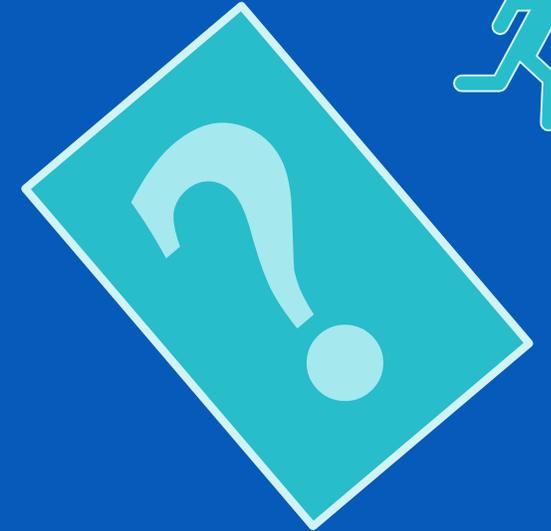




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Quiz!



What's in the bottle on the right?

- No clue?
- Particles, water and thickener?
- Particles, water and stabiliser?



Beads...

Water...

Validade...?

Valida: Natural Cellulose as Multifunctional Stabiliser in Waterborne Coating

Sappi - A diversified woodfibre group

sappi



- ❖ Global Presence
- ❖ 165 years of history
- ❖ Core business: pulp and paper
- ❖ Continued investments in high quality functional biomaterials
- ❖ Leadership position in woodfiber technologies

At a glance: Sappi solutions

sappi

We are a diversified, innovative and trusted leader that unlocks the power of renewable resources for use in:



Dissolving pulp



Graphic papers



Packaging and speciality papers



Casting and release papers



Validá
Fibrillated Cellulose



Forestry

Valida– Natural cellulose as inspiration

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renewable

non-toxic

bio-
degradable

natural

sustainable

bio-
compatible

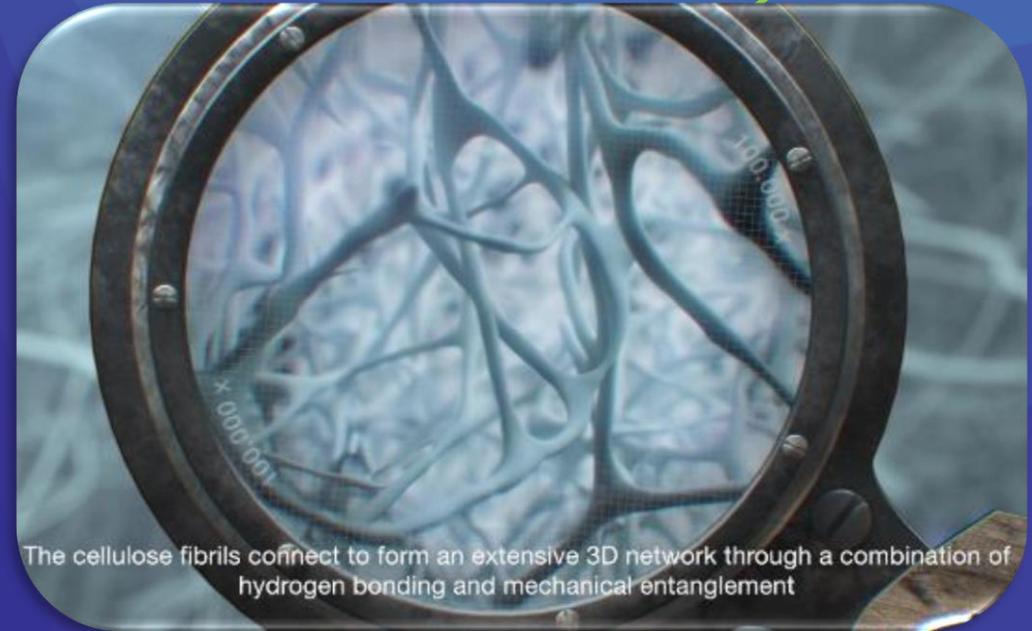
*Picture: Sappi Lothair plantation,
South Africa*

Cellulose is the most abundant organic polymer on earth!



Valida is fibrillated cellulose

- Valida forms a 3D network based on physical entanglements of the fibers and hydrogen bonding.



The cellulose fibrils connect to form an extensive 3D network through a combination of hydrogen bonding and mechanical entanglement

Produced by mechanical processing of woodfibers. No chemicals are added



Valida
@ 3% Gel



Valida
@ 8% Paste

Natural Cellulose

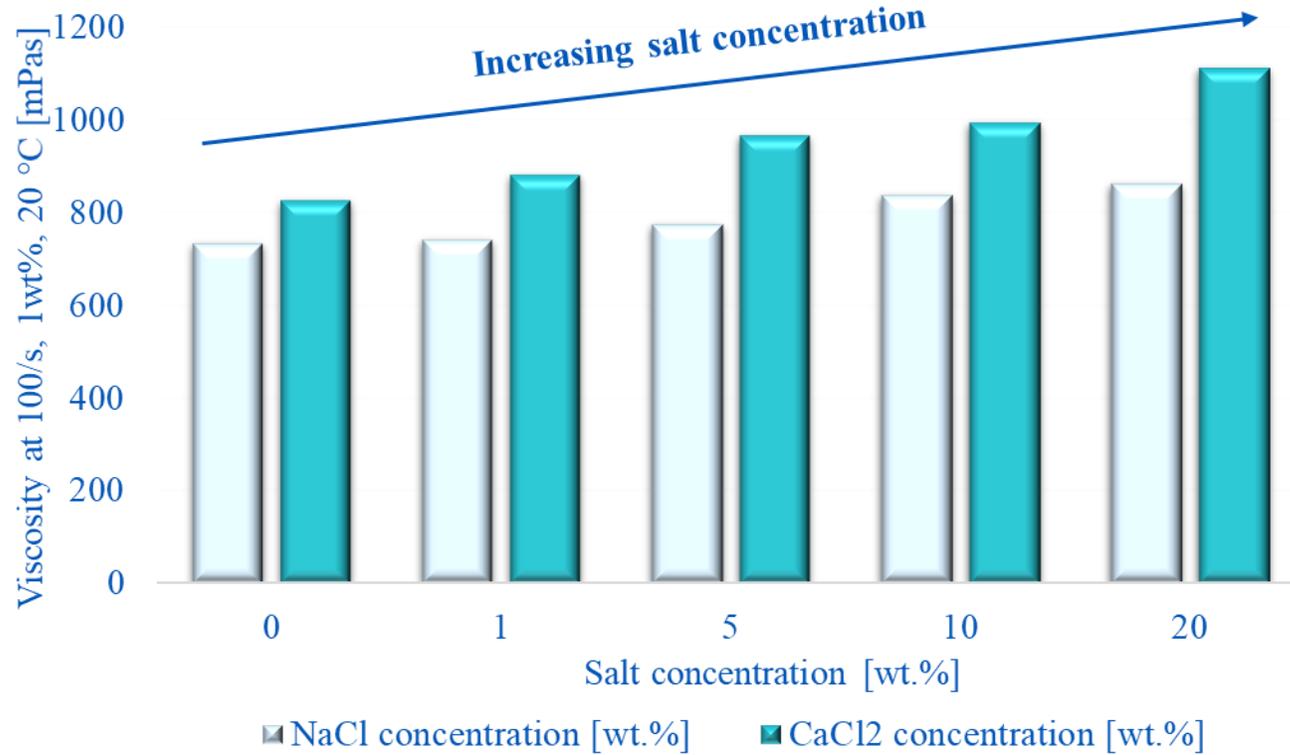
- ❖ Not soluble
- ❖ *Translucent*
- ❖ *Effective stabilizing at low active dosage*
- ❖ *Non-sticky*
- ❖ *Stable at pH 1-13,*
- ❖ *Stable towards electrolytes*
- ❖ Compatible with polar solvents
- ❖ *Pre-hydrated*



