01 February 2023
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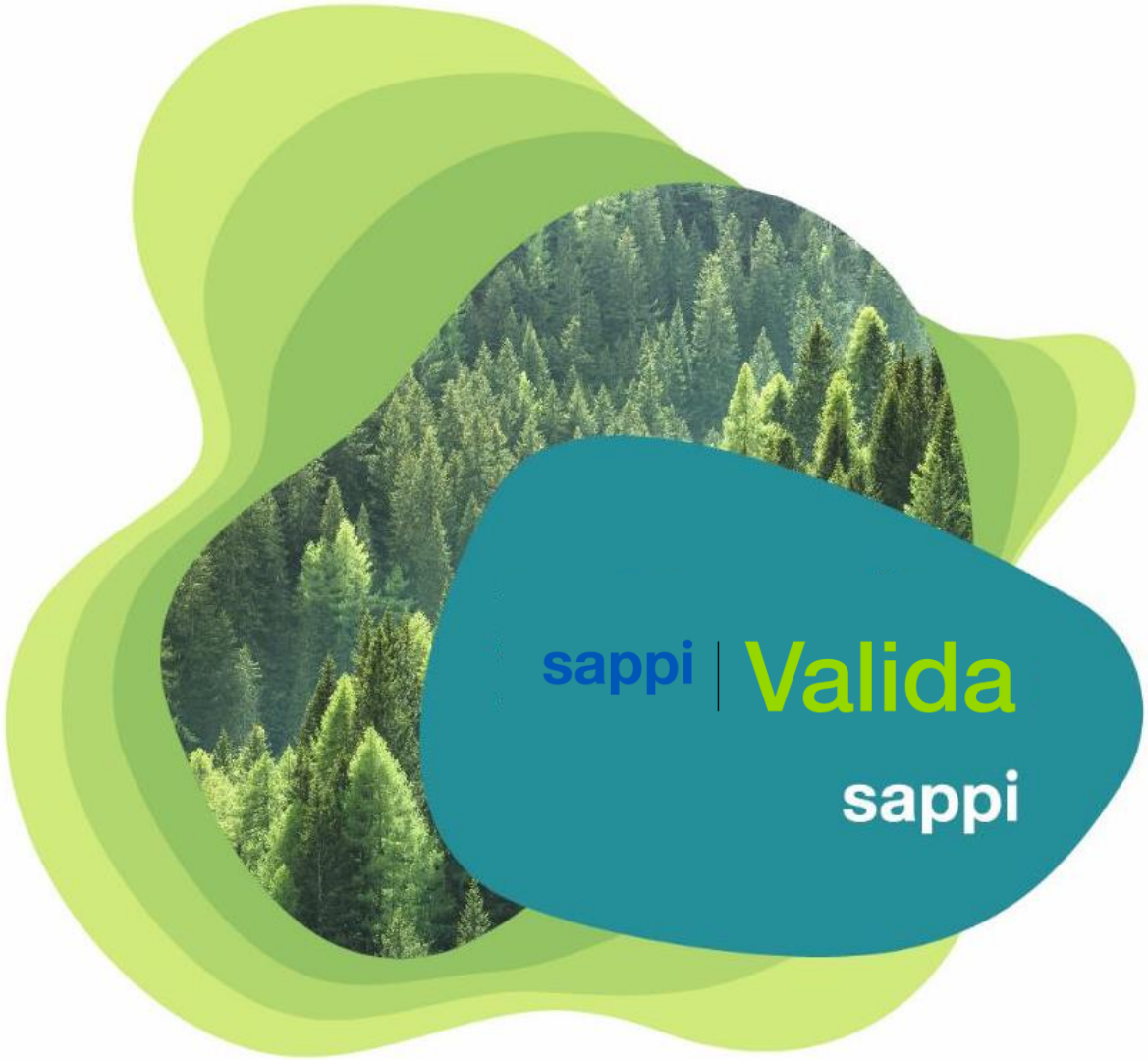
Valida: Natural cellulose as inspiration in high build coatings

Sappi - A diversified woodfibre group

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

Sustainability is at the core of our business



Sappi is a leading global provider of powerful everyday materials built from renewable resources.

Together with our partners, we are quickly moving toward a more circular economy.

Unlocking the power of trees

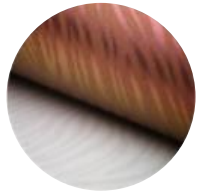
Packaging and Speciality Papers
Product Packaging, Technical papers

Graphic Papers
Commercial Print, Publishing

Casting and Release Papers
Textures for materials, Functional films, Automotive wraps

Xylitol, Furfural, and Chemicals from Sugars
Low-calorie Sweetener, Toothpaste, Recyclable Plastics






CELLULOSE | HEMICELLULOSE | LIGNIN




Verve
Textiles, Cellophane, Pharmaceuticals

Sappi Symbio
Automotive Parts, Furniture, Audio speakers

Valida Fibrillated Cellulose
Stabiliser, Rheology Modifier, Reinforcing Agent

Chemicals from Lignin
Binding Agent, Dispersion Agent, Emulsion Stabiliser

Valida– Natural cellulose as inspiration

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Picture: Sappi Lothair plantation, South Africa

Cellulose is the most abundant organic polymer on earth!

Valida is fibrillated cellulose

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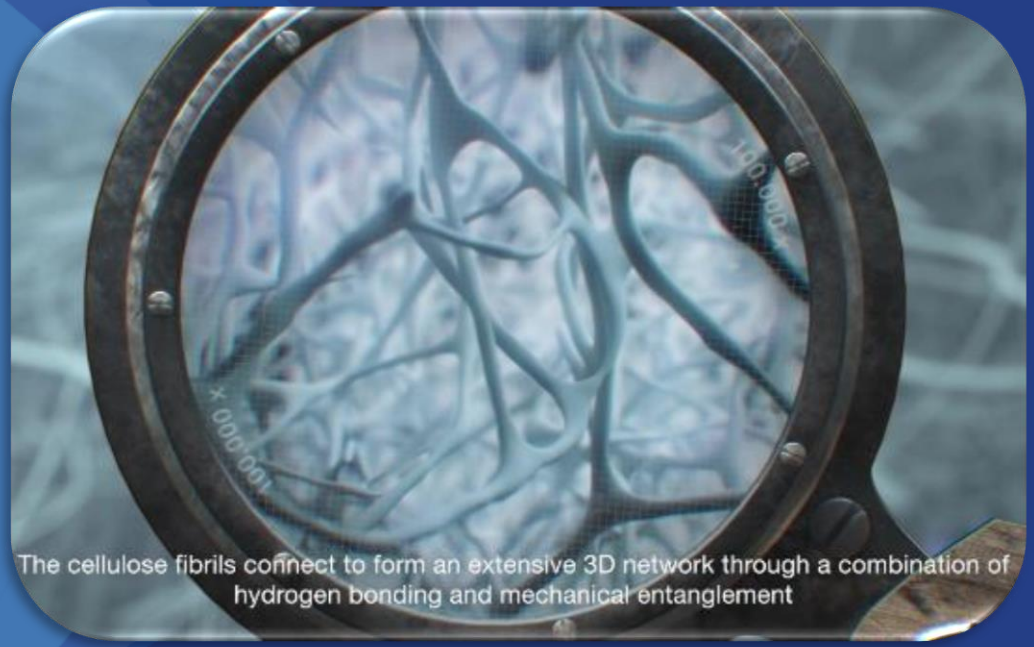
- Valida forms a 3D network based on physical entanglements of the fibers and hydrogen bonding.



