



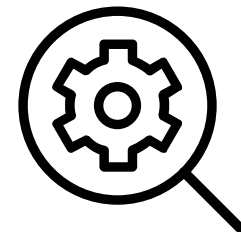
# Hydroxyapatite for architectural paints: Decosphaera® Transparent HAP 30

# Agenda

- **About hydroxyapatite**
- **Lamberti's expertise with hydroxyapatite**
- **Hydroxyapatite as matting agent: Decosphaera® Transparent HAP 30**
- **Decosphaera® Transparent HAP 30: application tests**
- **Appendix**

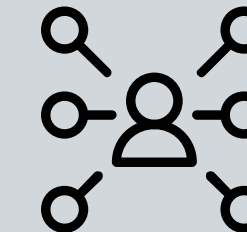
# Hydroxyapatite is a naturally occurring mineral from calcium apatite

## Main characteristics and properties of HAp



- **Hydroxyapatite** (hereinafter also **HAp**) is a natural form of calcium phosphate with the following chemical formula:  
 **$\text{Ca}_{10}(\text{PO}_4)_6(\text{OH})_2$**
- HAp is the **main component of bones and teeth** (up to 50% by volume and 70% by weight). For this reason it is characterized by an high level of **biocompatibility and osteoconductivity**
- HAp is an inorganic material that is obtained through a synthesis process using mainly phosphoric acid and calcium hydroxide

## Main sectors and applications for HAp



- HAp is a versatile ingredient which can be applied in different fields such **as chemistry and biology**
- The main sector where Lamberti is currently selling HAp is **cosmetics and personal care**
- At the same time, other markets such as **architectural paints** are under **technical valuation** in order to potentially expand HAp's applications

# In the last years, Lamberti has developed a quite relevant expertise with hydroxyapatite

2017-2020

From 2021

## JV with Kalichem



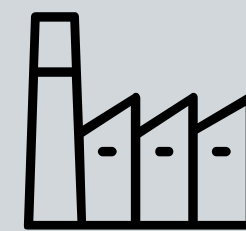
- Entered into the market of **hydroxyapatite** for **cosmetic and personal care**
- Acquired a **product platform** to start product and technology development in cosmetic and personal care

## Breakthrough in the cosmetics and personal care market



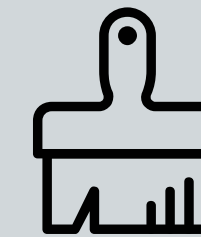
- **Expansion of the product portfolio** through the development of HAp for various applications within cosmetics and personal care
- **Geographical expansion** in new markets

## Expansion of production capacity and of industrial know-how





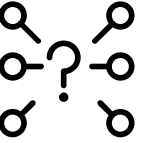



- To meet the **increasing market demand**, **additional production capacity** is now available in one of our main plant
- At the same, **more applicative labs** are getting familiar with the **technical know-how**