Chemically modified cellulose

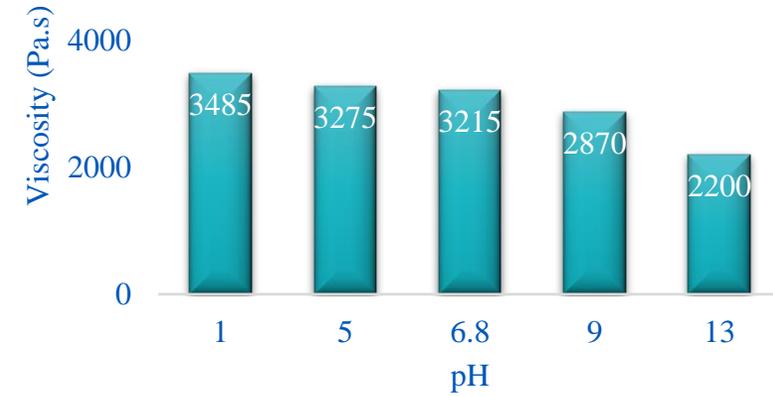
- ❖ Water soluble
- ❖ Transparent
- ❖ *Thickener – Not a Stabiliser*
- ❖ *Sticky*
- ❖ Limited pH stability Instable vs electrolytes
- ❖ Powder

Valida is robust

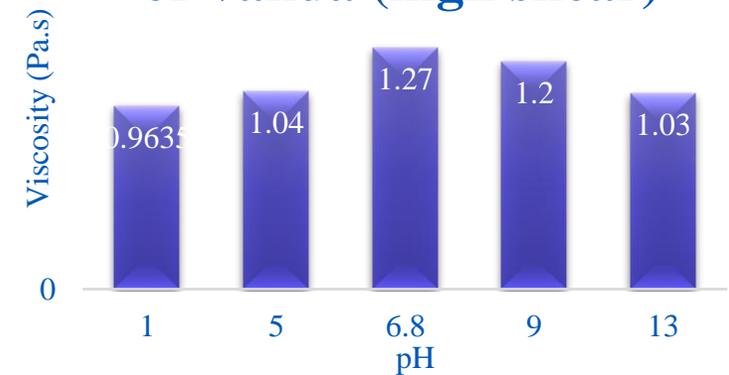


➤ Valida dosage: 1% active content in water

Effect of pH on viscosity of Valida (low shear)

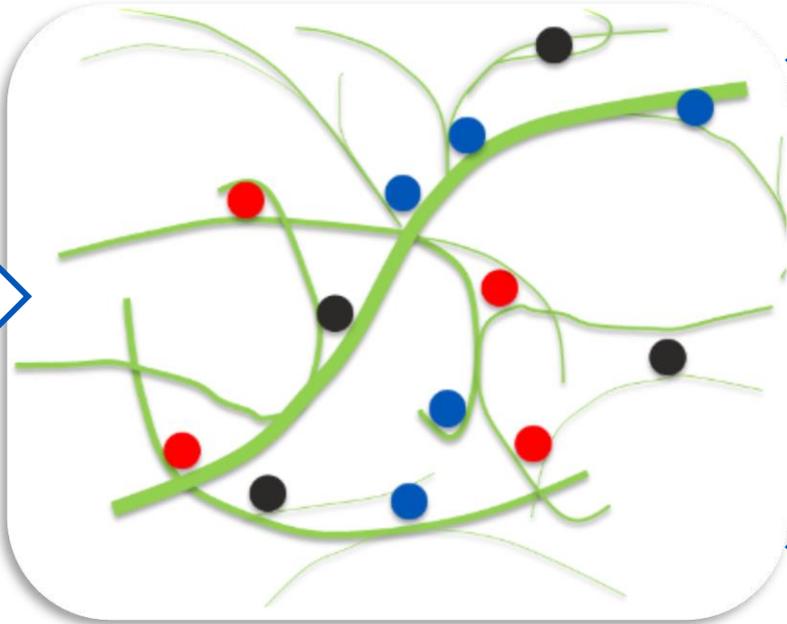
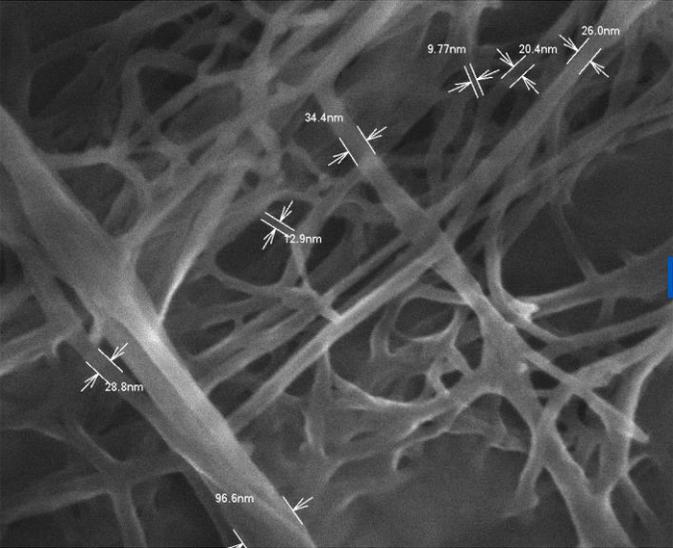


Effect of pH on viscosity of Valida (high shear)



3D fibrils network as scaffold for particles

Valida's unique stabilising property relies on its **strong physical network** & its **large surface area**.