Produced by mechanical processing of woodfibers. No chemicals are added

Fibrillated cellulose is Natural Cellulose

Valida is fibrillated cellulose

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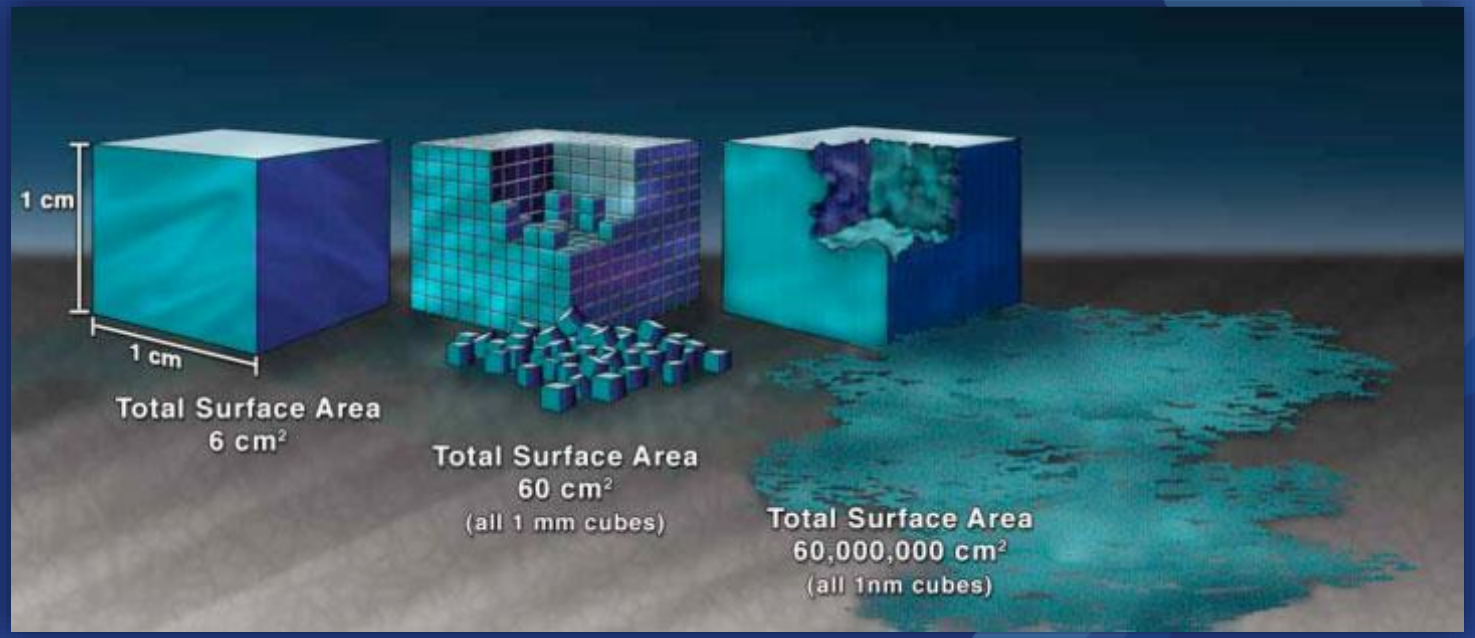
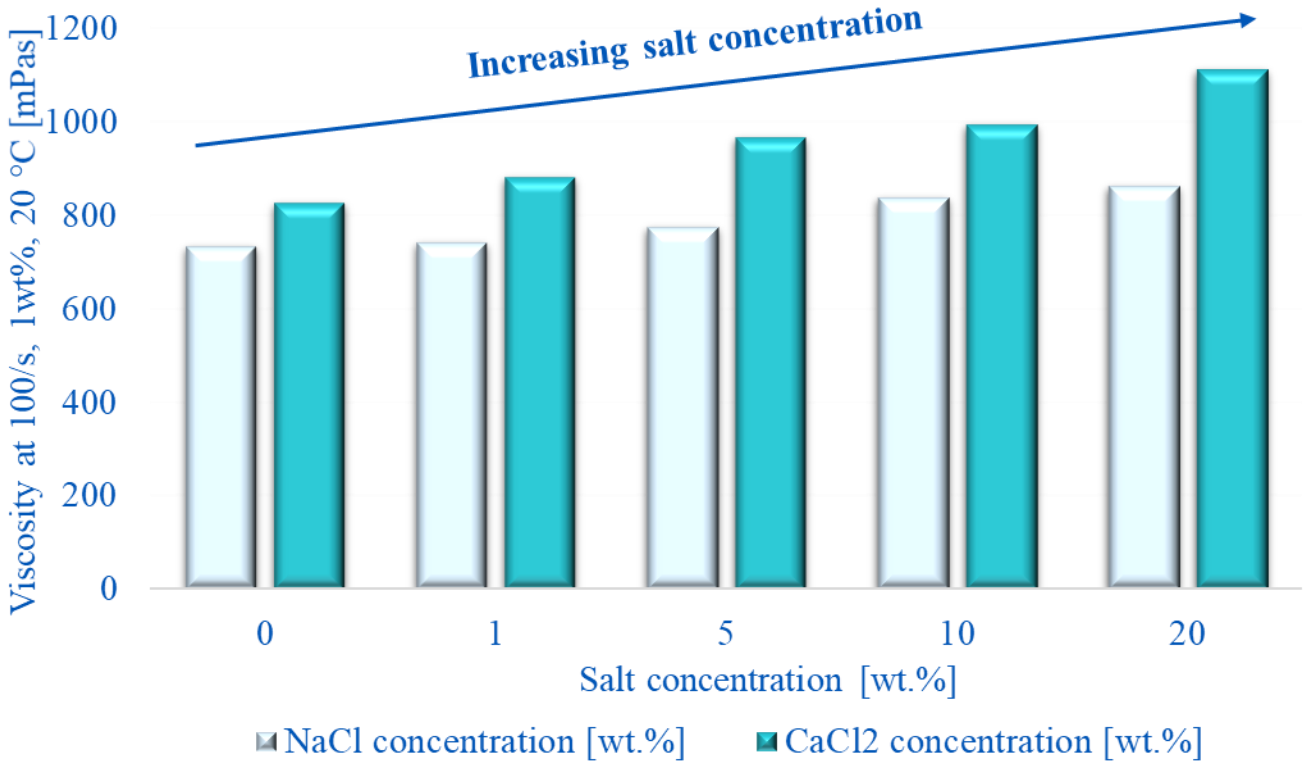
- *Insoluble 3D fibrils network*
- *Translucent*
- *Non-sticky*
- *Effective stabilisation at low active dosage*
- *Low impact on the viscosity*

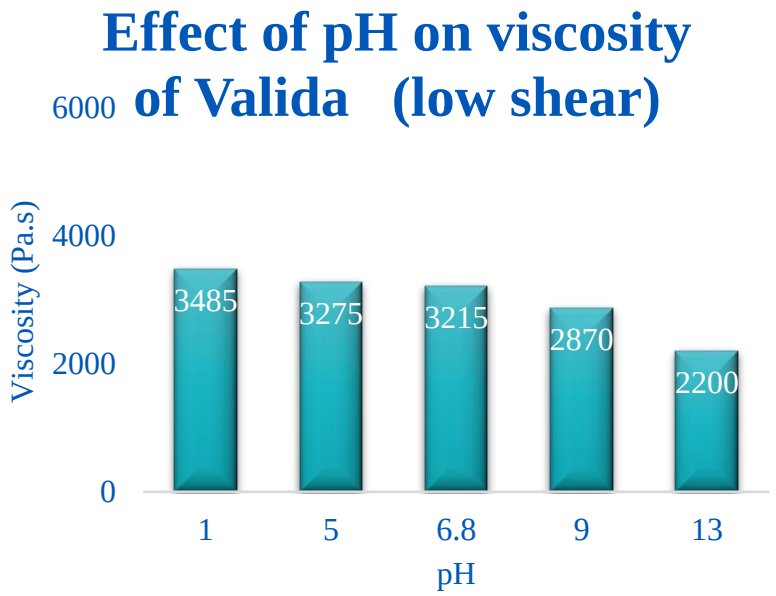
High surface area with functional OH groups