## Further development of the market of hydroxyapatite


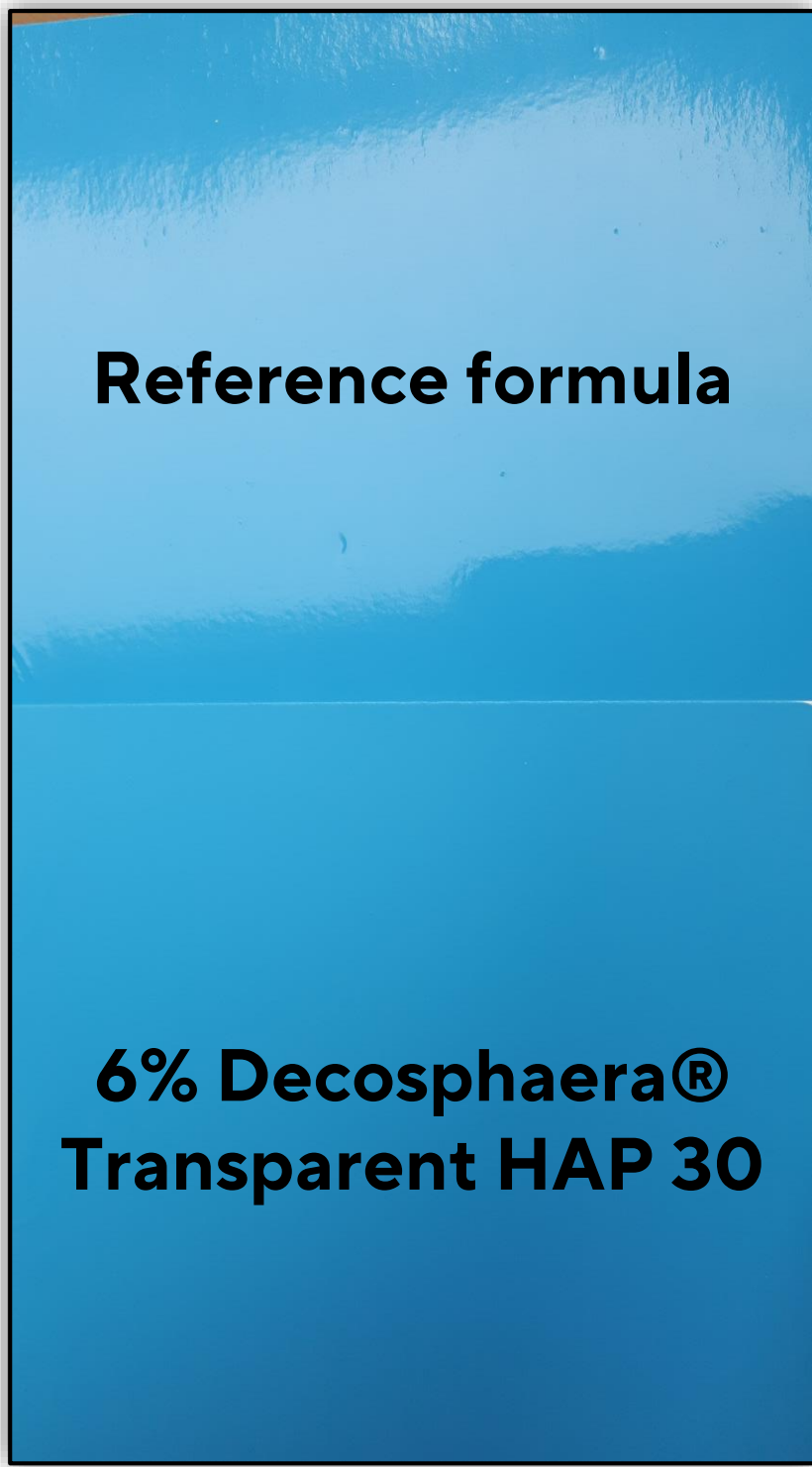

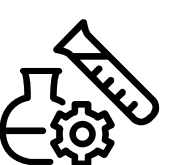


- Combining **industrial and commercial expertise** with extensive **R&D knowledge**, the main target is to extend the application of HAp also in other sectors where Lamberti operates
- **Architectural paints** is one of the target markets

## Decosphaera® Transparent HAP 30 as matting agent for architectural paints: rationale of the test and value proposition of the material

Tests' rationale		Remarks
	<b>Types of tests performed</b>	Extensive and complete lab test have been performed in order to have a <b>preliminary proof of concept</b> of the material
	Why <b>Decosphaera® Transparent HAP 30</b> as matting agent	From the first lab tests performed, <b>Decosphaera® Transparent HAP 30</b> has showed interesting results as <b>matting agent</b> for architectural paints
	Potential <b>future developments</b>	Lab test are promising, however to have a consistent <b>proof of concept</b> of <b>Decosphaera® Transparent HAP 30</b> as matting agent, we need to make more extensive tests
Market value proposition for the market		Remarks
	<b>Value added</b> by Lamberti	<b>Lamberti</b> can leverage on both a long-lasting experience in <b>architectural paints applications</b> as well as an extensive <b>expertise in hydroxyapatite</b>
	<b>Environmental impact</b>	HAp is an <b>inorganic</b> ingredient and therefore its <b>environmental profile</b> could potentially be attractive
	Positive <b>market trend</b>	<b>The reduction of the environmental impact</b> of both chemical ingredients and finished products is a growing market trend

# Decosphaera® Transparent HAP 30: application tests overview and technical value proposition

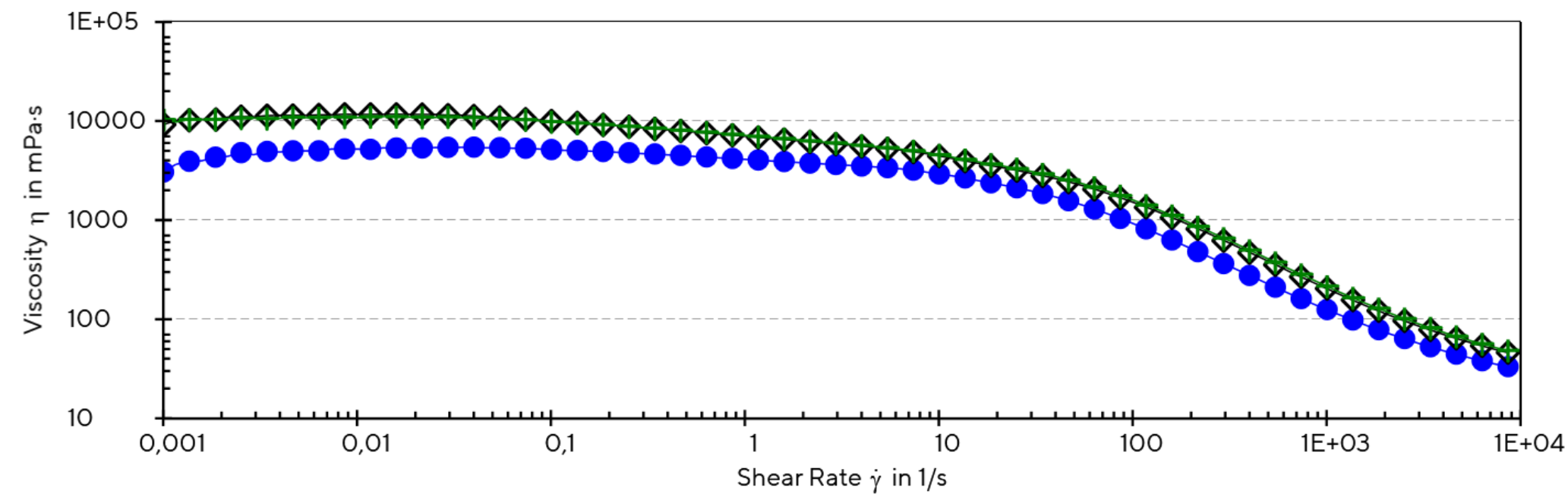
Most relevant testing conditions	Key characteristics we have tested in an architectural paint formulation	Decosphaera® Transparent HAP 30 as matting agent: performance snapshot
 <b>PVC 20 high gloss paint</b> (Pure Acrylic latex)	<b>1</b> Rheology/viscosity	 <p>Reference formula</p> <p>6% Decosphaera® Transparent HAP 30</p>
 <b>Reference: 20% TiO<sub>2</sub></b>	<b>2</b> Pigment compatibility	
 Substitution of <b>6% TiO<sub>2</sub></b> with the different matting agents <sup>(1)</sup>	<b>3</b> Whiteness	
	<b>4</b> Hiding power	
	<b>5</b> Gloss	
	<b>6</b> Dry-burnishing resistance	
	<b>7</b> Wet scrub resistance	