Valida in Paints and Coatings

Valida – Features



Insoluble 3D - network of cellulose fibrils suspended in water



High stabilising capacity



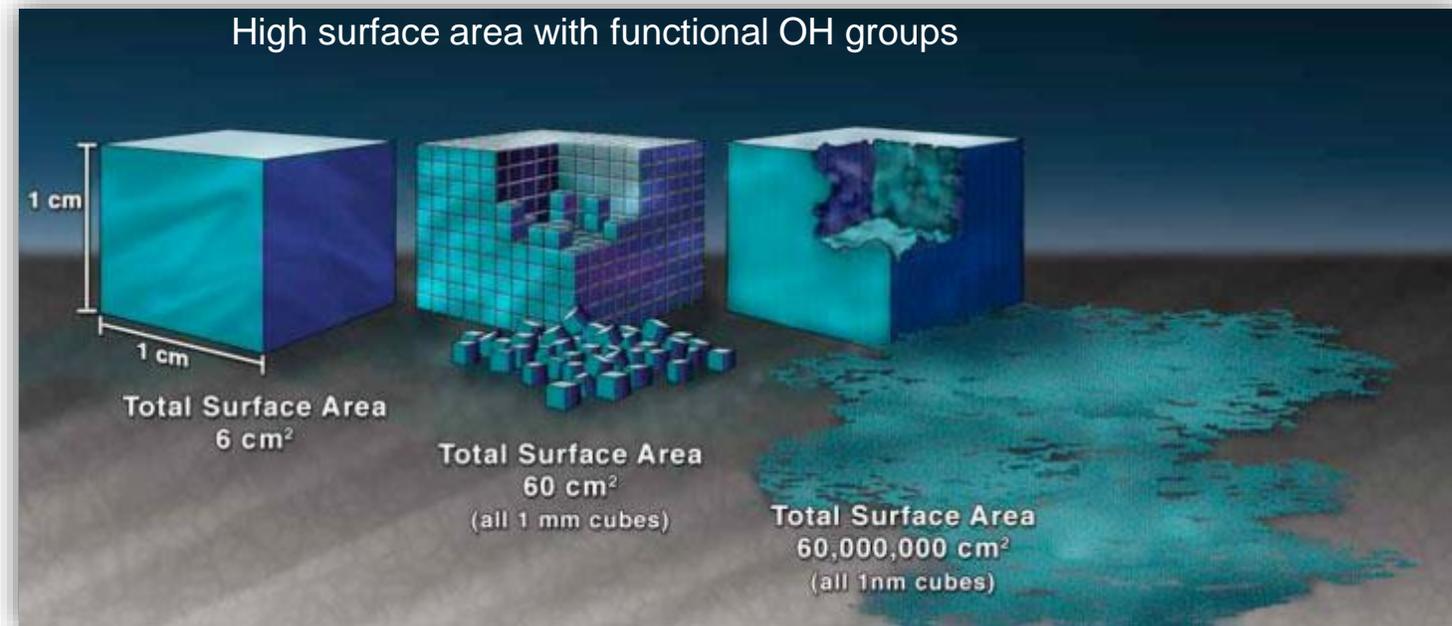
Highly shear thinning, Thixotropic, Sprayable



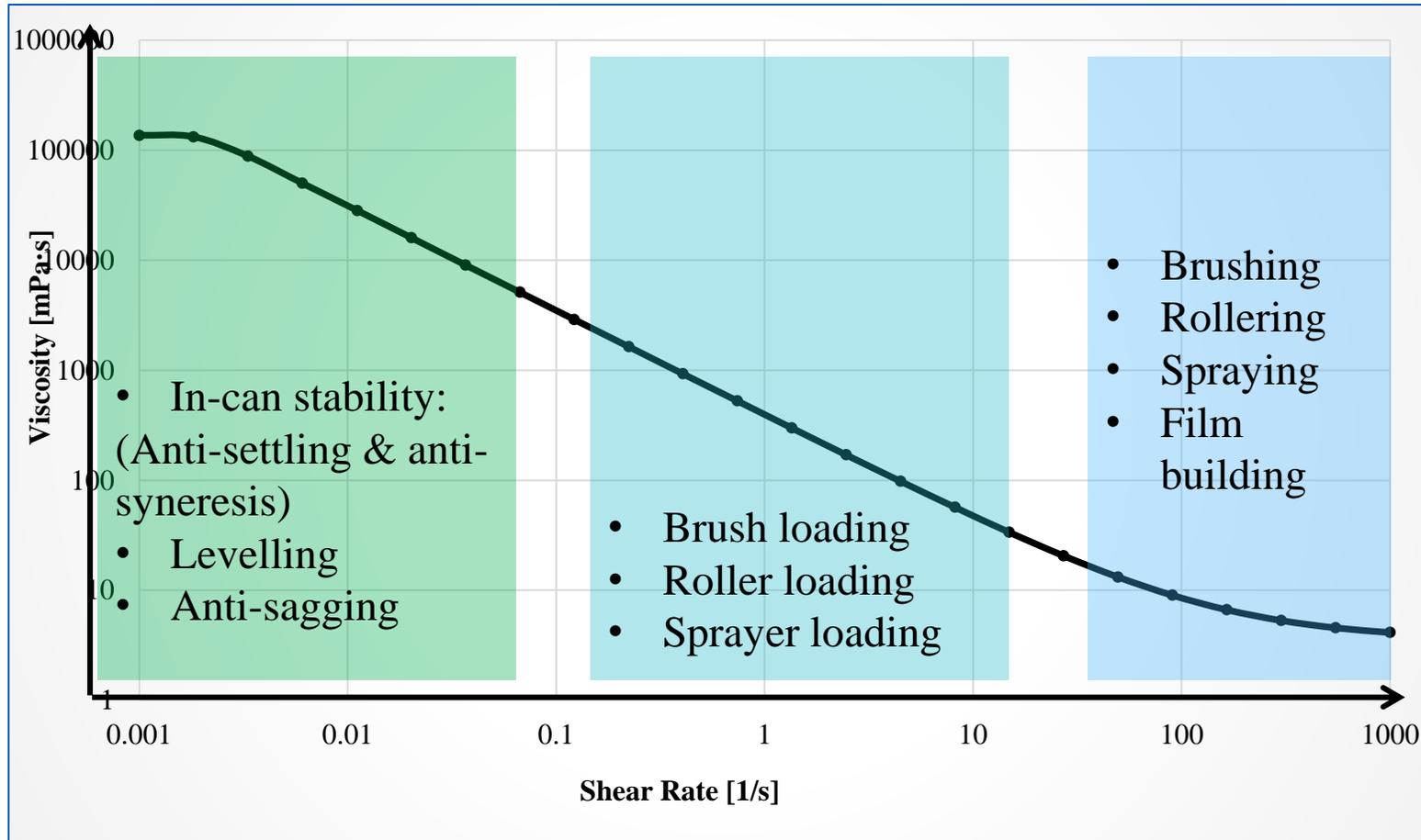
Robust: pH, electrolytes, polar solvents, surfactants..

➤ Synergy with conventional rheology modifiers

➤ Compatible with Acrylic, Styrene Acrylic, Water Based Epoxy, VAE and PU resins



Valida: Highly Shear thinning and Sprayable



High Stabilising Potential

Ref.