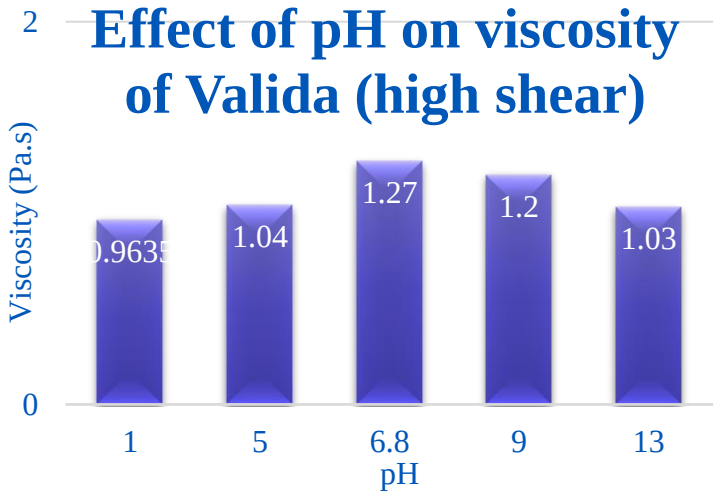


➢ **Pre-hydrated**

Valida is robust



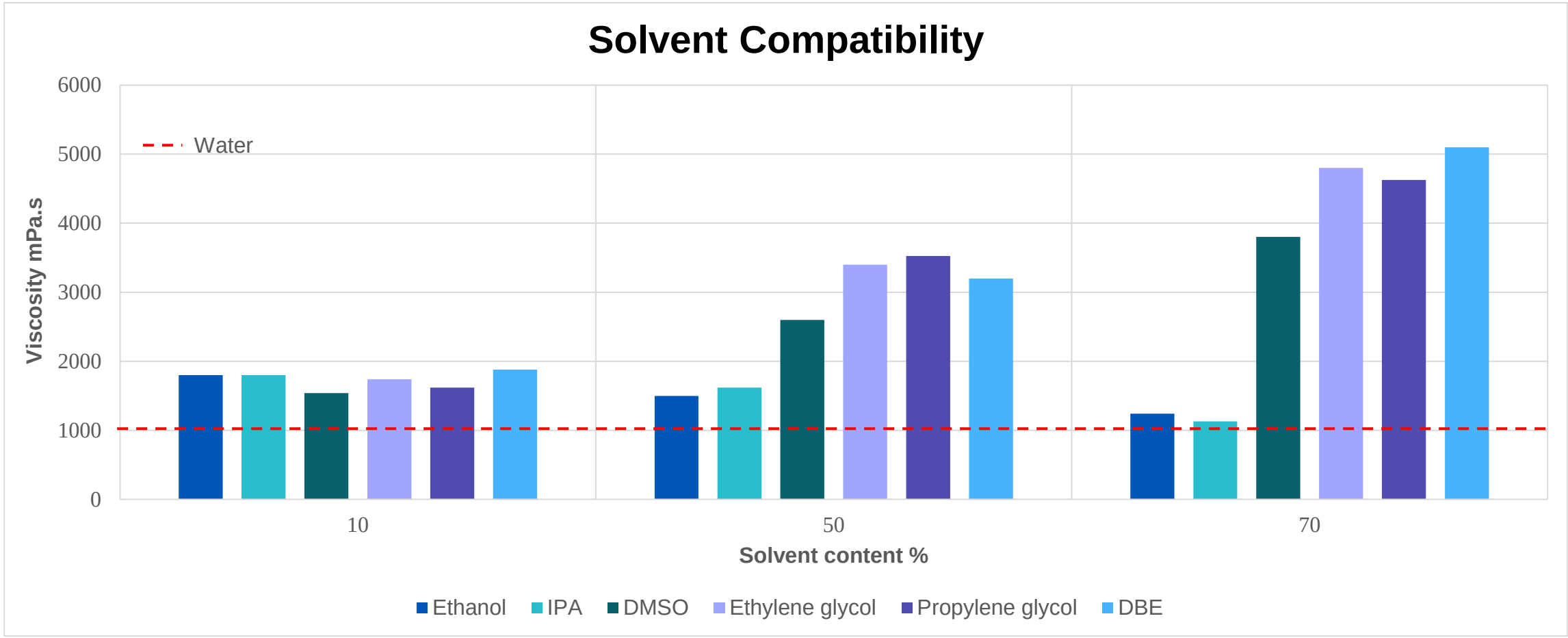




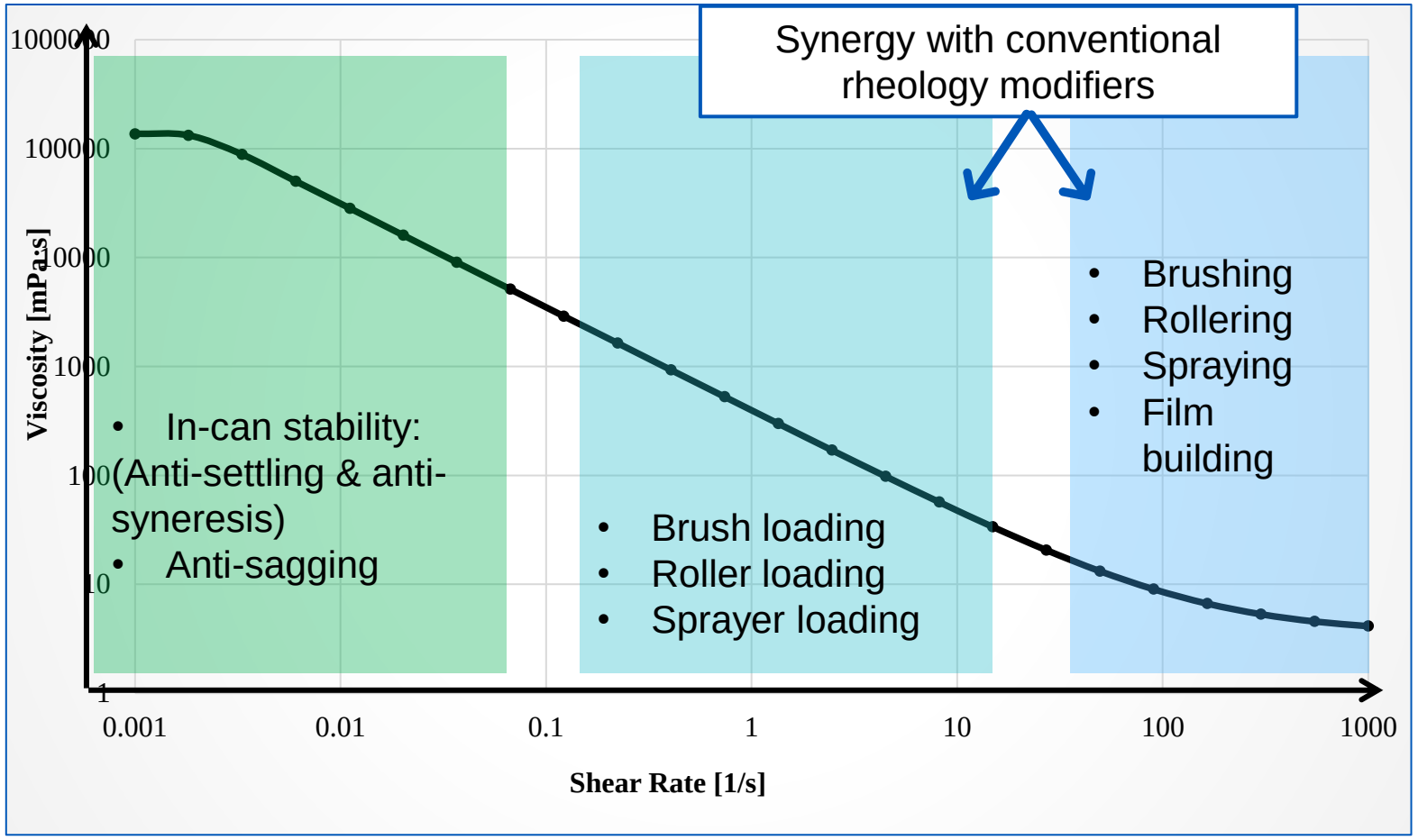
- Valida dosage: 1% active content in water