(1) Only 4% substitution for silica because of technical constraints



# 1 Rheology: influence on flow and in-can stability after storage

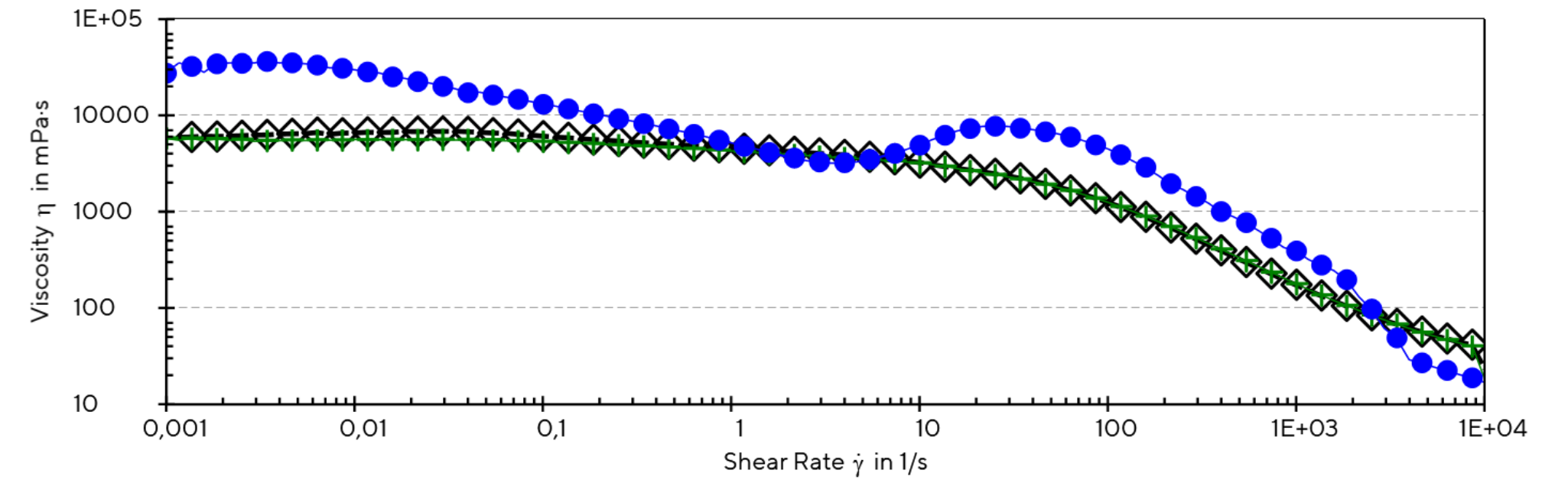
## Starting flow curve



4% Silica    Reference (TiO2 - no matting agent)    6% Decosphaera® Transparent HAP 30

●  $\eta$     ◆  $\eta$     +  $\eta$

## Flow curve after 14 days at 50 degrees

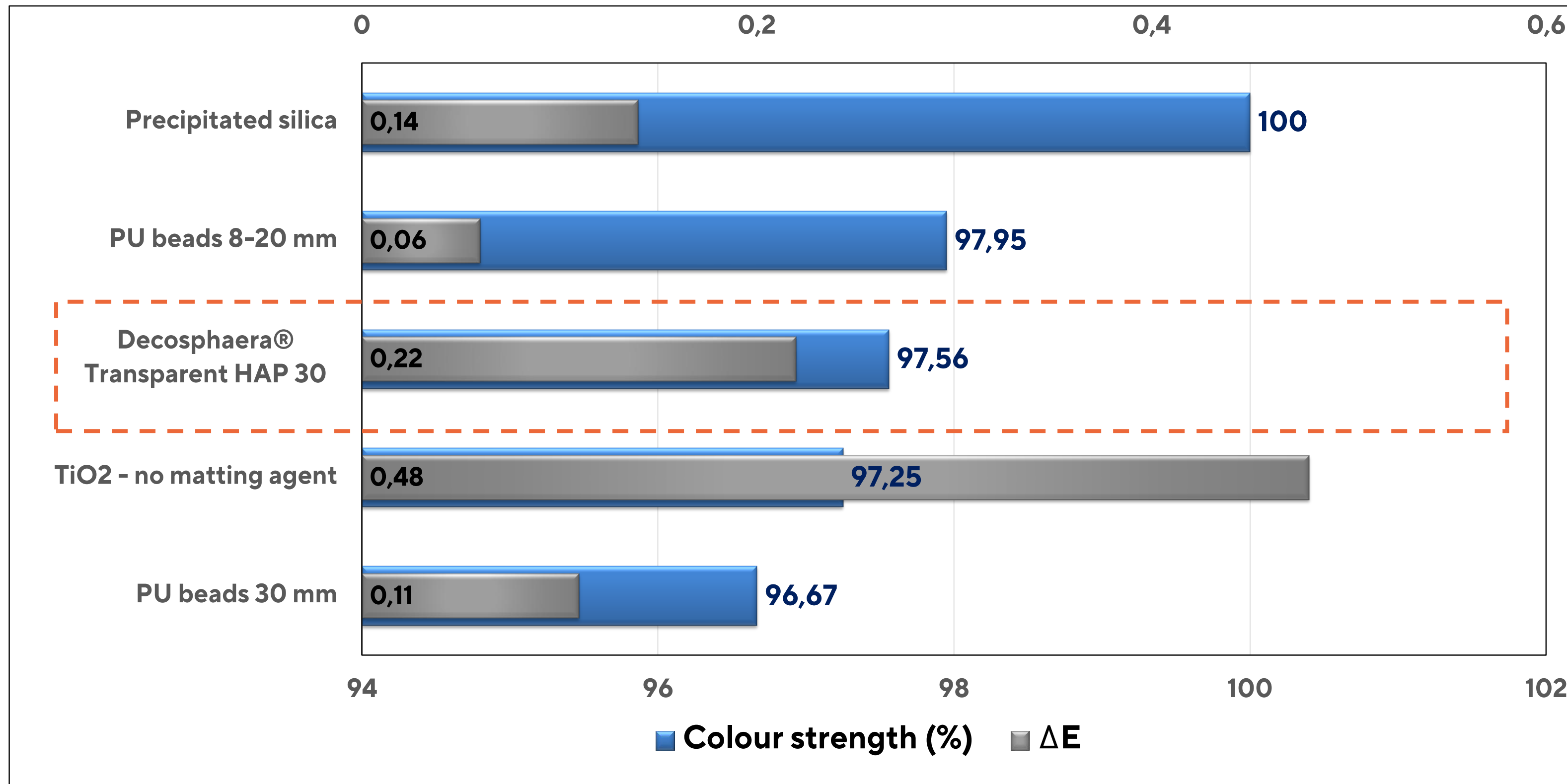


Reference (TiO2 - no matting agent)    6% Decosphaera® Transparent HAP 30    4% Silica