Ref. + Valida



- Good dispersion of pigments
- Good in-can stability, no sedimentation
- Passed 1 month freeze-thaw stability test (ASTM D2243)

Case study:

Interior wall paint

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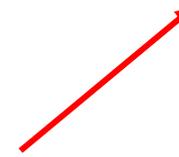


Interior wall paint formulation

	Raw Material	Functionalities	Control	Valida based formulation	Valida based formulation
PVC (reference formulation) = 75%					
			wt. %	wt. %	Wt%
Dispersion stage	Demineralised water	Solvent	15	15	15.0
	Vegetable oil and emulsifier	Defoamer	0.1	0.1	0.1
	Amino alcohol, 90% sc	Neutralising agent	0.1	0.1	0.1
	Polyacrylate Sodium salt, 40% sc	Dispersing agent	0.2	0.2	0.2
	<i>Add under high stirring (2000rpm = 6m/s)</i>				
	Valida, gel	Biobased multifunctional stabiliser	0	6.7	13.33
	<i>Dispersion for 10 minutes at 1800rpm</i>				
	Calcium carbonate, D50 = 5µm	Filler	40.5	40.5	40.5
	Rutile titanium dioxide	Pigment	10	10	10
	<i>Dispersion for 15 minutes at 1000 - 1500 rpm</i>				
Let down Stage	Styren Acrylic Emulsion, MFFT 22° C, 50% sc	Binder	10	10	10
	DiIsoButyl ester	Coalescing agent	1.5	1.5	1.5
	High molecular (PU) non ionic rheology modifier, 32% sc	Associative thickener	1.25	0.8	0.2
	Acrylic copolymer dispersion, 30% sc	Non associative thickener	0.25	0.2	0.1
	Demineralised Water	Solvent	21.10	14	9.0
	Total		100	100	100

- ❖ Valida, gel consists of 3% fibers suspended in 97% water
- ❖ Valida was added during the dispersion step.
- ❖ Speed adjusted to 2000 rpm

