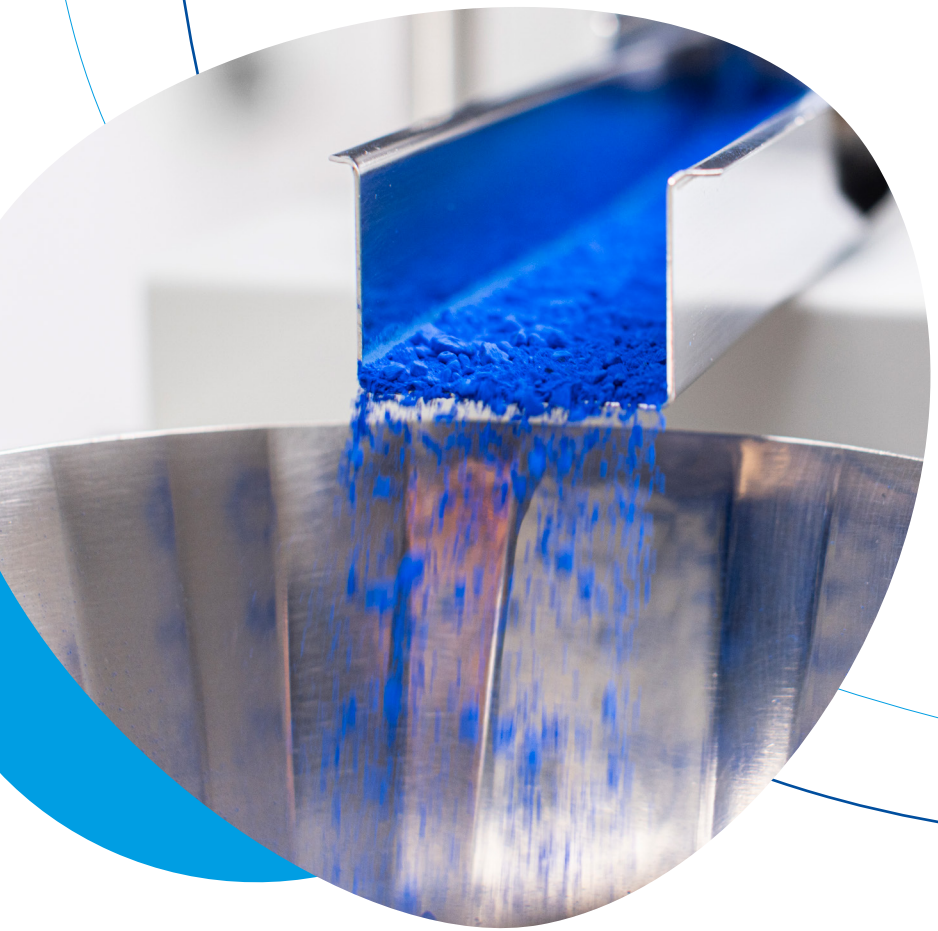


APPLICATION INFORMATION

PTFE-FREE TEXTURES IN POWDER COATINGS WITH CLAYTONE AND GARAMITE

PFAS-free

All products in this brochure are PFAS-free.

H-A 1

A member of ALTANA

Content

Introduction

Polytetrafluoroethylene (PTFE) is a typical representative of perfluoroalkyl and polyfluoroalkyl substances (PFAS) that provides unique properties for powder coatings. The effects range from scratch resistance to the creation of fine textures. In particular, the robust, fine texture is a desired design in the market today. It covers functional as well as decorative demands. Its usage has been increasingly critically assessed at a global level for some time now, because products from this group of chemicals are suspected of being harmful to health. BYK provides a solution that avoids the use of PFASs entirely and still obtains a fine texture design in powder coatings by using CLAYTONE and GARAMITE. It helps to fulfill the demand for matt, fine texture designs without fear of rapid emergency changes in the formulation due to regulatory restrictions.

For additional information on additives and technical topics, please contact us:
powderlab.BYK.Wesel@altana.com

Note

To ensure the best appearance and full functionality, please open in Adobe Acrobat.

