BYK´s PFAS-free additive world for the future

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Background of PFAS concerns

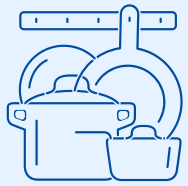
PFAS: **P**er- and poly**f**luoro**a**lkyl **s**ubstances

PFAS are

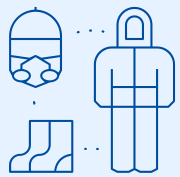
- extremely **p**ersistent
- **b**ioaccumulative
- partially **t**oxic
- widely used

Where can they be found?

Rain clothes, textiles, and surface treatments

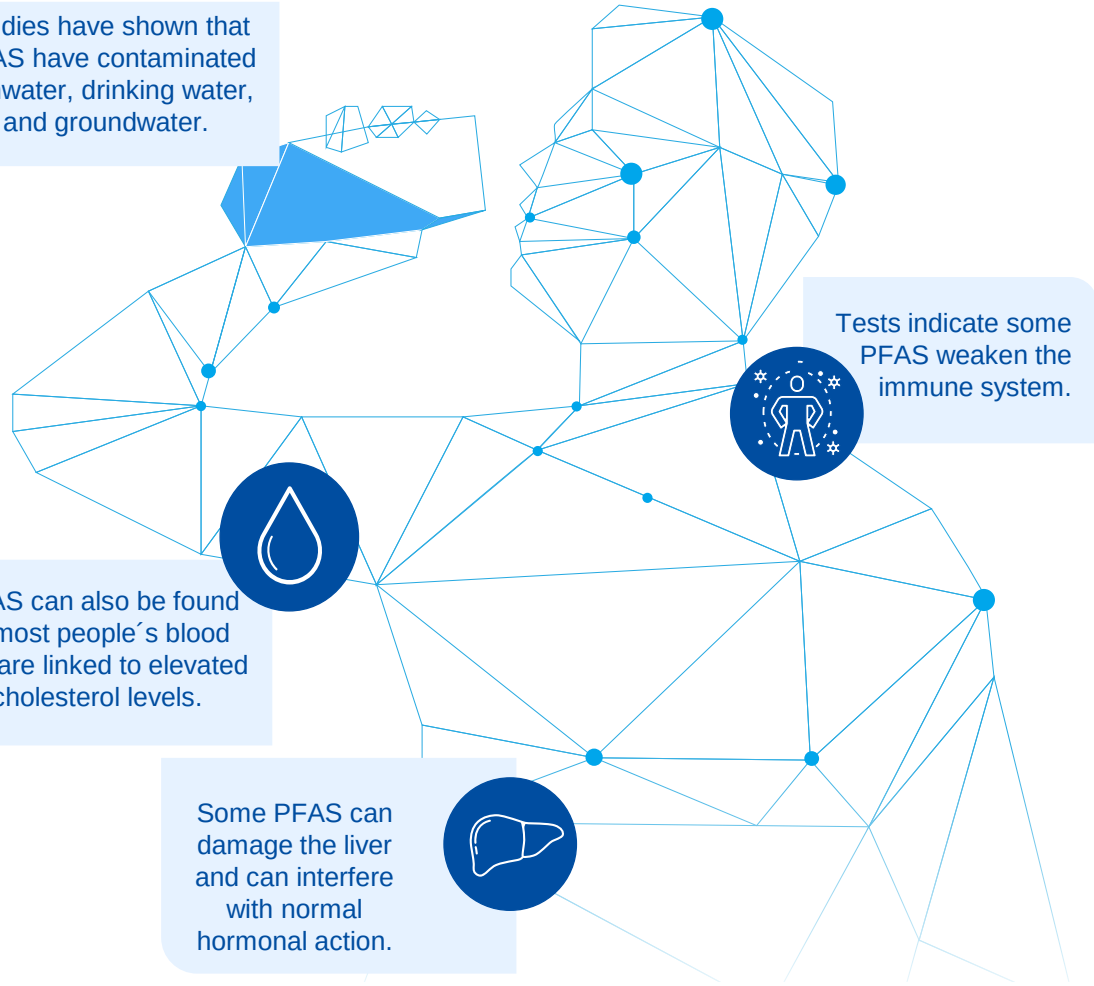