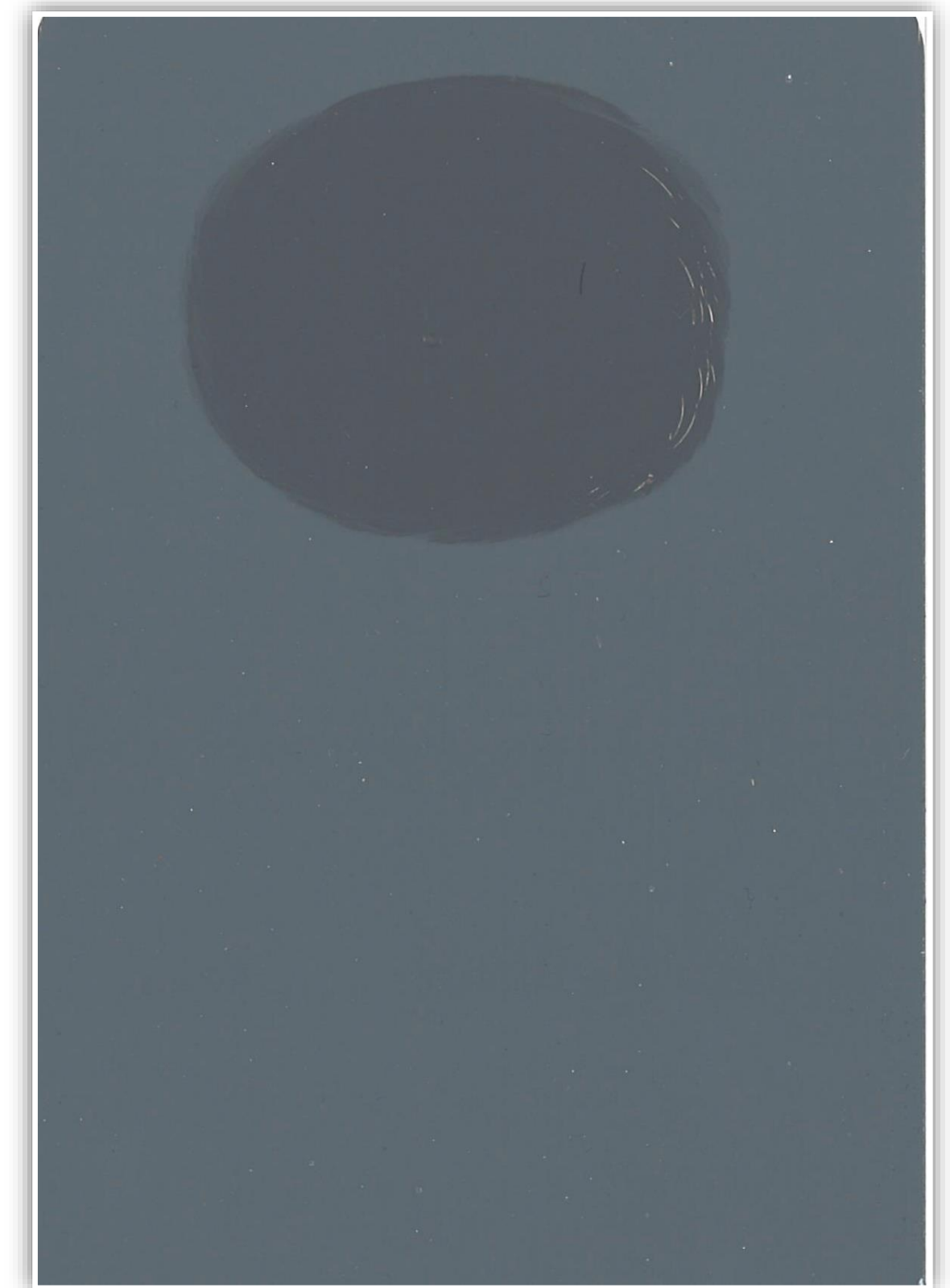
◆  $\eta$     +  $\eta$     ●  $\eta$

## 2 Decosphaera® Transparent HAP 30 as matting agent: pigment compatibility

Pigment compatibility comparison



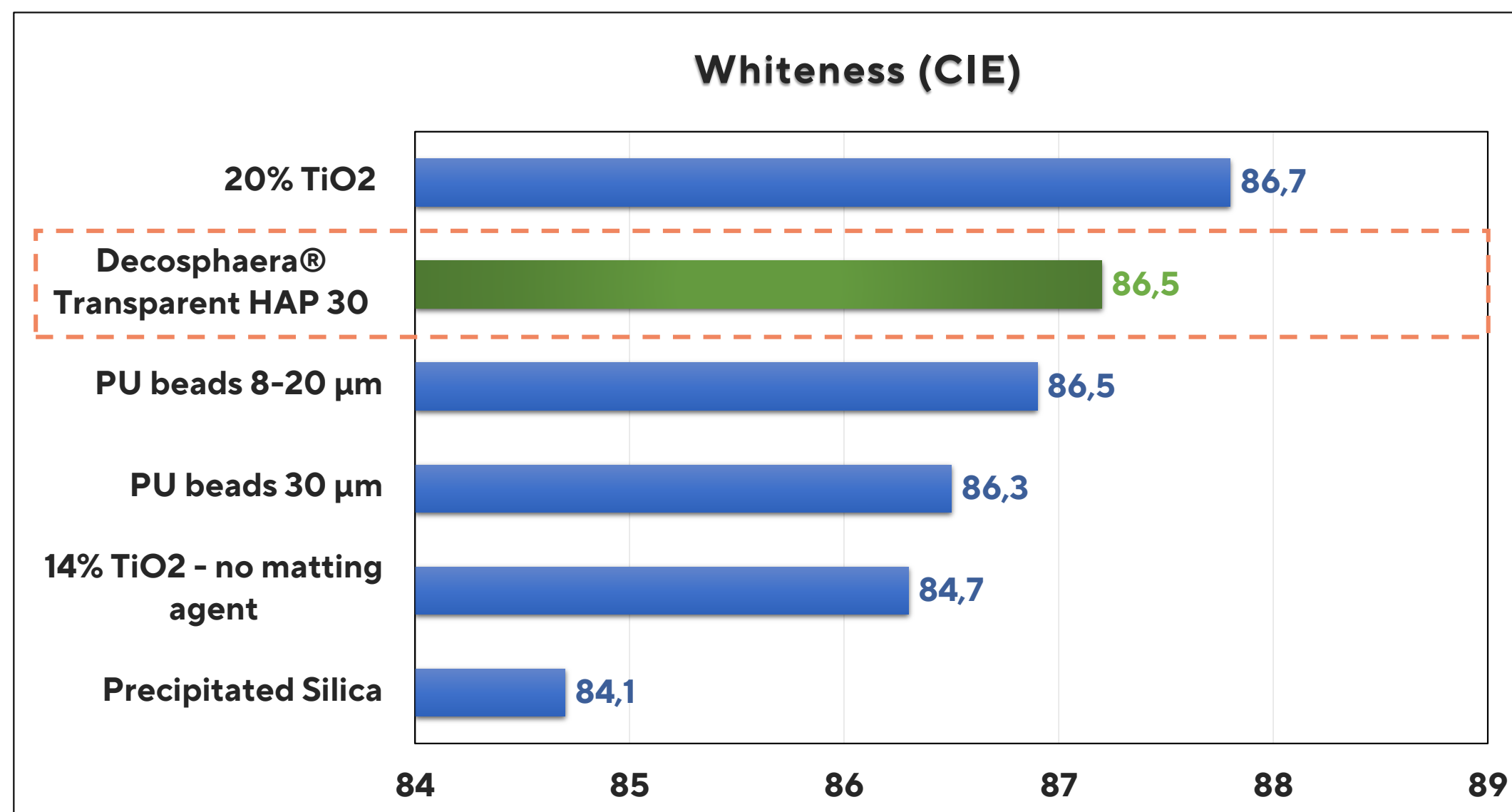
Decosphaera® Transparent HAP 30 performance example





### 3 Decosphaera® Transparent HAP 30 as matting agent: influence on whiteness and wet-scrub resistance