CLAYTONE and GARAMITE in powder coatings

Various products of the product lines CLAYTONE and GARAMITE can be used to create structure or texture finishes by increasing the melt viscosity and providing predictable rheology for powder coatings. The resulting fine texture finishes offer an alternative to PTFE-based additives. CLAYTONE and GARAMITE types offer a selection of visual effects. Differences in the combination of gloss level, texture fineness and dosage reliability can be achieved and selected by using these types. These effects are supported by the composition of the formulation.

CLAYTONE shows a distinct strength in hybrid systems (polyester + epoxy), while GARAMITE shows its strength in HAA systems (polyester + ß-hydroxyalkyl amide). Nevertheless, both product lines are suitable for all types of powder coating resin systems.

The additives need to be mixed with resin, hardener, pigments, and other raw materials in a high-speed mixer and extruded afterwards. Good dispersion of the additive by the extruder promotes texture development.

Production process of powder coatings

Net weight

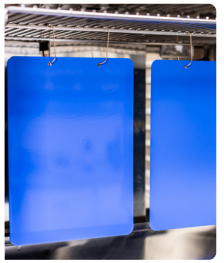
Pre-mixing

Extrusion

Grinding

Sieving

Application



Curing

G.01

Evaluation of optical appearance, structure, and texture effects

The texture effect achieved can be evaluated visually or, for example, with a 3D surface scan using spectro2profiler provided by BYK Gardner. This instrument takes multiple pictures and generates a 3D topography of the coating surface.

The explanation of 3D topography is slightly more complex and is indicated by a color scale:

- An even and homogenous color indicates a smooth surface.
- A color gradient from yellow to green shows differences between the minimum and maximum height, which can be perceived as structure.
- A color gradient from yellow to violet shows even higher differences between the minimum and maximum height, which can be seen as texture.

Color scale

Minimum
No texture

Maximum
Texture

The measurement area for the 3D topography is approx. 15 mm x 15 mm, while the size of the photographed samples is approx. 60 mm x 60 mm.

G. 02

Hybrid powder coating systems (polyester + epoxy)

Hybrid formulations include a leveling additive for smooth finishes. To achieve a texture effect, PTFE wax-based additives are used. With the CLAYTONE and GARAMITE product lines, the texture effect is created without PTFE.

These different starting point formulations show various possibilities with BYK additives. CLAYTONE and GARAMITE can be used with or without a leveling additive to achieve different texture appearances.

Starting point formulations

Raw material	Control (no texture)	Standard texture formulation	Without leveling additive		With leveling additive	
			2.0 % Rheology additive	4.0 % Rheology additive	2.0 % Rheology additive	4.0 % Rheology additive
Polyester resin (AV ~ 35 mg KOH/g)	46.6	46.6	46.6	46.6	46.6	46.6
Epoxy resin (EEW ~ 770 g/eq)	19.4	19.4	19.4	19.4	19.4	19.4
Titanium dioxide	5.2	5.2	5.2	5.2	5.2	5.2
Barium sulfate	25.4	25.4	25.4	25.4	25.4	25.4
Organic blue pigment	2.0	2.0	2.0	2.0	2.0	2.0
Benzoin	0.4	0.4	0.4	0.4	0.4	0.4
Leveling additive	1.0	0.8	-	-	0.8	0.8
PTFE wax additive	-	0.5	-	-	-	-
CLAYTONE or GARAMITE type	-	-	2.0	4.0	2.0	4.0
Total	**100.0**	**100.3**	**101.0**	**103.0**	**101.8**	**103.8**