Solvents compatibility

Brookfield viscosity @1% active fiber content

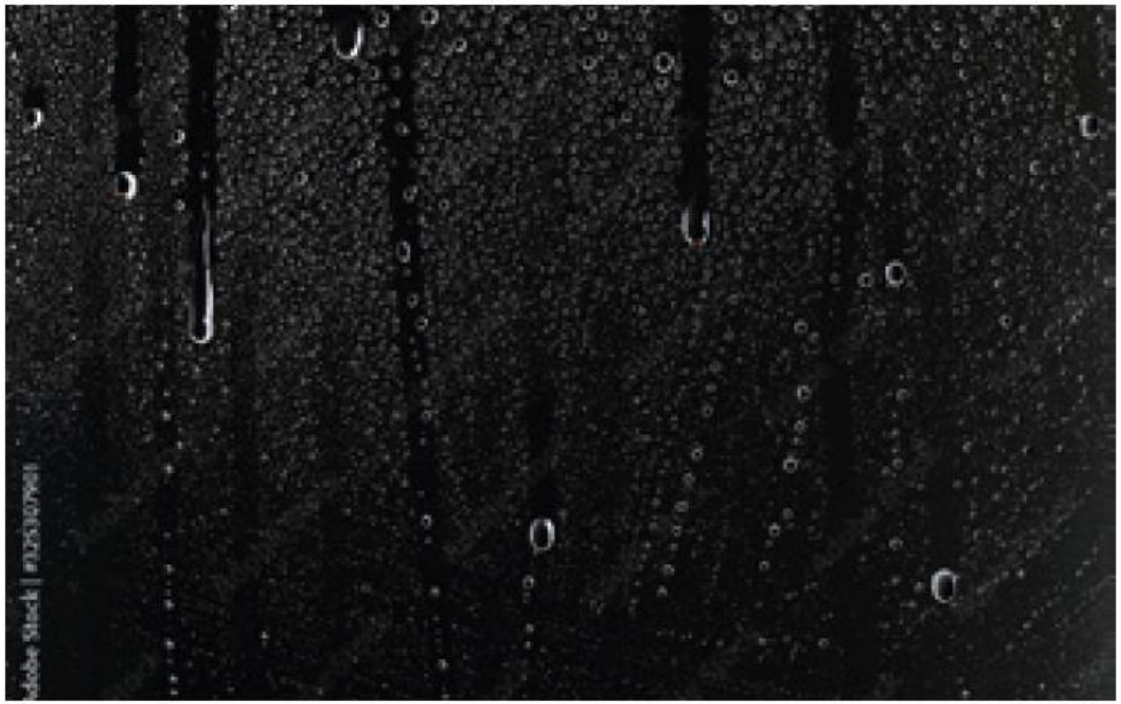


Valida: Highly Shear thinning and Sprayable



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

Valida: Highly Shear thinning and Sprayable



Ref.– spray pattern

Valida - spray pattern

3D fibrils network as scaffold for particles

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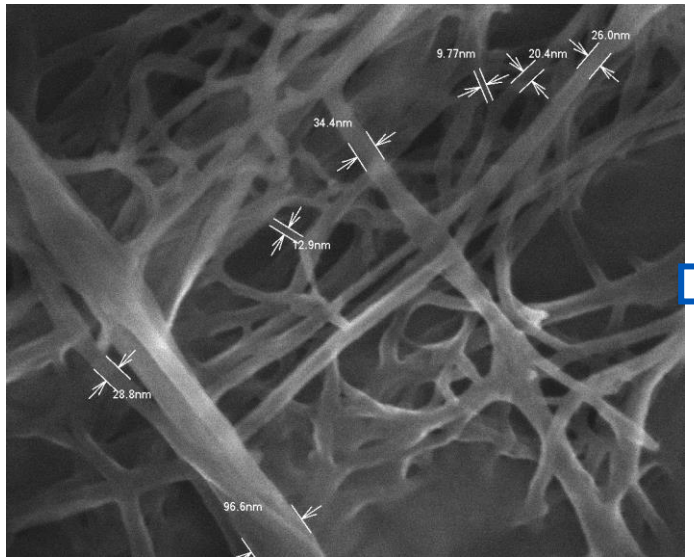
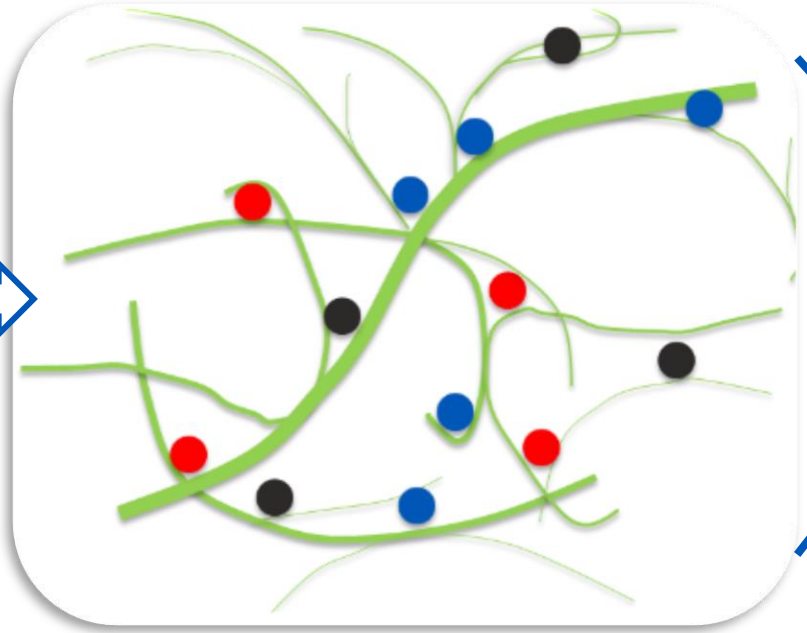
Valida's unique stabilising property relies on its ***strong physical network*** & its ***large surface area*****.**





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)

Valida: Typical applications

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Décor paints

Silicate Paints

Textured Paint

Plaster/Render

High Build Coatings

Wood Coatings

Intumescent Paint

Seeds Coatings

Case study: Elastomeric Roof Coating

Elastomeric Roof Coating Formulation

	Raw Material	Functionalities	Dosage
			wt.%
Dispersion stage	Demineralized water	solvent	5.3
	Propylene glycol	solvent	1.8
	solution of sodium polymethacrylate	Dispersing agent	0.4
	BIT & Zinc Pyrithione	Biocide	0.3
	Mixture of foam-destroying polysiloxanes and hydrophobic solids in polyglycol	defoamer	0.2
	Valida S231C	**Biobased stabiliser**	**5 (0.4%)**
	Calcium carbonate + magnesium carbonate	Fillers	35.4
	TiO_2	TiO_2	8.0
Let down Stage	Styrene acrylic	Binder	42.0
	Mixture of foam-destroying polysiloxanes and hydrophobic solids in polyglycol	defoamer	0.1
	Ester Alcohol	Coalescent agent	0.5
	OIT, Zinc Pyrithione & Terbutryn	Biocide	1.0
	Total		100%

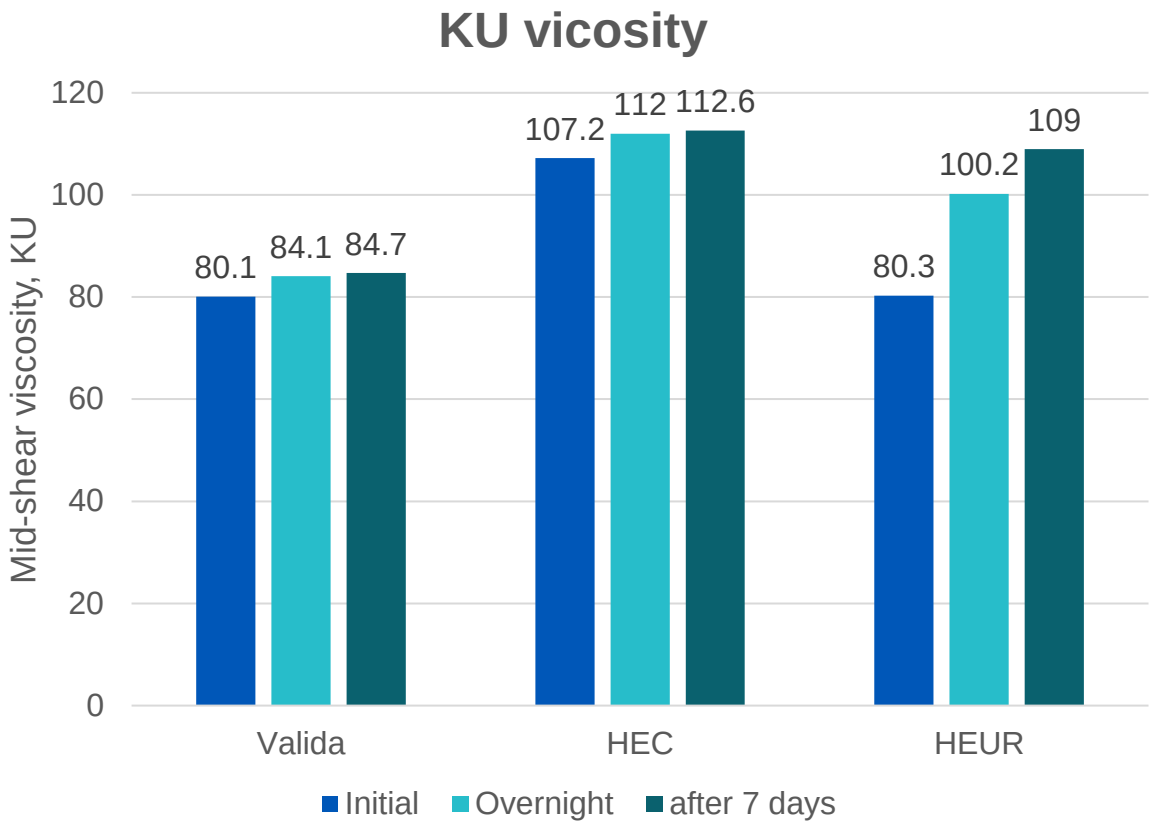
❖ **Valida added during the dispersion step**

Additional information:

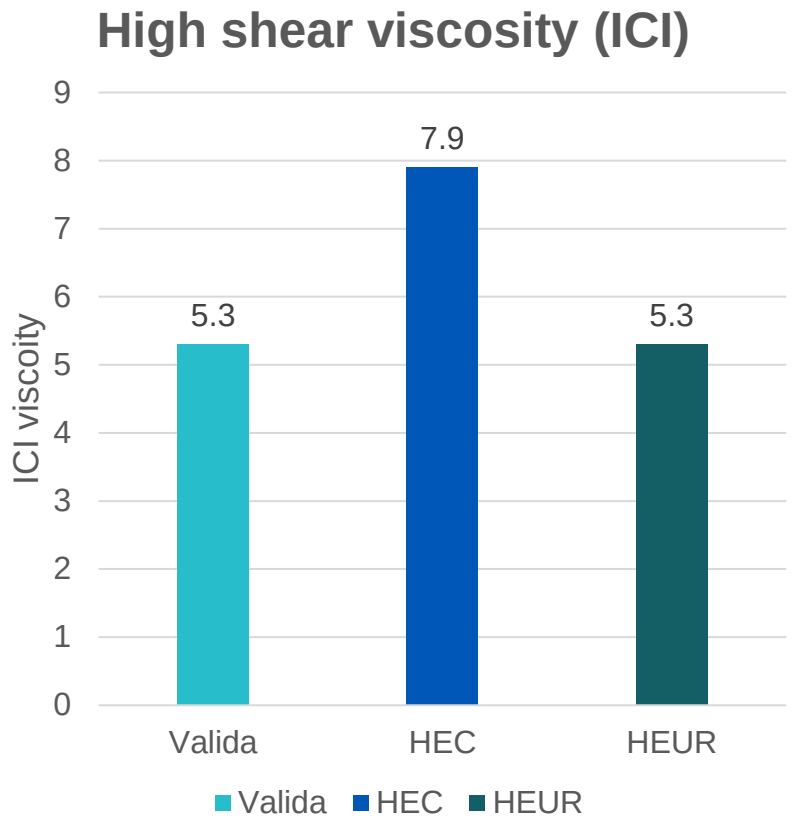
PVC= 44%
Solid content: 65% wt.