Non-stick coatings for frying pans and pots, and food packaging



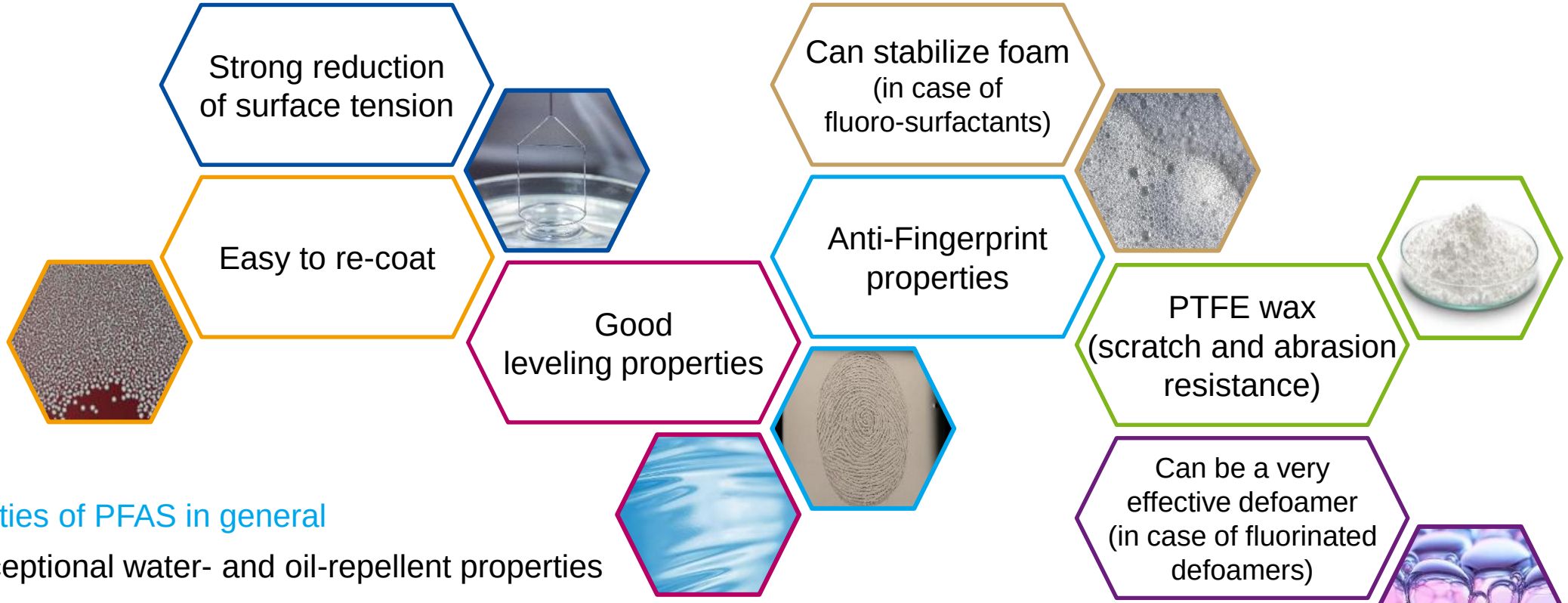
Fire-fighting foams and fire protective clothing

Chrome plating, paints, and construction materials



Key properties of PFAS in coatings and inks

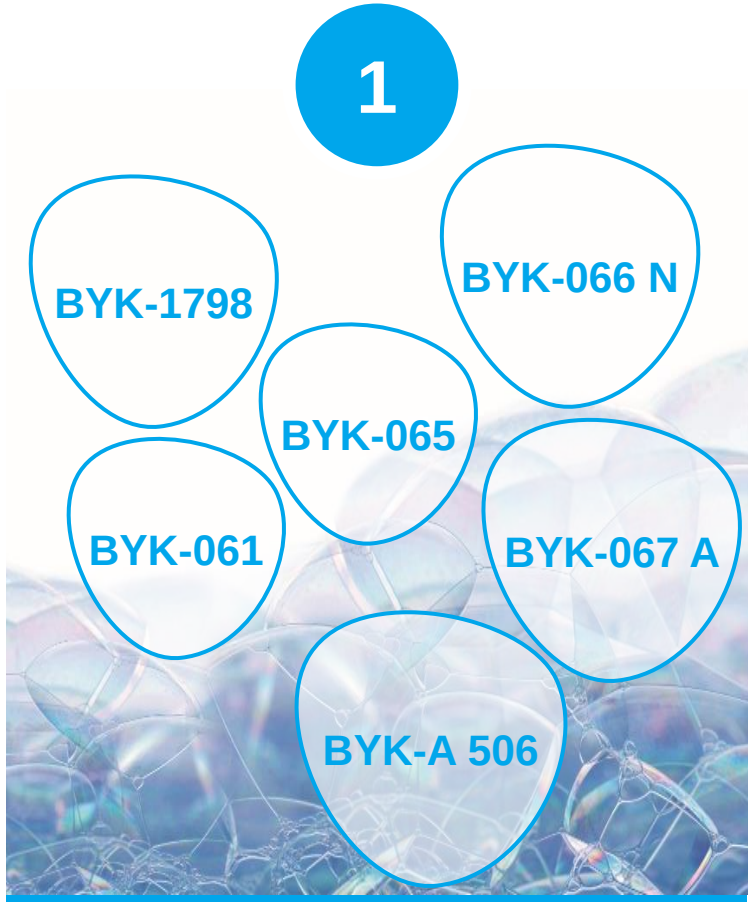
Unique property-portfolio of PFAS for numerous applications



Properties of PFAS in general

- Exceptional water- and oil-repellent properties
- High durability under extreme conditions
- Electrical and thermal insulation