T. 01

Processing instructions

Extruder
Twin screw
Heating zone 90 °C–105 °C
Shaft speed 350 rpm

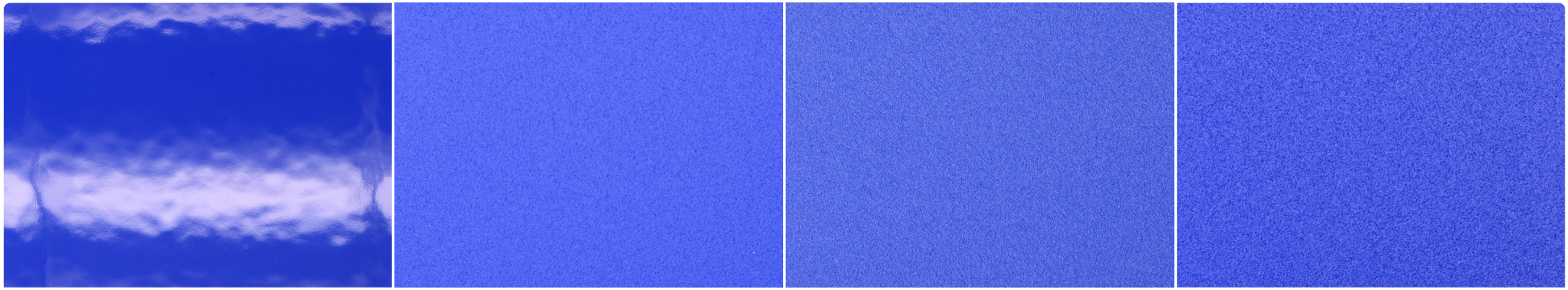
Application

Powder gun
Voltage 70 kV
Thickness minimum 70 µm

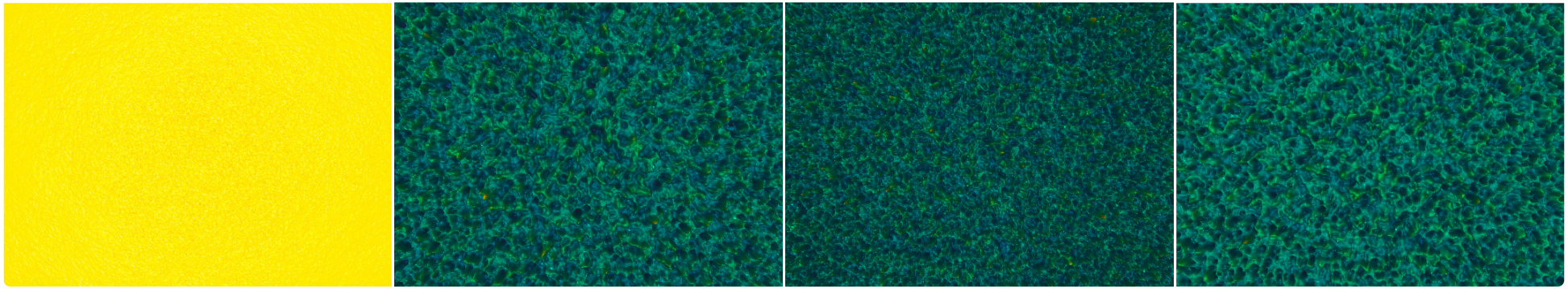
Typically used additives are GARAMITE-1210, GARAMITE-7305, CLAYTONE-APA, and CLAYTONE-HY, which create various gloss and texture effects. CLAYTONE-HY can be used to achieve similar texture effects compared to PTFE standard formulations. If CLAYTONE-HY is combined with a leveling additive, the gloss might be increased compared to the samples without.

CLAYTONE-HY compared to PTFE wax additive in hybrid system

Optical appearance



Control (no texture) | Standard texture formulation | 4.0 % CLAYTONE-HY without leveling additive | 4.0 % CLAYTONE-HY with leveling additive