Dosage: 5% Valida paste. Valida paste consists of 8% active fiber content suspended in 92% water

Stable viscosity overtime



*Measured according to: ASTM D562 method B



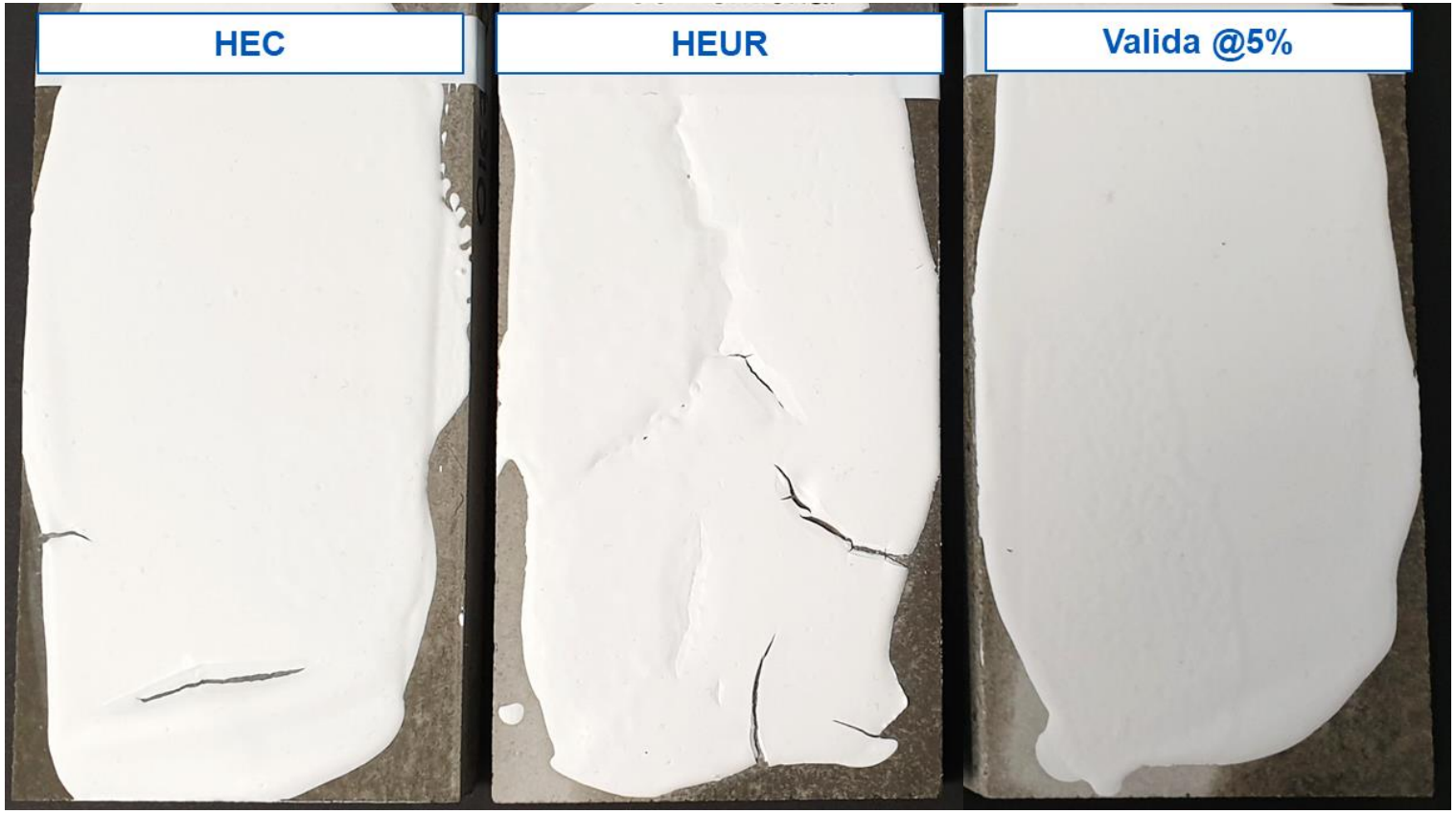
*Measured according to: ASTM D4287

Mud Cracking is not cracking anymore!

Reference Paint:	Mud cracking
Valida	None
HEC	Edge Cracking and checking
HEUR	Significant cracking and checking

Highly shear thinning - Film Building

Improved Sag Resistance



Thickness: 5-8 mm wet layer at 50 °C
*Dosage: 5% Valida paste. Valida paste consists of 8% active fiber content suspended in 92% water

Reduced Dirt Pick-up

HEC	HEUR	Valida @5%

Reference Paint:	Dirt pick-up*, (7 days), ΔL
Valida	0.31 Very low
HEC	0.4 Very low
HEUR	9.53 Medium

*Dosage: 5% Valida paste. Valida paste consists of 8% active fiber content suspended in 92% water

Valida boosts Rheology and Physical properties

Rheology:
- Improved stability
- Good Anti-Sagging
- Different KU viscosity

Improved physical properties:
- Higher Tensile strength
- Good elongation
- Improved adhesion to substrate

Low water absoprtion
Lower dirt pick-up

Properties	HEC (0.3%)	HEUR (0.3)	Valida @5%
KU viscosity (7 days)	112.6 KU	109.0 KU	**84.7 KU**
Dirt pick-up*, (7 days), ΔL	0.4 Very low	9.53 Medium	**0.31** **Very low**
Water absorption, (7 days), %	5.0	9.1	**5.0**
Anti-sag index	24 mils (600 µm)	20.4 mils (510 µm)	**24 mils** **(600 µm)**
Elongation at break, %	300	260	**320**
Tensile strenght, MPa	2.1	1.6	**3.8**
Adhesion to concrete, after 14 days, MPa	8.5 MPa	7.6 MPa	**9.0 MPa**
Mud-cracking (5-8 mm wet layer at 50 °C)	Cracking at the edge	Significant cracking	**No cracking**

Figure 1: Dosage: 5% Valida paste. Valida paste consists of 8% active fiber content suspended in 92% water. PVC= 44%
*Dirt pick up measured according to UNI 10792
*Water absorption measured according ASTM D6083

Quiz!

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What does Valida require for a good dispersion ?

A. Dispersing agent
B. pH tweaking
C. High temperature
D. Shear/Tip Speed

Case study:

Interior wall paint

Interior wall paint formulation

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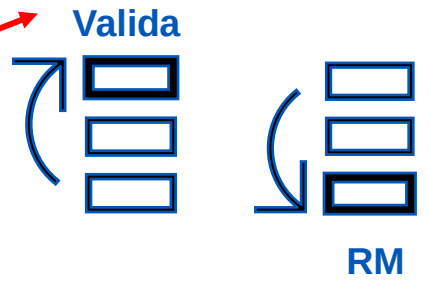
	Raw Material	Functionalities	Control	Valida based formulations	
	PVC = 75%				
			wt.%	wt.%	Wt%
Dispersion stage	Demineralised water	Solvent	15	15	15.0
	Vegetable oil and emulsifier	Defoamer	0.1	0.1	0.1
	Amino alcohol, 90% sc	Neutralising agent	0.1	0.1	0.1
	Polyacrylate Sodium salt, 40% sc	Dispersing agent	0.2	0.2	0.2
	Add under high stirring (2000rpm = 6m/s)				
	Valida, gel	**Biobased multifunctional stabiliser**	**0**	**6.7**	**13.33**
	Dispersion for 10 minutes at 1800rpm				
	Calcium carbonate, D50 = 5µm	Filler	40.5	40.5	40.5
	Rutile titanium dioxide	Pigment	10	10	10
	Dispersion for 15 minutes at 1000 - 1500 rpm				
Let down Stage	Styrene 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***
	Vegetable oil and emulsifier	Defoamer	0.1	0.1	0.1
	Demineralised Water	Solvent	21.10	14	9.0
	Total		100	100	100

