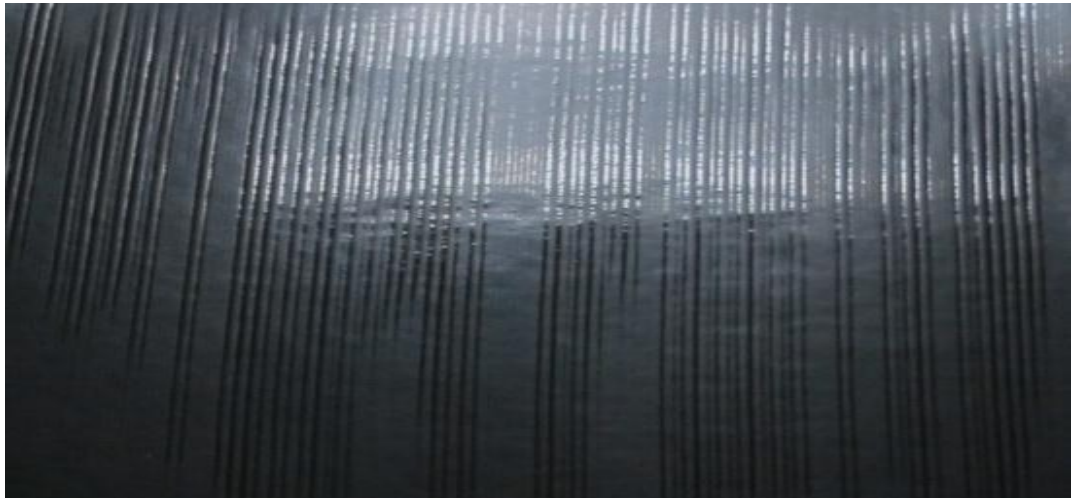
Example: Importance of Surface Tension Reduction

Just Below Crater Causing Material

Anti-crater Effect of Surface Additive #1 in Polyester Coating

Application & Surface Defects





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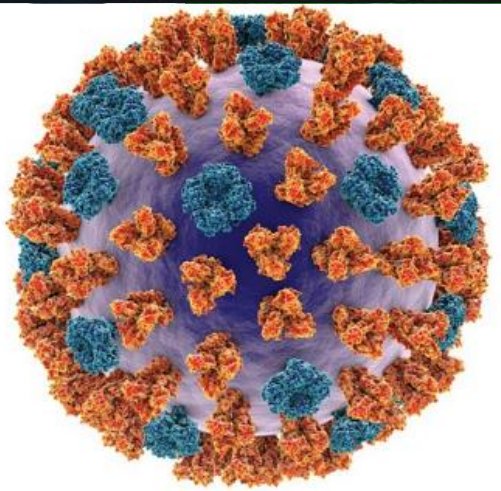
Sustainability & Next Frontier for Wood Coatings



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BYK Additives Product Groups

Wetting and dispersing additives

Surface additives

Rheology modifiers

Defoamers and air release additives

Wax additives

Adhesion promoters and Coupling Agents

Viscosity reducers

Processing additives