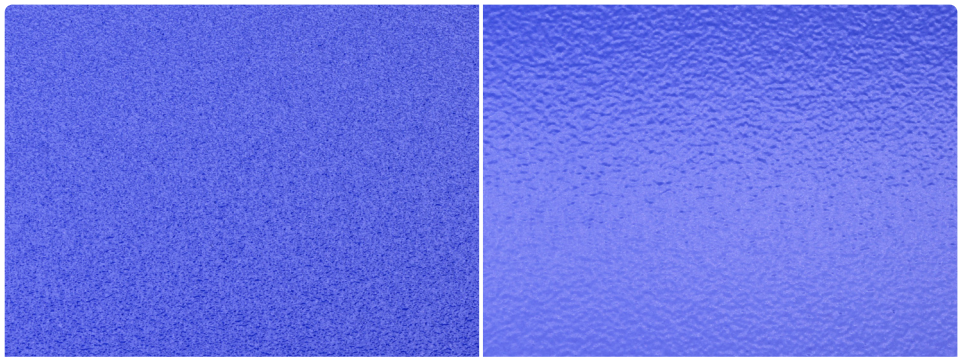


3D topography

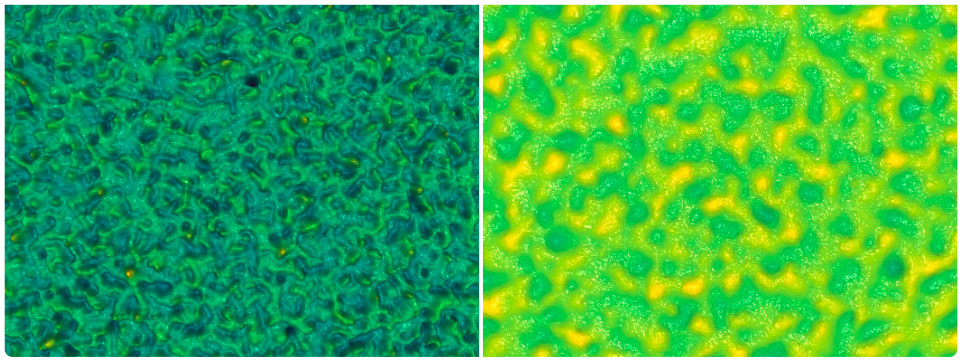
The usage of the other recommended additives leads to different structures and texture effects, which provides a wide variety simply by using different dosages of the additives. The samples differ in gloss values as well as in structure appearance, which can be seen in the 3D typography of the surfaces. GARAMITE-7305 provides smoother surfaces, while GARAMITE-1210 creates a stronger texture. Different dosages of CLAYTONE-APA provide matt surfaces, which become more matt with higher dosages.

Comparison of GARAMITE-1210 and GARAMITE-7305 in hybrid system

Optical appearance



4.0 % GARAMITE-1210 | 4.0 % GARAMITE-7305

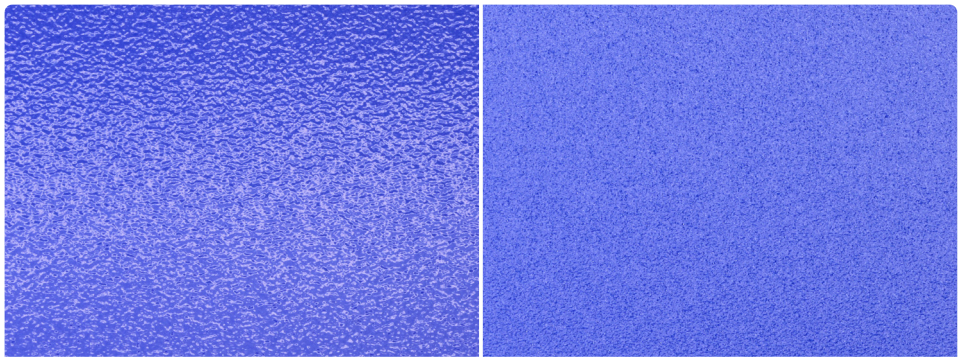


3D topography

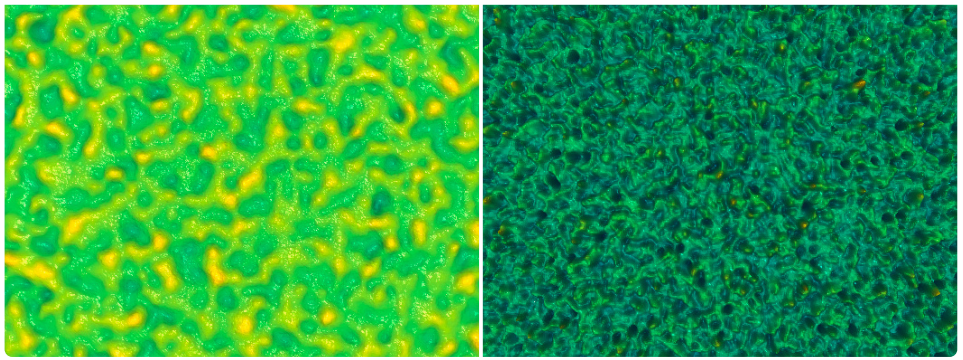
G.04

Different dosages of CLAYTONE-APA in hybrid system

Optical appearance



2.0 % CLAYTONE-APA | 4.0 % CLAYTONE-APA



3D topography

G.05

HAA powder coating systems (polyester + ß-hydroxyalkyl amide)

HAA powder coating systems include a leveling additive for smooth finishes. To achieve a texture effect, PTFE wax-based additives are used. With the CLAYTONE and GARAMITE product lines, the texture effect is created without PTFE.