*Valida, gel consists of 3% fibers suspended in 97% water

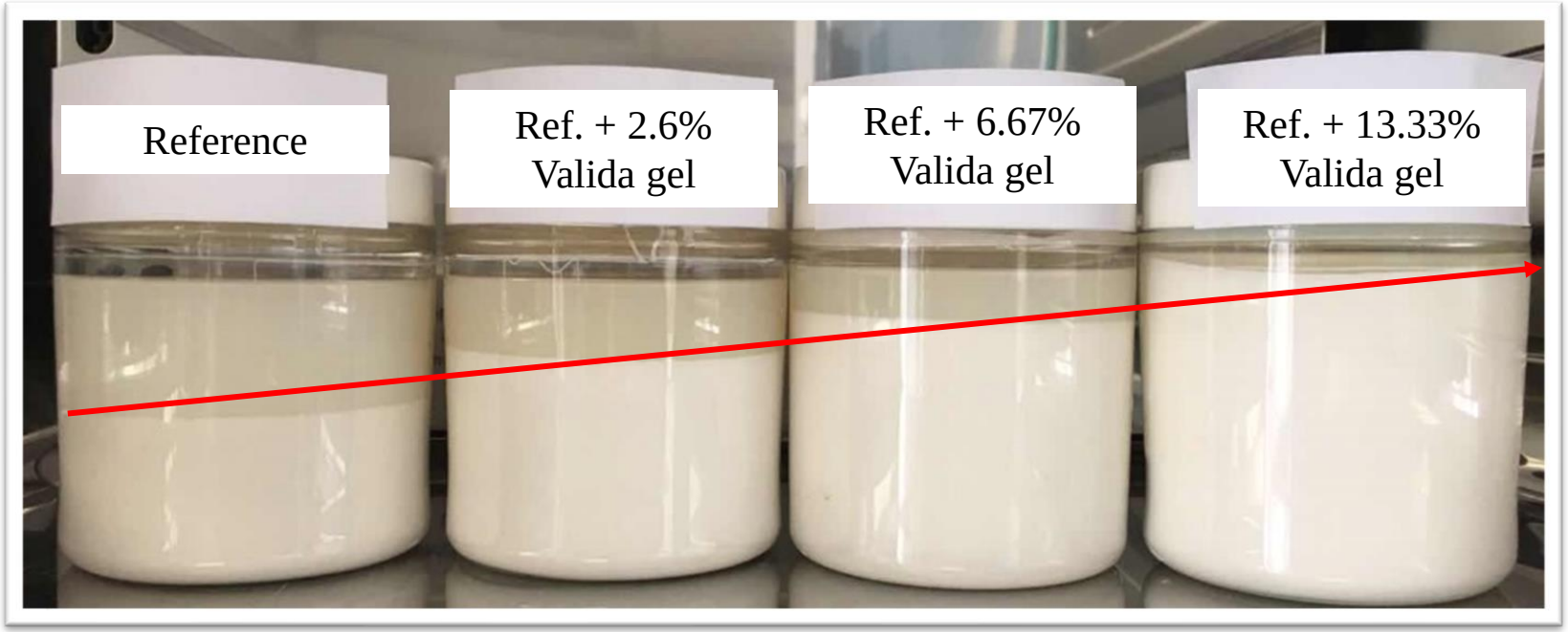
❖ **Valida added during the dispersion step**

Synergy with conventional rheology modifiers



Improving in-can stability

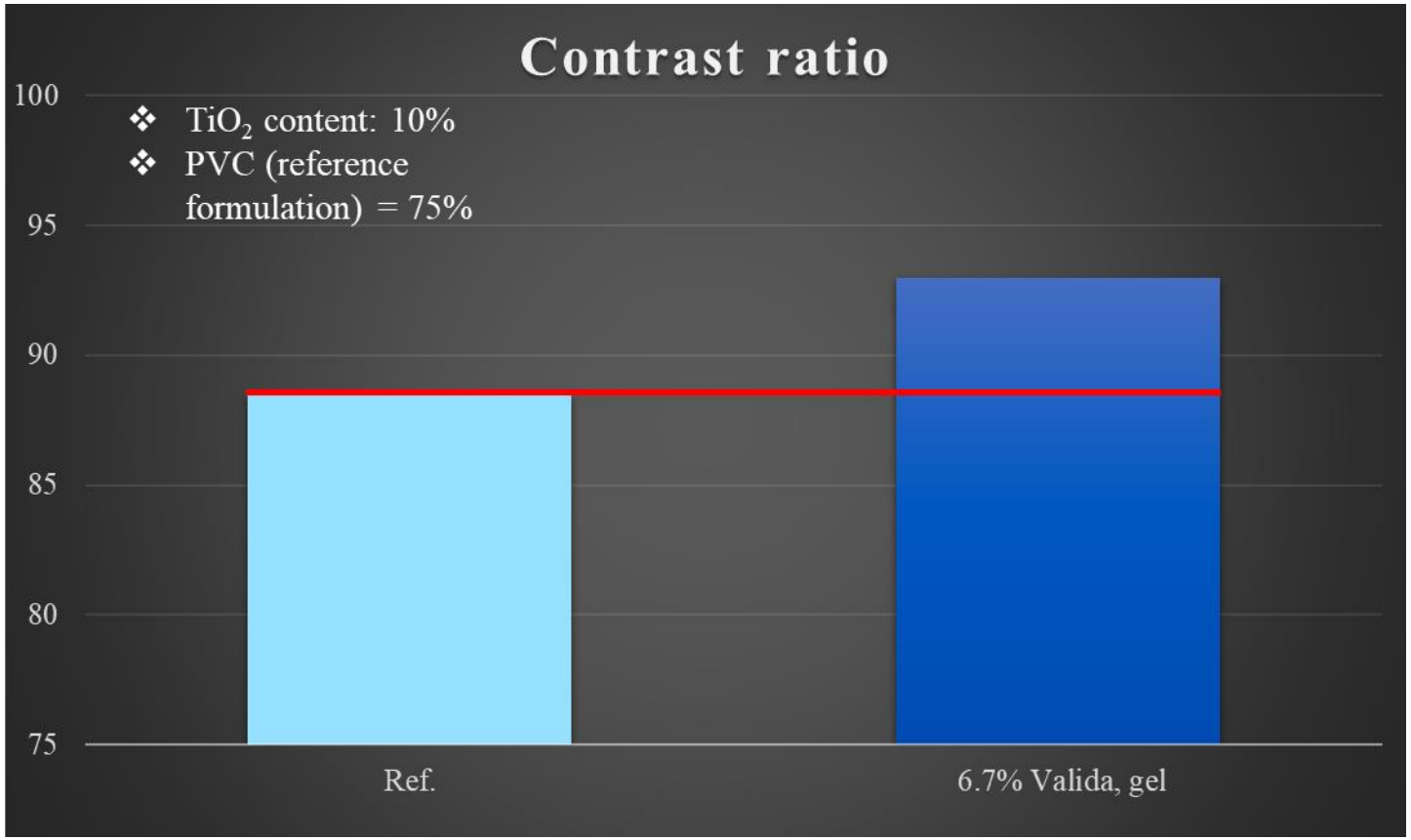
- Testing conditions: 6 months stability test in an oven under 40ºC



*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 TiO_2



Potential for complementing TiO_2 in formulation

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

Improved sagging resistance

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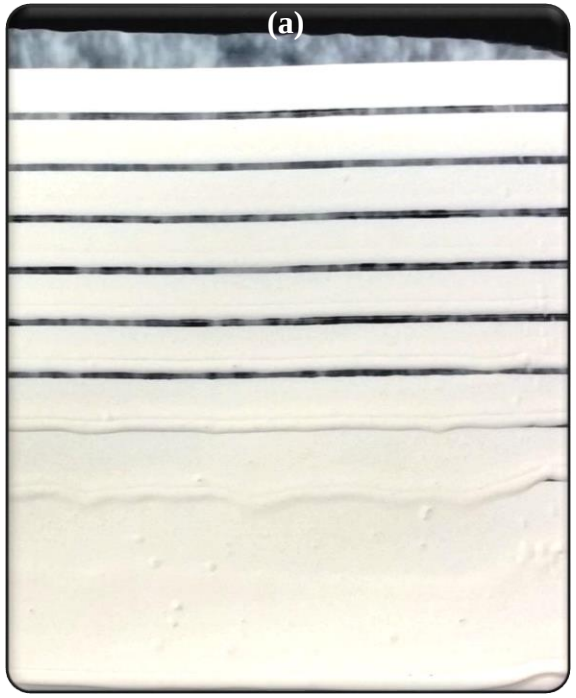
Reference