- ❖ Lowered the dosage of conventional rheology modifiers

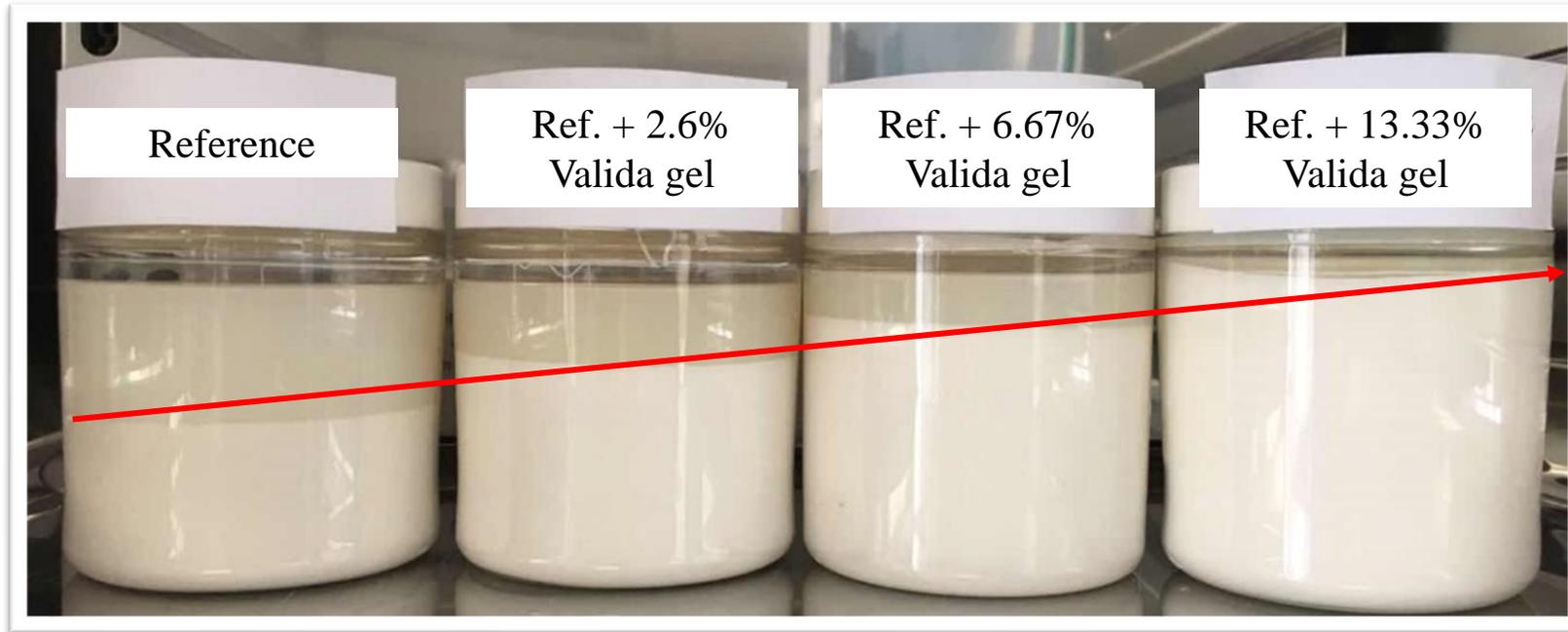


Primary Benefits

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Improving in-can stability

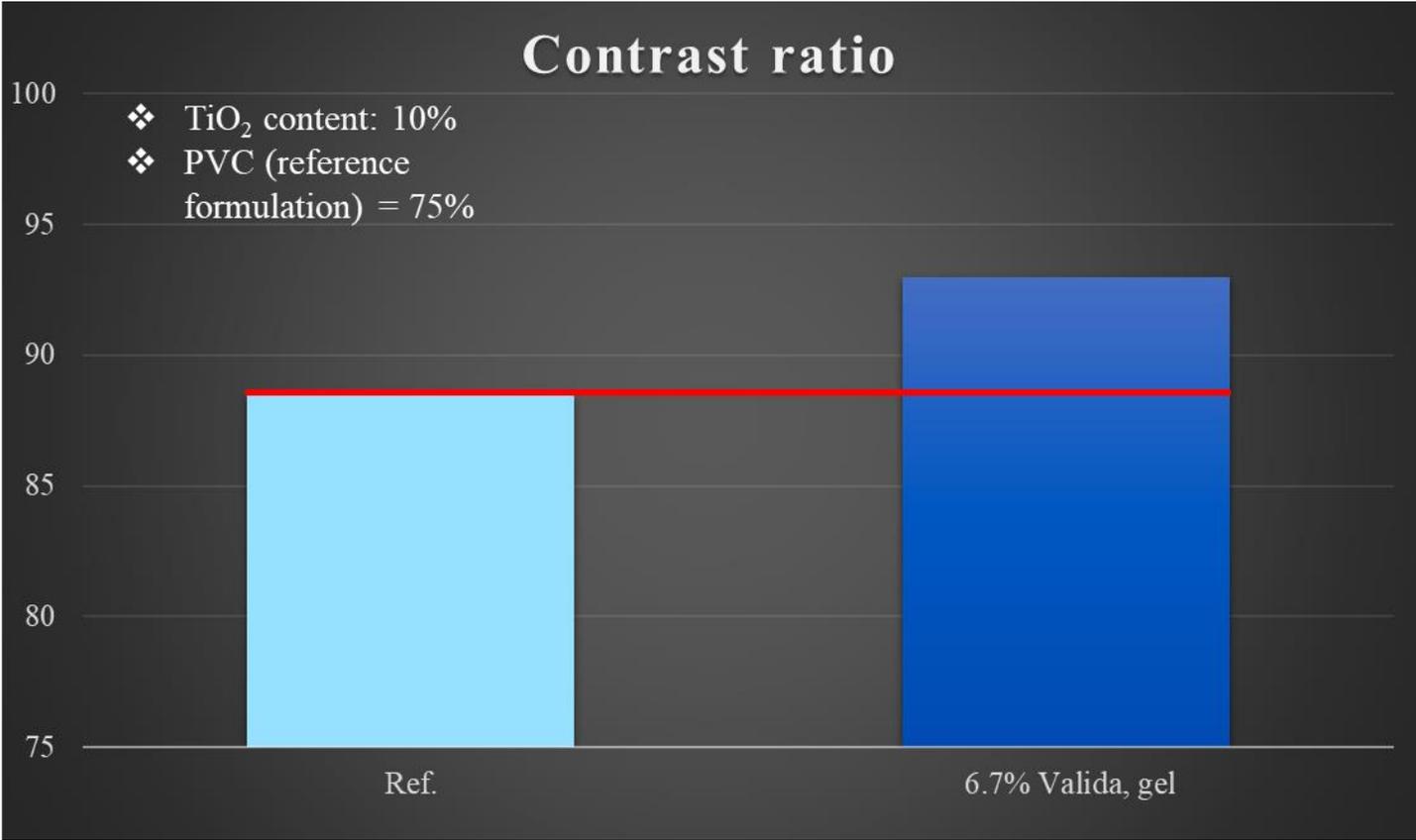
- Testing conditions: 6 months stability test in an oven under 40°C



*Dosage based on Valida gel, which consists of 3% active fiber in 97% water

Booster for contrast ratio – hiding power

➤ Valida acts as a stabilizer and could potentially act as *physical spacer* for TiO₂