These different starting point formulations show various possibilities with BYK additives. CLAYTONE and GARAMITE can be used with or without a leveling additive to achieve different texture appearances.

Starting point formulations

Raw material	Control (no texture)	Standard texture formulation	With leveling additive	
			2.0 % Rheology additive	4.0 % Rheology additive
Polyester resin (AV ~ 33 mg KOH/g)	70.4	70.4	70.4	70.4
HAA (Ratio 95:5)	3.7	3.7	3.7	3.7
Titanium dioxide	15.0	15.0	15.0	15.0
Barium sulfate	9.1	9.1	9.1	9.1
Carbon black	0.4	0.4	0.4	0.4
Benzoin	0.4	0.4	0.4	0.4
Leveling additive	1.0	0.8	0.8	0.8
PTFE wax additive	-	0.5	-	-
CLAYTONE or GARAMITE type	-	-	2.0	4.0
Total	**100.0**	**100.3**	**101.8**	**103.8**

T. 02

Processing instructions

Extruder
- Twin screw
- Heating zone 90 °C–100 °C
- Shaft speed 350 rpm

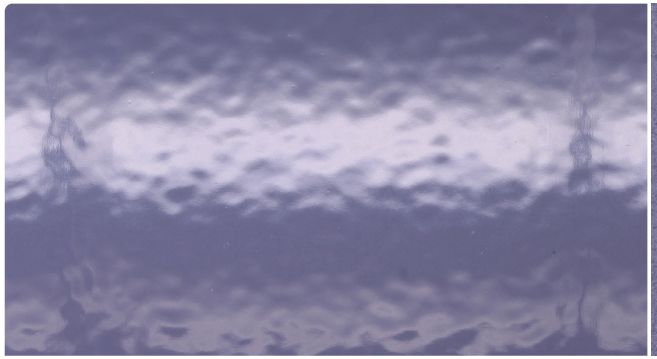
Application

Powder gun
- Voltage 70 kV
- Thickness minimum 70 µm

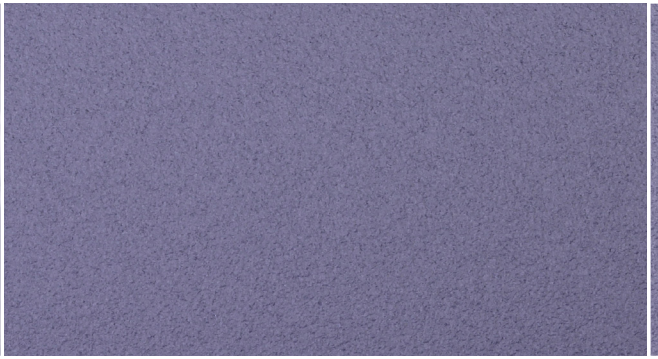
Typically used additives are GARAMITE-1210 and CLAYTONE-HY, which create various gloss and texture effects. GARAMITE-1210 can be used to achieve almost the same effect compared to a PTFE standard solution.