#### Decosphaera® Transparent HAP 30 whiteness performance



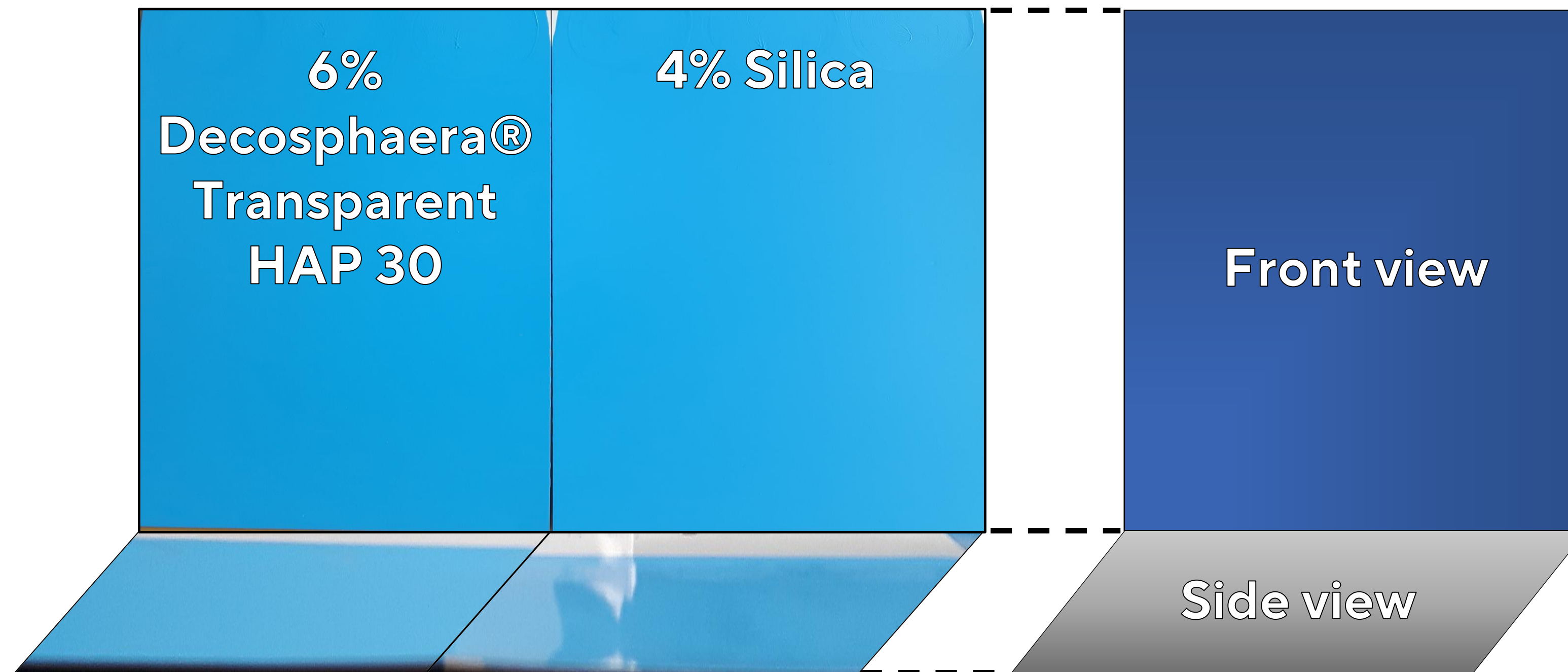
#### Remarks

- Generally speaking, **Decosphaera® Transparent HAP 30** does not create any significant drift in whiteness
- In addition to that, we can also claim that **Decosphaera® Transparent HAP 30** does not create any significant drift in whiteness with respect to high performance matting agents of comparable size