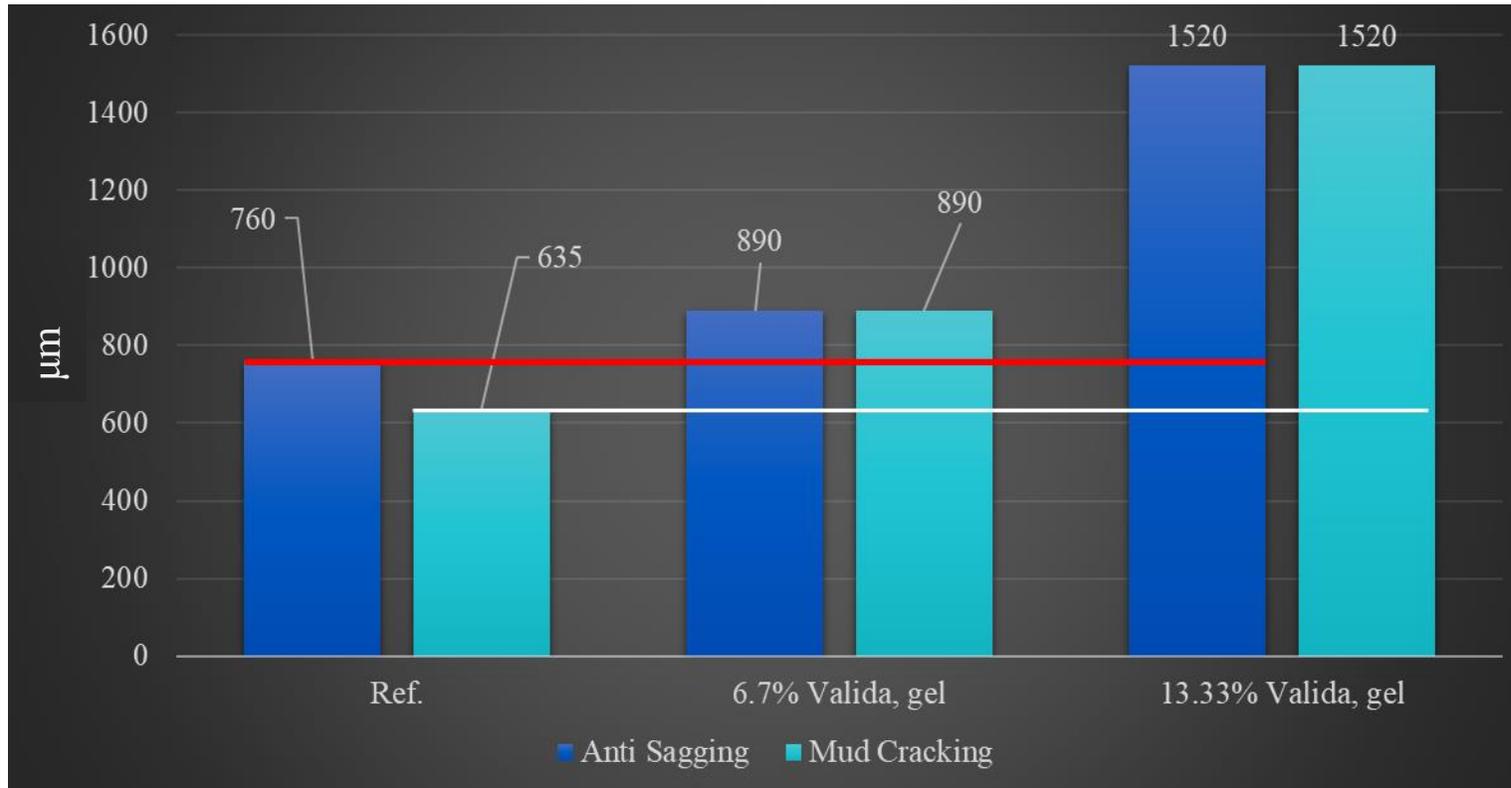


Potential for complementing TiO₂ in formulation

*Dosage based on Valida gel, which consists of 3% active fiber in 97% water

Improved Anti-Sagging & Anti Mud-Cracking

Valida improves sag resistance and mud-cracking resistance



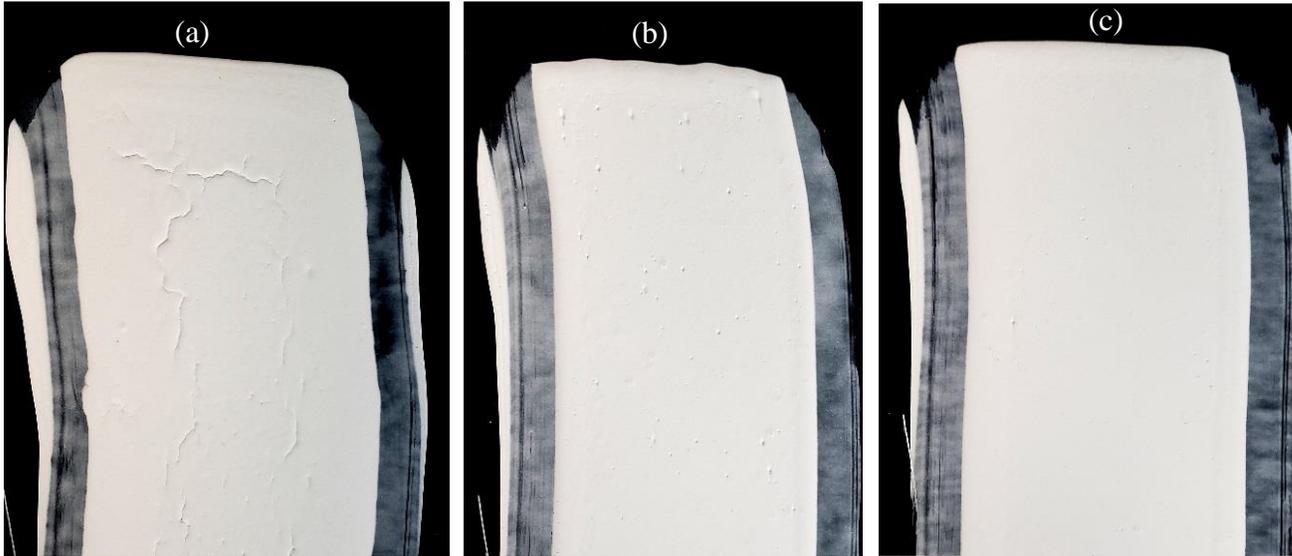
*Dosages based on Valida gel, which consists of 3% active fiber in 97% water



Figure 1: (a) Reference, (b) 6.7% Valida gel, (c) 13.33% Valida gel

Mud-cracking does not crack anymore!

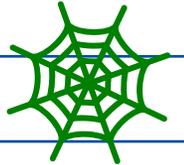
- Valida **eliminates** Mud-Cracking



- Thickness: 1270 μm

Figure 1: (a) Reference, (b) 6.7% Valida gel, (c) 13.33% Valida gel

3D network can be seen as spiderweb: delocalizes the stress across the coating surface



Water retention slows down evaporation rate

Valida improves mud-crack resistance significantly

Additional benefits

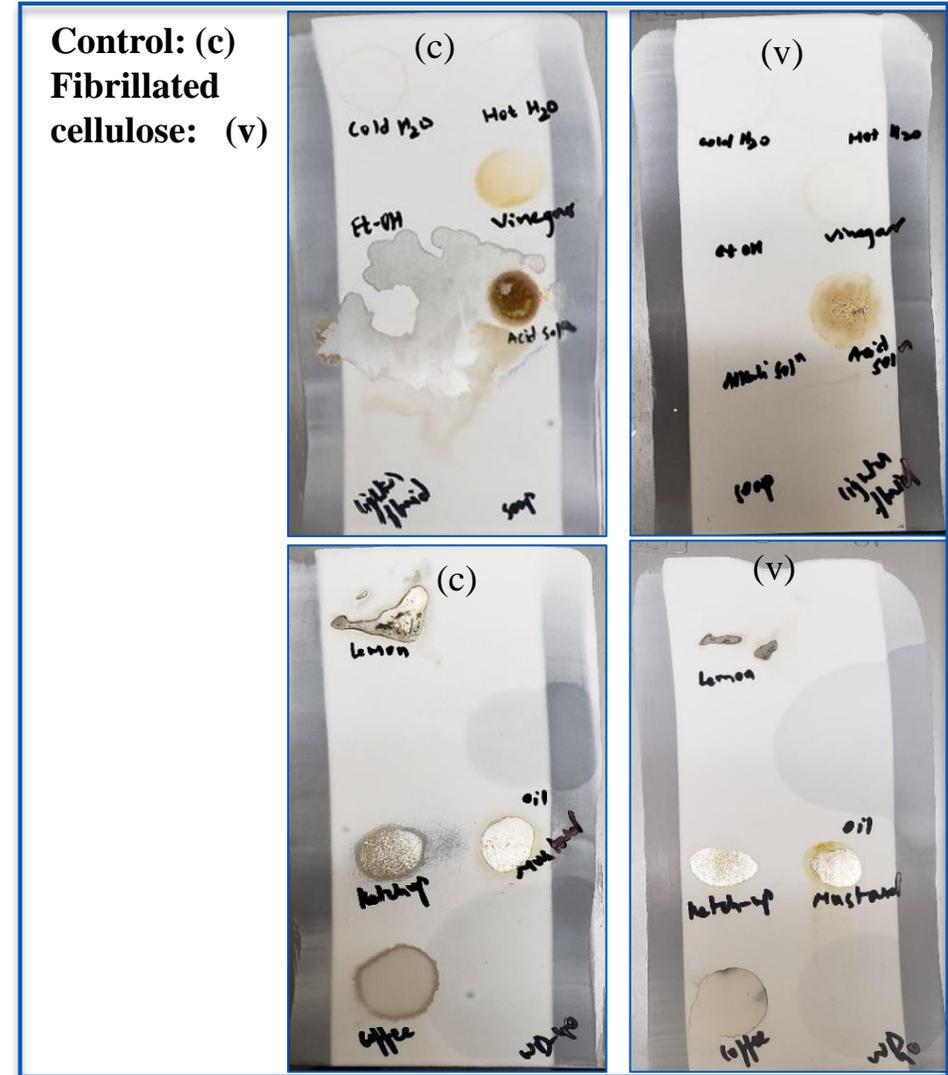
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Enhanced resistance to stains in interior wall paint

Households chemicals	Reference formulation	Fibrillated cellulose formulation
Vinegar	✗	●
Alkali solution, 50 wt.% NaOH in water	✗	●
Acid solution, 30 wt.% HNO ₃ in water	✗	●
Lemon fruit	✗	●
Ketch-up	✗	●
Coffee	✗	●
Distilled water, cold Distilled water, hot Ethyl alcohol (50% volume) Diluted soap solution Lighter fluid Lemon fruit Vegetable oil Mustard Lubricating fluid (WD-40)		=