GARAMITE-1210 compared to PTFE wax additive in HAA system

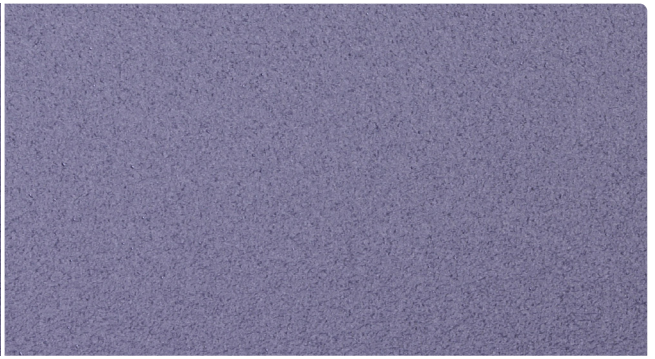
Optical appearance



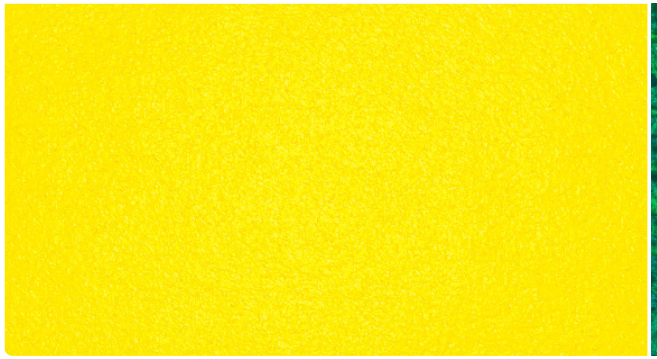
Control (no texture)

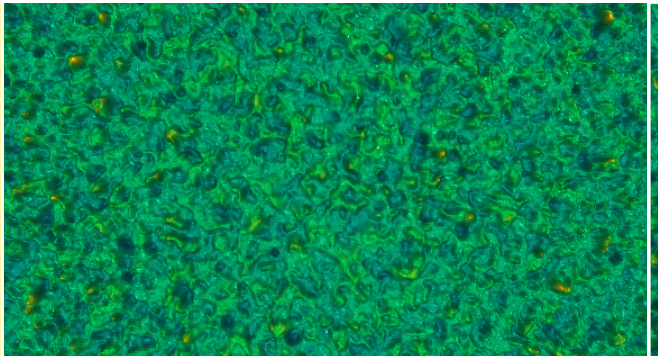


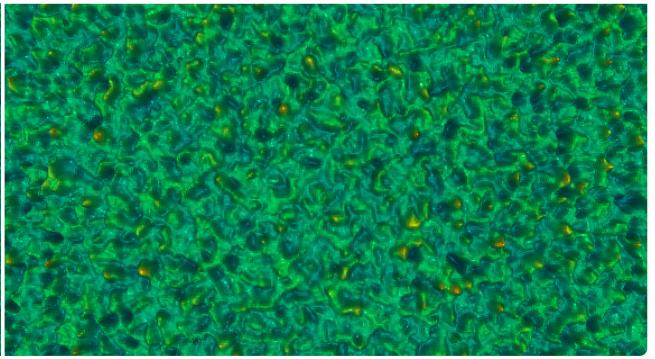
Standard texture formulation



4.0 % GARAMITE-1210







3D topography

Comparison of CLAYTONE and GARAMITE with competitor products

To achieve a texture effect, PTFE wax-based additives are used. With the **CLAYTONE** and **GARAMITE** product lines, the texture effect is created without PTFE. In this study **CLAYTONE** and **GARAMITE** are compared to competitor products and a PTFE-based wax additive as internal standard.

Properties of a BYK standard formulation with a PTFE wax-based additive:

- Low dosage 0.5–1.0 %
- Low gloss 60° 4–5 GU
- Fine texture
- Smooth haptic
- Acceptable mechanical resistance

Optical appearance with a PTFE wax-based additive

G.07

CLAYTONE and **GARAMITE** are the **best PFAS-free alternatives** for achieving a texture effect compared to other products in the market.