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## Decosphaera® Transparent HAP 30 as matting agent: appearance of drawdowns at different angles

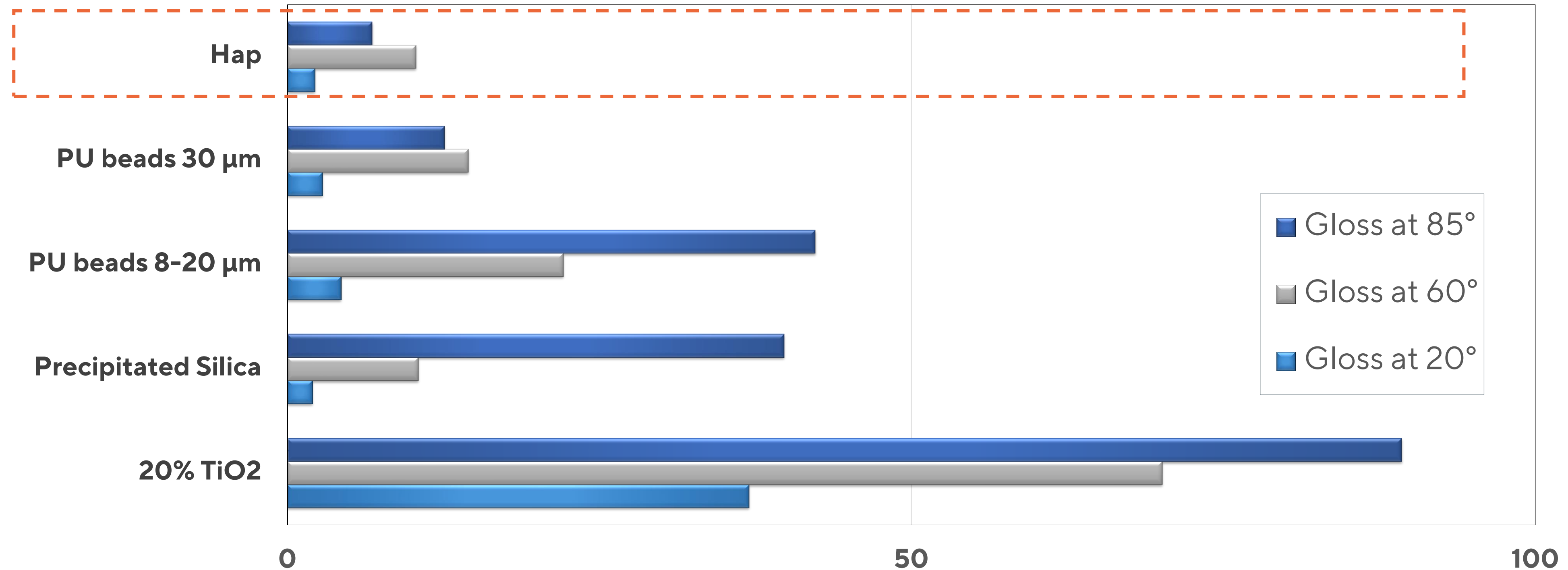
Decosphaera® Transparent HAP 30 provides low gloss, regardless of the observation angle



### Remarks

- **Decosphaera® Transparent HAP 30** allows to obtain **ultra-matt finishes** irrespective of the observation angle
- On the other hand, **precipitated silica shows lack of matting property when looked at low angles**, showing light reflection (see side view picture)
- This is definitely a **crucial property of Decosphaera® Transparent HAP 30**, especially when used for large surfaces as it ensures a homogeneous appearance of the entire coated area