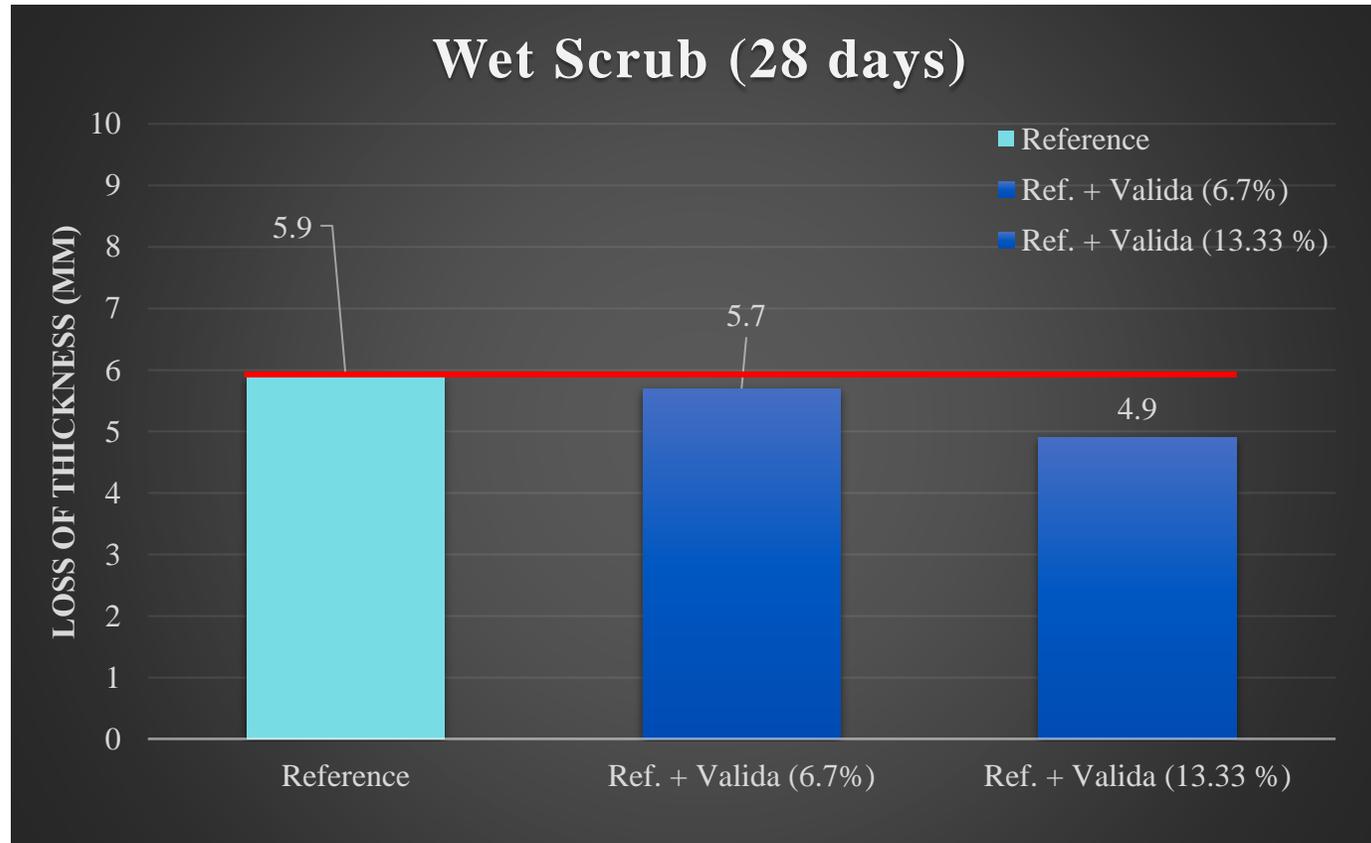
*ASTM D1308 Stain Resistance

Formulation with Fibrillated cellulose showed better resistance to household chemicals especially acidic solutions compared to control (Vinegar, nitric/sulfuric acid solution)



Wet-Scrub Resistance

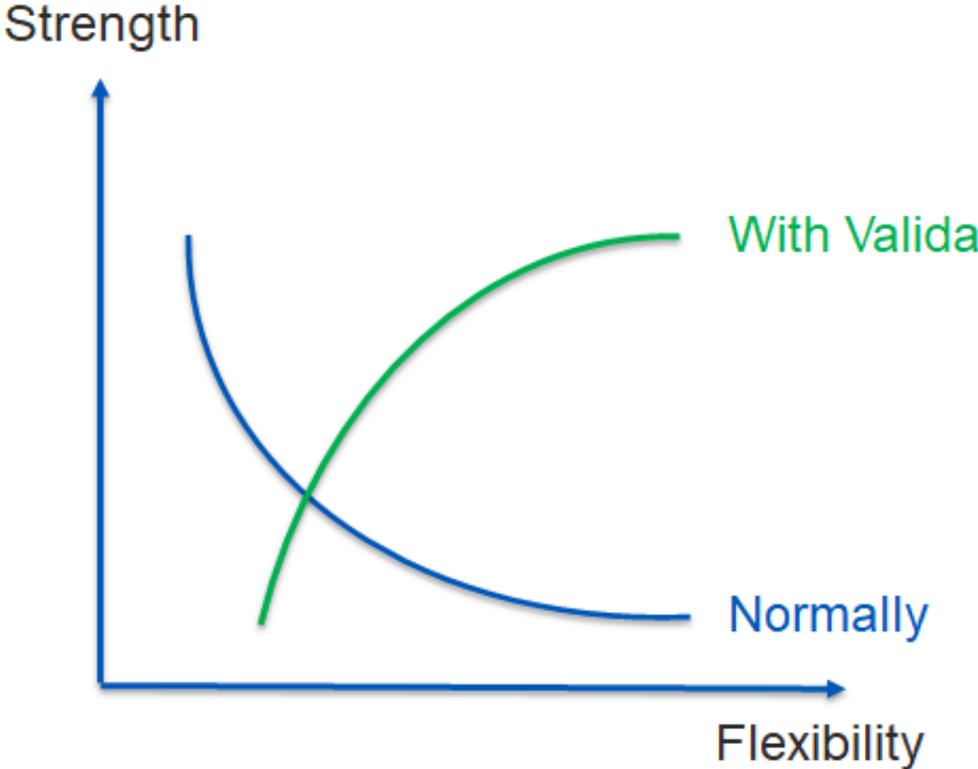
Paint formulated with Valida shows improved wet scrub resistance



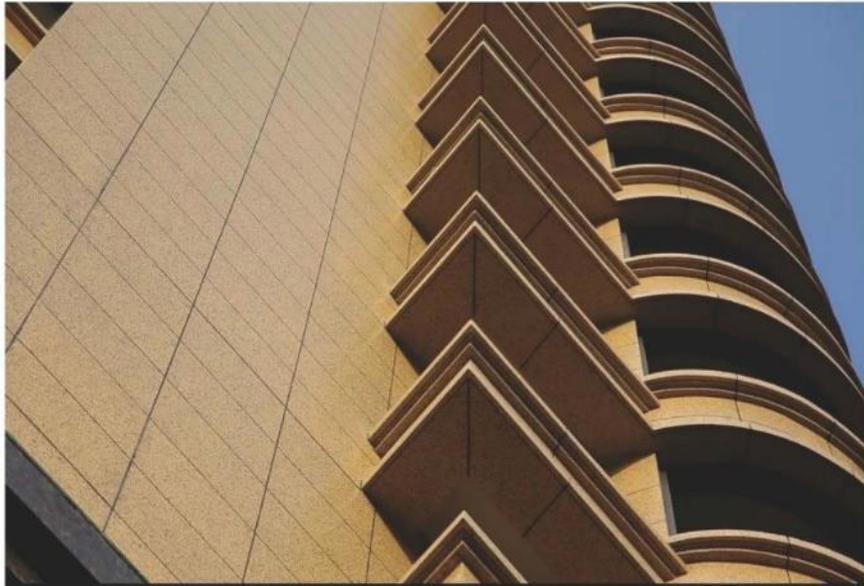
❖ **Test standard:**
Internal method
based on ISO 11998

- ❖ Dosages based on Valida gel, which consists of 3% active fiber in 97% water
- ❖ Paint formulated with 6.67% Valida gel is Class 2 (loss of weight < 20 micron)
- ❖ Paint formulated with 13.33% of Valida gel is Class 1 (loss of weight < 5 μ m).