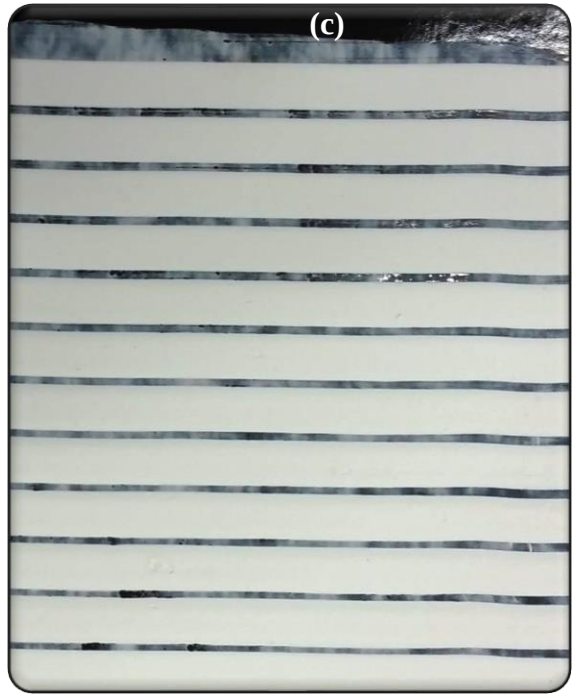


Sagging limit 760µm

6,67% Valida

Sagging limit 890µm

13.33% Valida

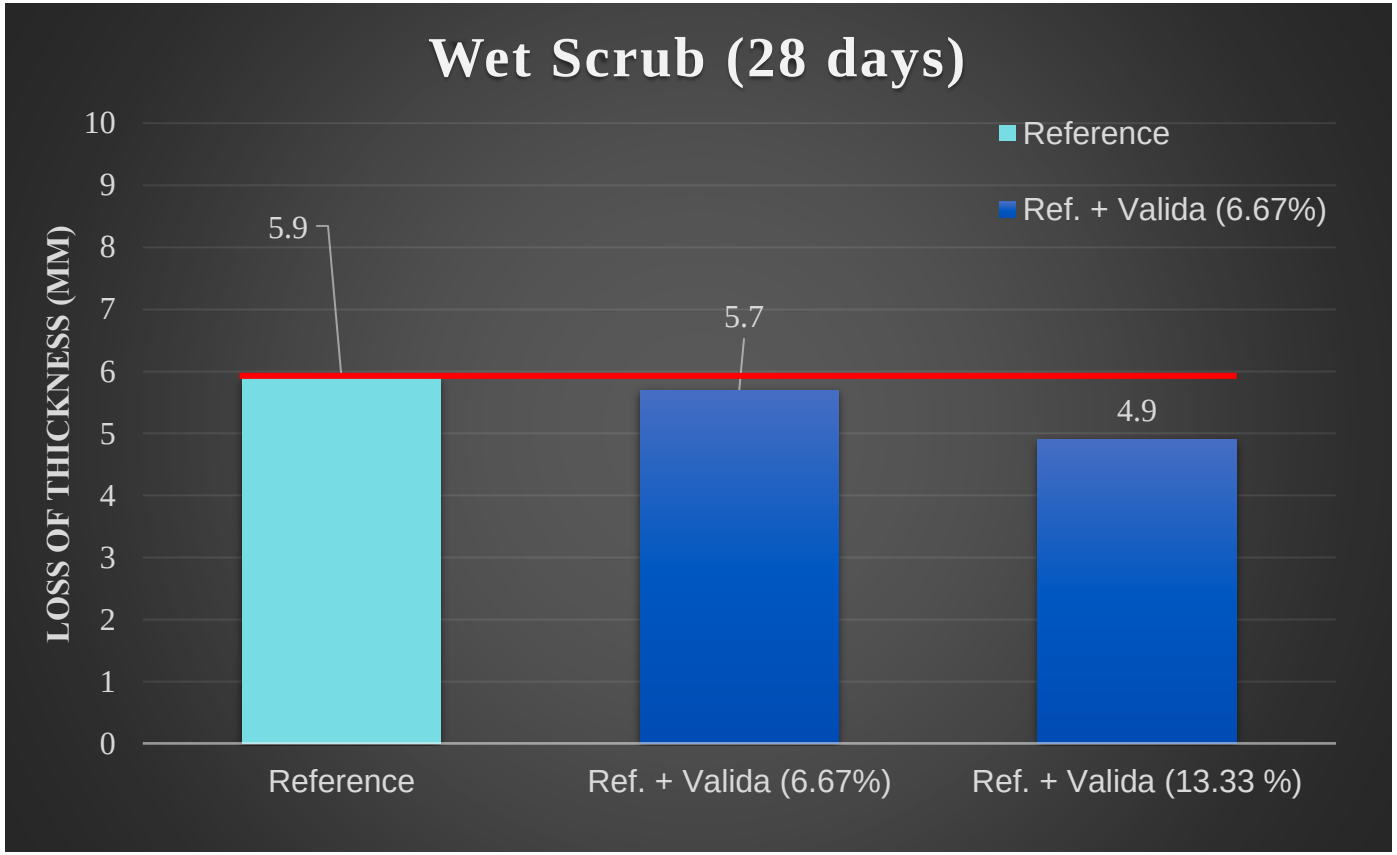


Sagging limit 1520µm

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

Wet-Scrub

Paint formulated with Valida shows improved wet scrub resistance



*Dosages based on Valida,3% “as received”

- Test standard: Internal method based on ISO 11998
- Paint formulated with 6.67% Valida,3% is Class 2 (loss of weight < 20 micron)
- Paint formulated with 13.33% of Valida,3% is Class 1 (loss of weight < 5µm).