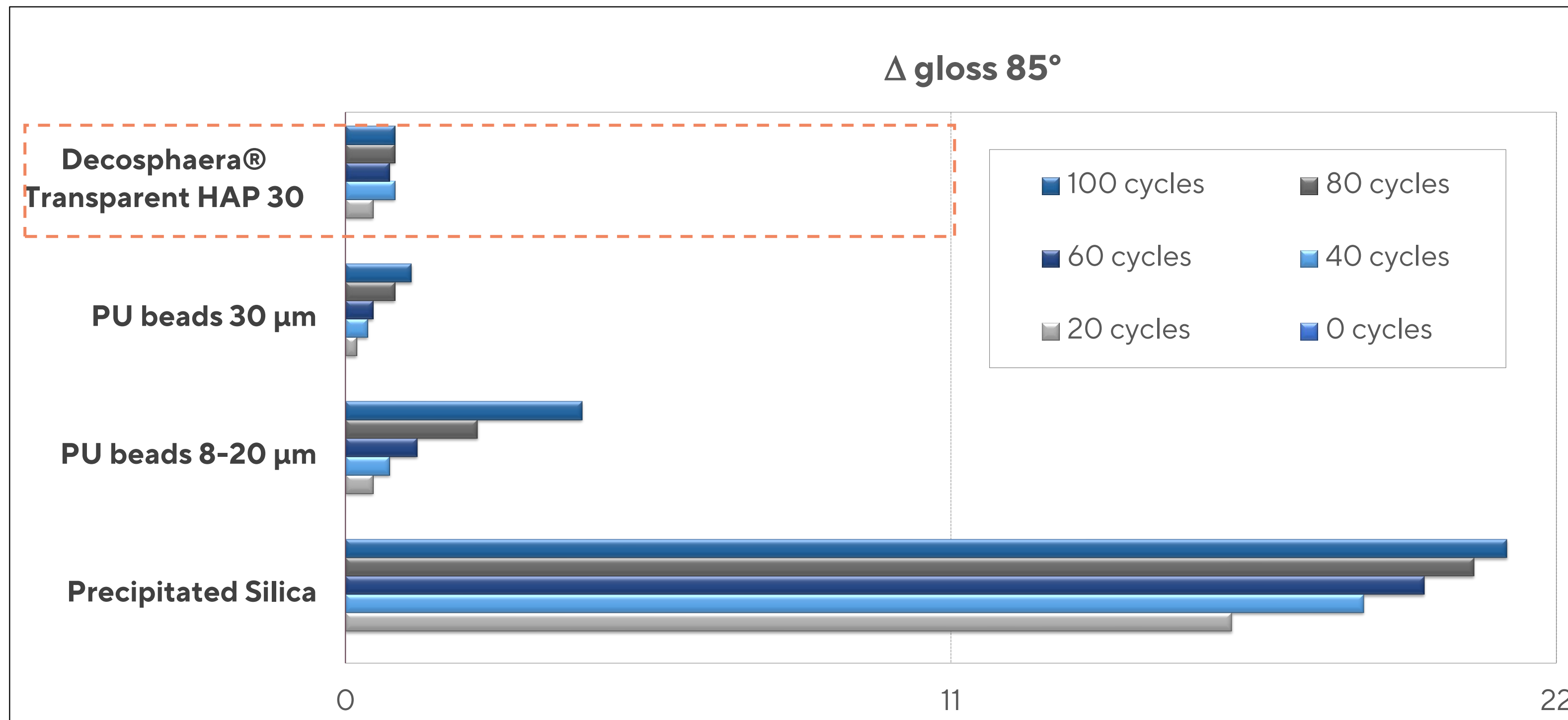
5 Decosphaera® Transparent HAP 30 shows a good gloss performance at 10°, 60° and 85°



The **dependency of matting efficiency** on observation angle is strictly related to the difference between gloss values taken at 20° and 85°. The lower, the better.

## 6 Burnishing resistance: $\Delta$ gloss at 85° after burnishing

Decosphaera® Transparent HAP 30 shows good gloss performance also at 85° and



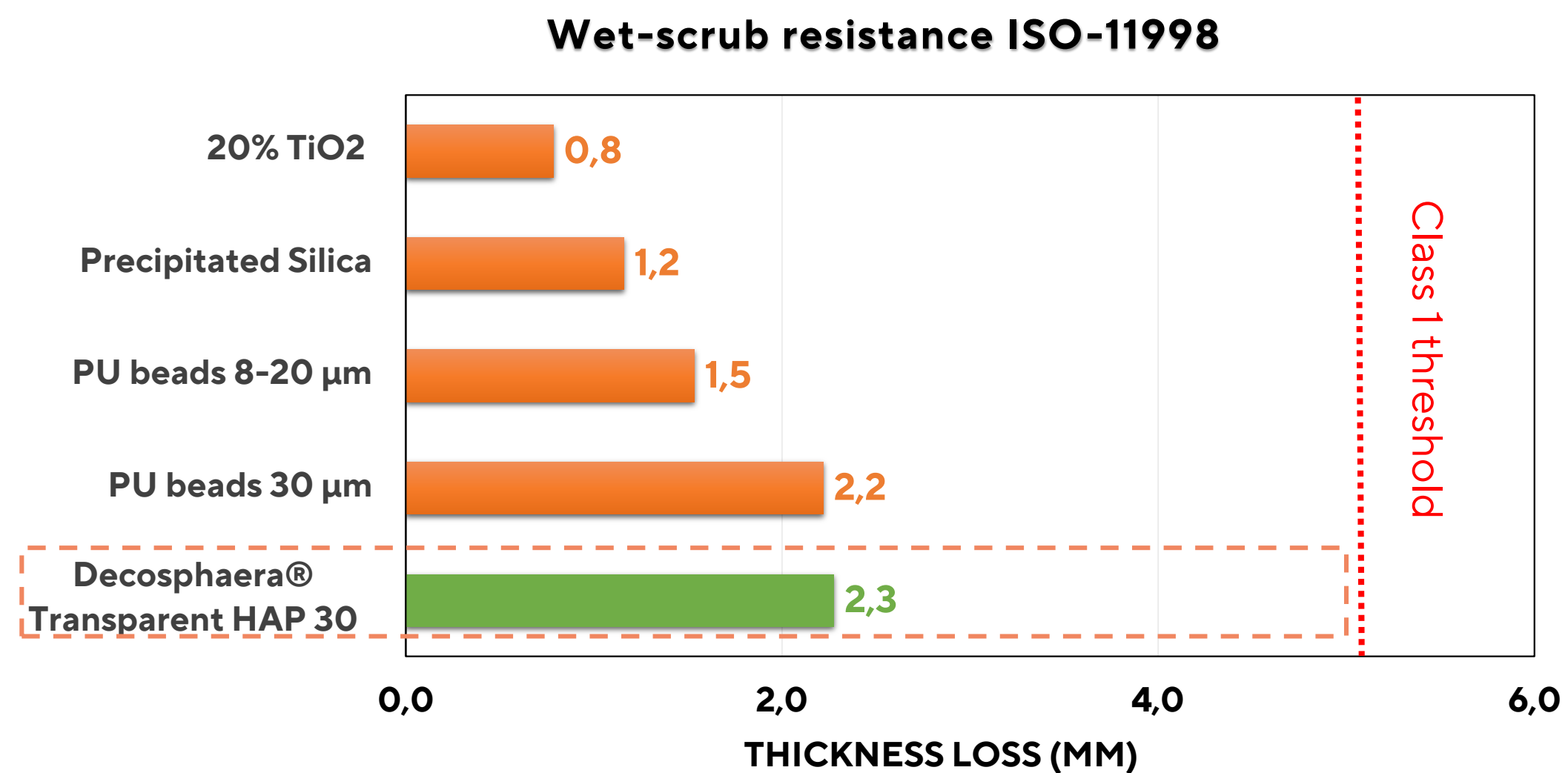
Decosphaera® Transparent HAP 30: performance example