Enhanced scratch resistance & flexibility



Example - Multicolor paint



Finished surface

Valida functions as a stabiliser & delivers the following benefits:

1. In-can stability and prevent hard sedimentation.
2. Enhance sprayability and efficiency
3. Enhance the mechanical property of the finished surface

Reference



Valida-based formulation



Store at room temperature for 24h



Closing considerations

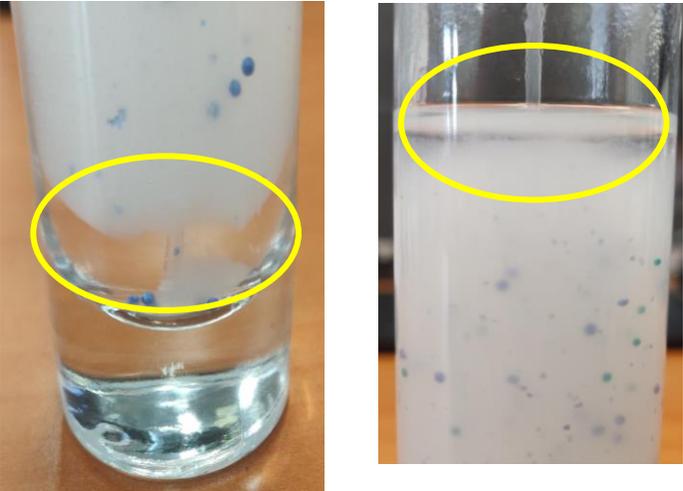


Formulation recommendation in paints and coatings:

➤ Product Validation @ 0.4% active fibers!

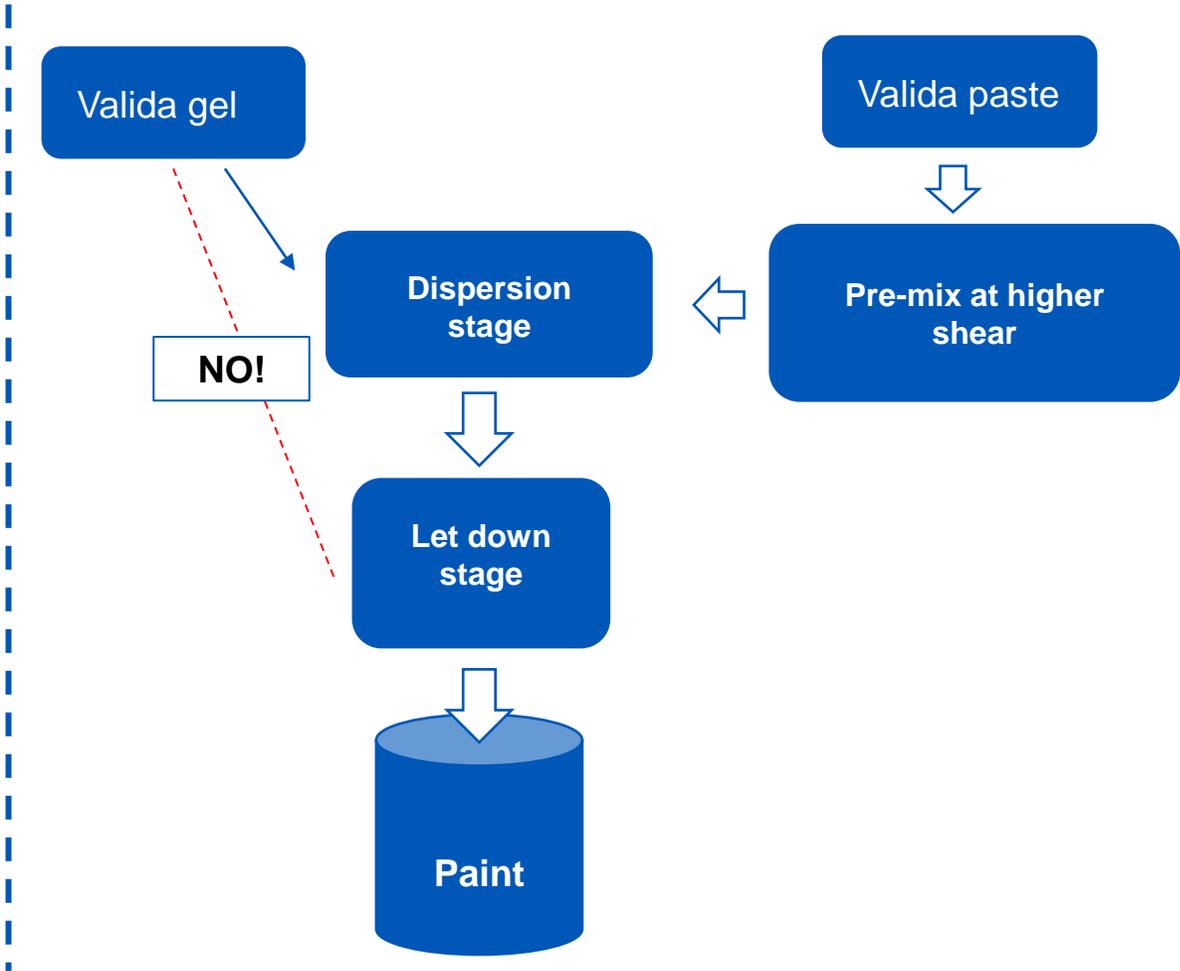


Valida gel: 13,33% Valida paste: 5%



Why?

➤ Use enough shear to activate the network!



Valida: Typical applications

Architectural paint



Silicate Paint



Textured Paint



Elastomeric roof coating



Wood Coating



Intumescent Paint



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Rheology:

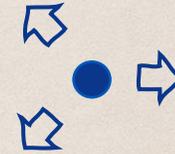
- ❖ In-Can stability
- ❖ Anti-Sagging
- ❖ Sprayability

Surface:

- ❖ Contast-Ratio
- ❖ No Mud-Cracking
- ❖ Anti-Staining

And...

- ❖ Reinforcing
- ❖ Robust



Thank you!

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valida@sappi.com

Gabriel.ferrante@sappi.com

+31 6 50 16 95 60