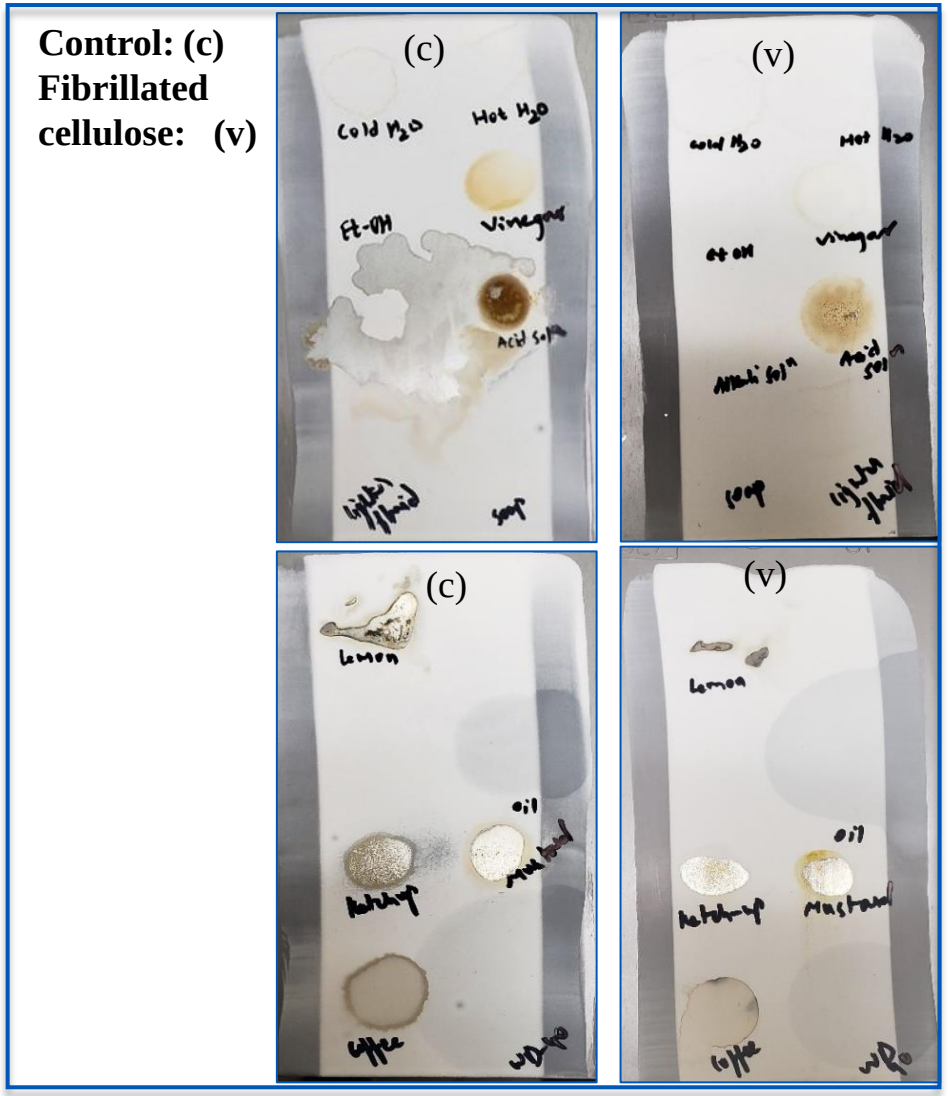
Additional Benefits

Enhanced resistance to stains in interior wall paint

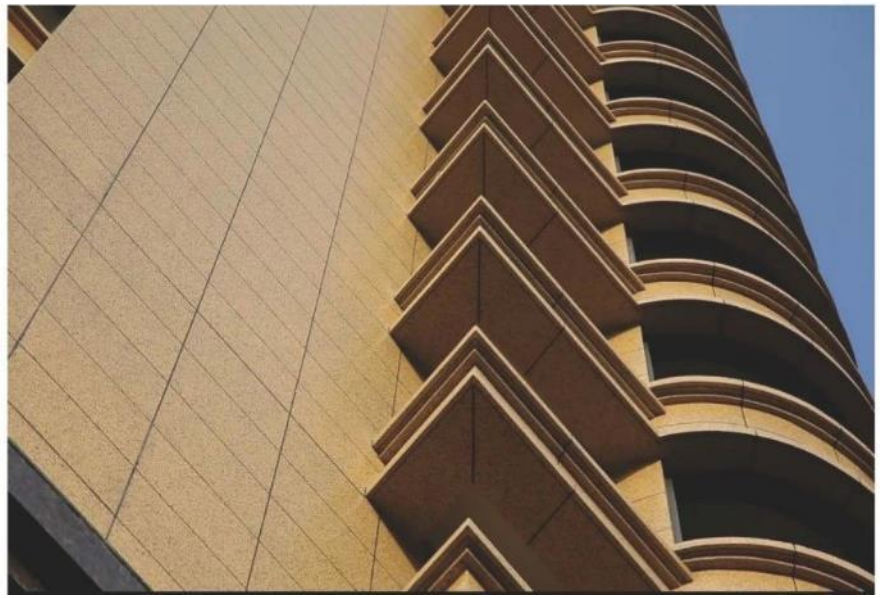
Households chemicals	Reference formulation	Fibrillated cellulose formulation
Vinegar	✘	●
Alkali solution, 50 wt.% NaOH in water	✘	●
Acid solution, 30 wt.% HNO_3 in water	✘	●
Lemon fruit	✘	●
Ketch-up	✘	●
Coffee	✘	●
Distilled water, cold Distilled water, hot Ethyl alcohol (50% volume) Diluted soap solution 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)



Application Example - Multicolor paint



Finished surface

Reference

Valida-based formulation

Store at room temperature for 24h

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

Closing considerations

Formulation tips in paints and coatings:

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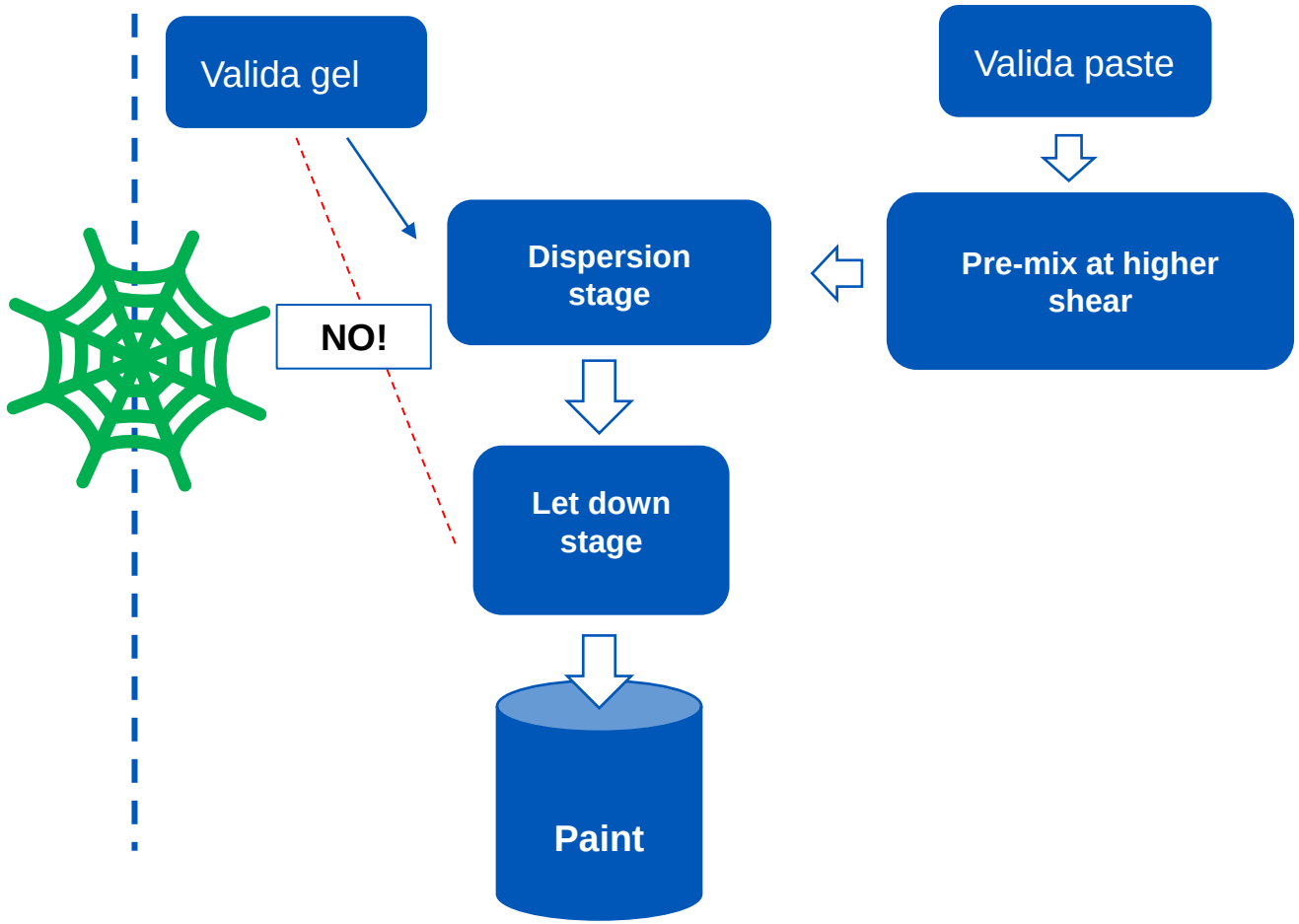
- **Product Validation @ 0.4% active fibers!**

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

Why?

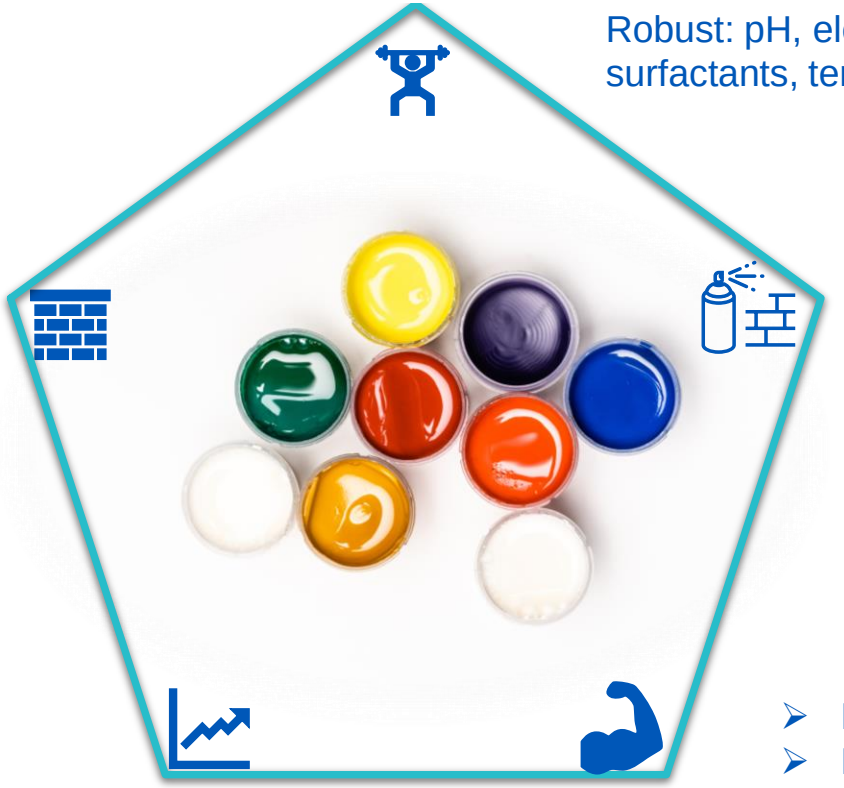
- **Use enough shear to activate the network!**



Valida: Multi-functional stabiliser (not a thickener)

100% Natural and Sustainable

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



Surface Benefits:
- Anti-Staining
- Improved Contrast Ratio
- No Mud-Cracking

Spray-ability
- Highly shear thinning,
- Thixotropic,
- Sprayable

- High stabilising capacity,
- Anti-Sagging

- Enhanced Chemical
- Physical properties

Thank you!

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