## 7 Decosphaera® Transparent HAP 30 as matting agent: wet-scrub resistance

### Decosphaera® Transparent HAP 30 wet-scrub resistance performance<sup>(2)</sup>



### Remarks

- **Decosphaera® Transparent HAP 30 shows a lower wet scrub** resistance than the reference benchmark
- This difference is quite small, allowing to formulate high quality matt paint with wet-scrub resistance values well within the Class 1 Resistance threshold
- **The performance of Decosphaera® Transparent HAP 30 is strictly related to its different size** as clearly shown by the comparable performance of 30 mm PU beads
- Beads protect the coatings: bigger the size, higher the resulting loss in weight per each bead removed

(2) Wet-scrub performance has been measured according to ISO 11998

## From our tests Decosphaera® Transparent HAP 30 as matting agent shows good performance for many key characteristic. Potential issues are limited

Key characteristics		Lamberti team performance evaluation
1	Rheology/viscosity	5/5
2	Pigment compatibility	4,2/5
3	Whiteness	4,4/5
4	Hiding power	3/5
5	Gloss	5/5
6	Dry-burnishing resistance	4/5
7	Wet-scrub resistance	3/5
Potential issues		Remarks
	Settling	<b>Settling</b> of Hap particles during time may occur, depending on the specific rheology and composition of the final formulation
	Rheology adjustments	A proper <b>adjustment of the rheology</b> modifiers package might be necessary in order to prevent settling

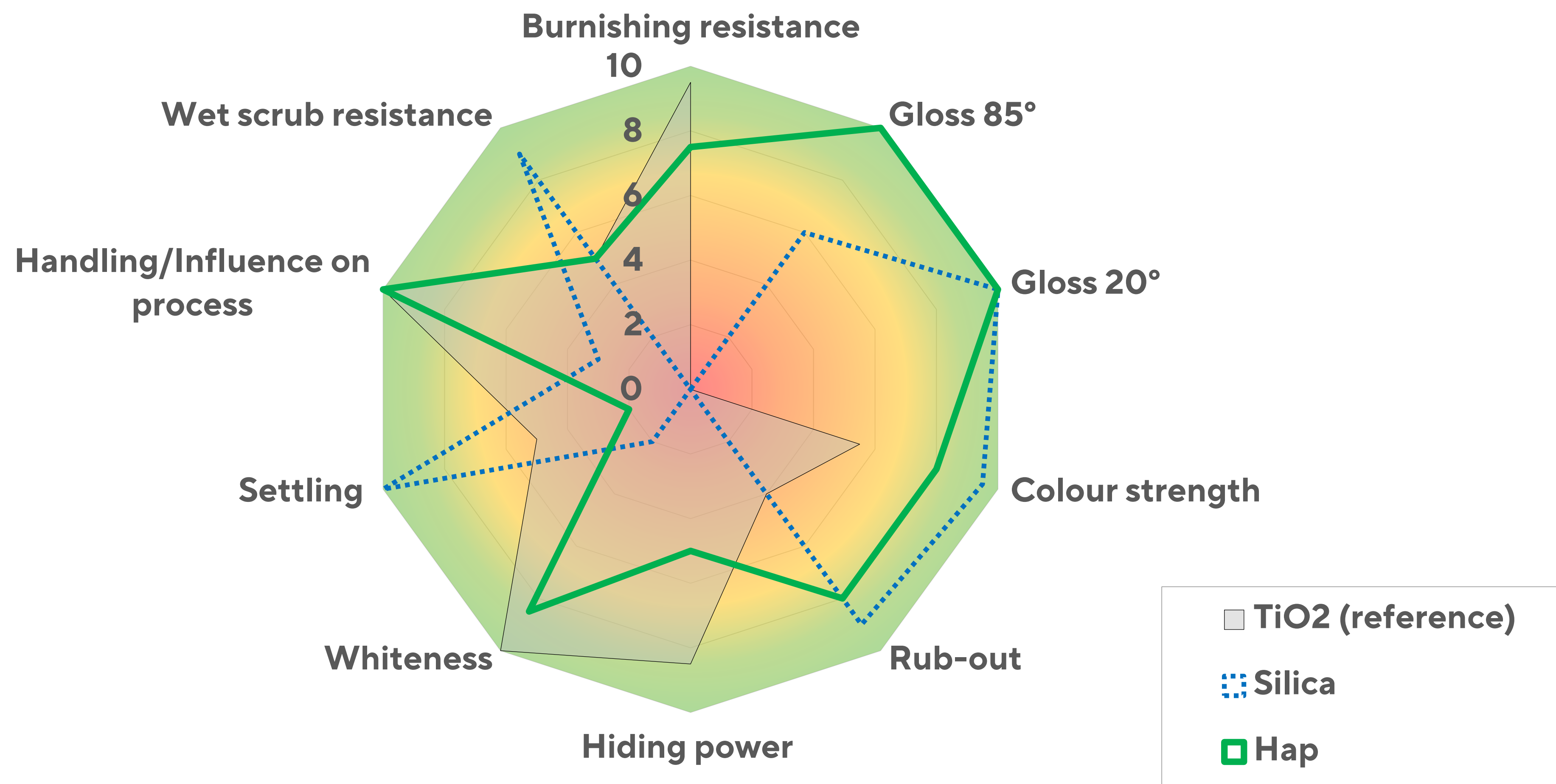




# Appendix



## Decosphaera® Transparent HAP 30 as matting agent: overall comparison - 1





## Decosphaera® Transparent HAP 30 as matting agent: overall comparison - 2