CLAYTONE/GARAMITE compared to competitor products

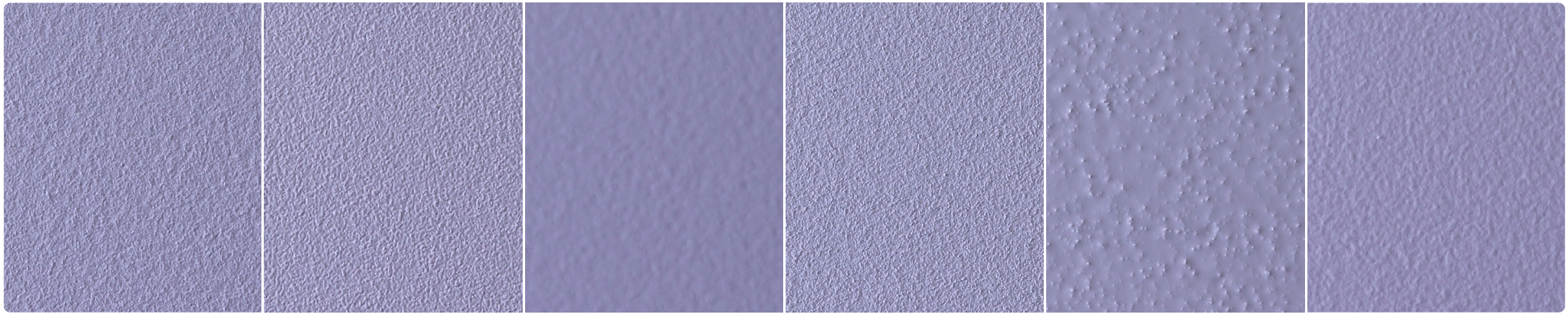
Additive	Sufficient dosage to match PTFE standard*	Texture	Gloss	Haptic	Mechanical resistance	Note/judgment
CLAYTONE or GARAMITE	● 4.0 %	● Fine	● Low	● Rough	● Reduced	● Use additional wax for haptically smoothness
Competitor 1	● 7.0 %	● Flat	● Low	● Anti-slip	● Reduced	● No alternative, since texture is not similar
Competitor 2	● 6.0 %	● Fine	● Low	● Rough	● Reduced	● Higher dosage required
Competitor 3	● 6.0 %	● Uneven	● High	● No texture	● Reduced	● No alternative, since texture is not similar
Competitor 4	● 15.0 %	● Fine	● High	● Smooth	● Reduced	● Very high dosage required

Target range: ● Suitable ● Acceptable ● Not desired

T.03

* Exemplary in BYK standard formulation/test system

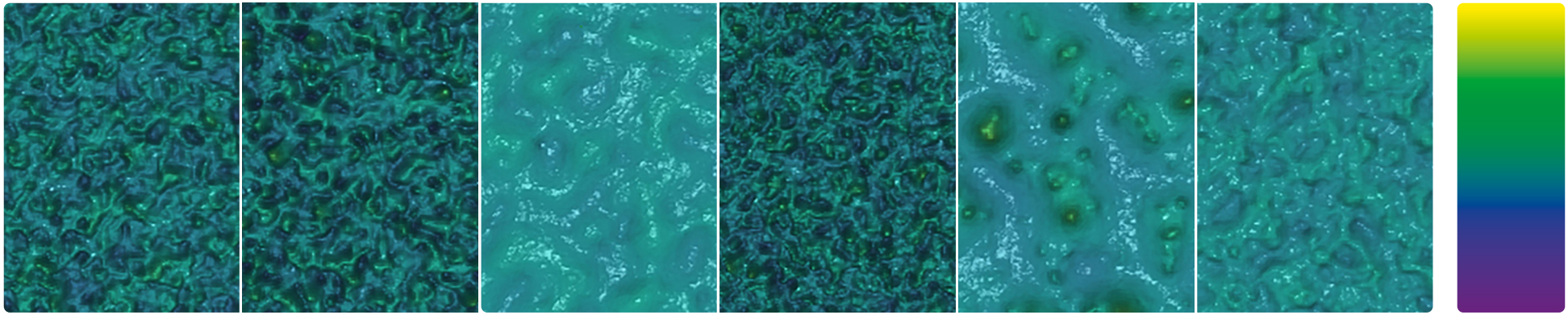
Optical appearance



1.0 % PTFE wax-based additive | 4.0 % CLAYTONE/GARAMITE | 7.0 % competitor 1 | 6.0 % competitor 2 | 6.0 % competitor 3 | 15.0 % competitor 4

G. 08

3D topography



1.0 % PTFE wax-based additive | 4.0 % CLAYTONE/GARAMITE | 7.0 % competitor 1 | 6.0 % competitor 2 | 6.0 % competitor 3 | 15.0 % competitor 4

G. 09

H-A 1 04/2025

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