Where do you find PFAS in BYK additives?
Product overview

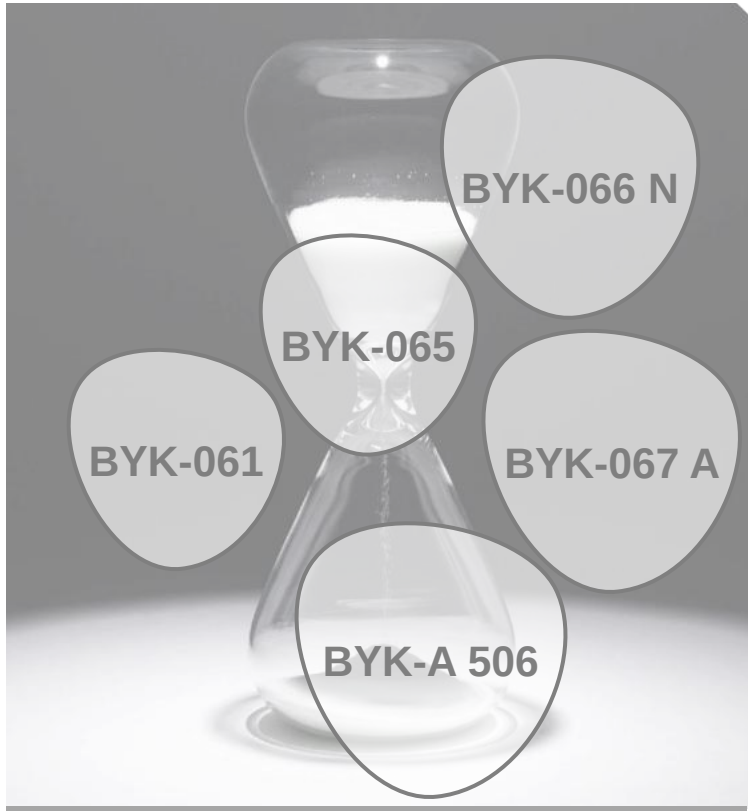


Defoamer

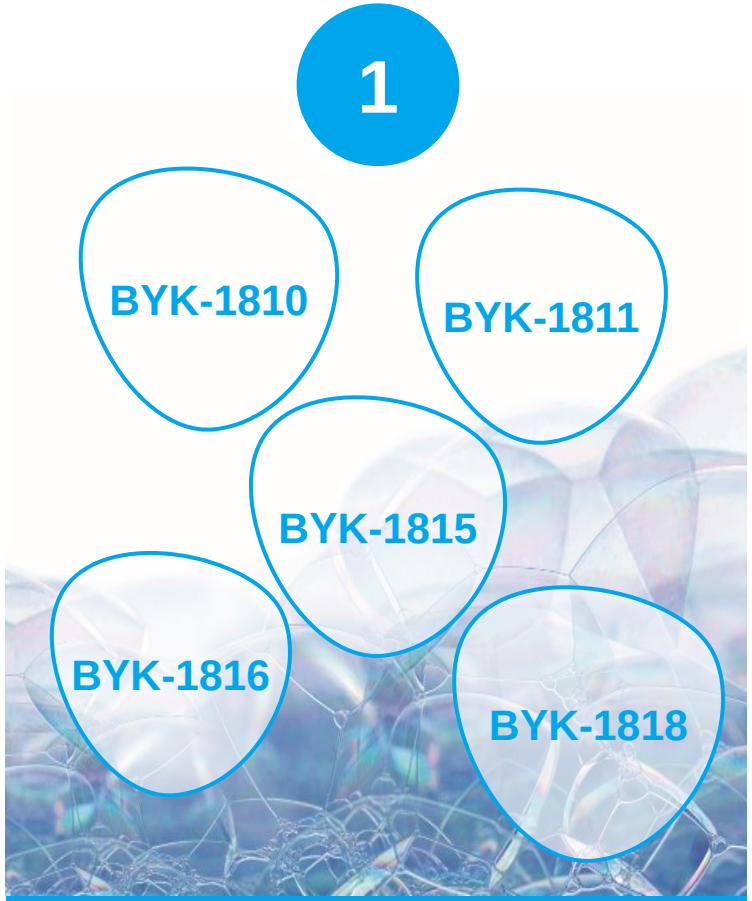
Wax additives

Surface additives

New PFAS-free defoamer family



PFAS containing defoamer



PFAS-free defoamer

One fits all?
Not really realistic when you try to replace PFAS!

BYK has a choice to cover all kind of application areas

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PFAS-free defoamer

Performance is at par with PFAS-containing defoamer

- ✓ **Excellent defoaming properties (wide formulation range) in solvent-borne and solvent-free systems**
- ✓ **Spontaneous defoaming**
- ✓ Anti-pinhole effect
- ✓ Reduction of surface tension
- ✓ Positive influence on leveling and surface appearance
- ✓ **No negative influence on transparency (provided compatibility)**
- ✓ Good storage stability

BYK-1810

1% in BuAc

BYK-1811

10% in BuAc

BYK-1815

10% in BuAc

BYK-1816

10% in BuAc

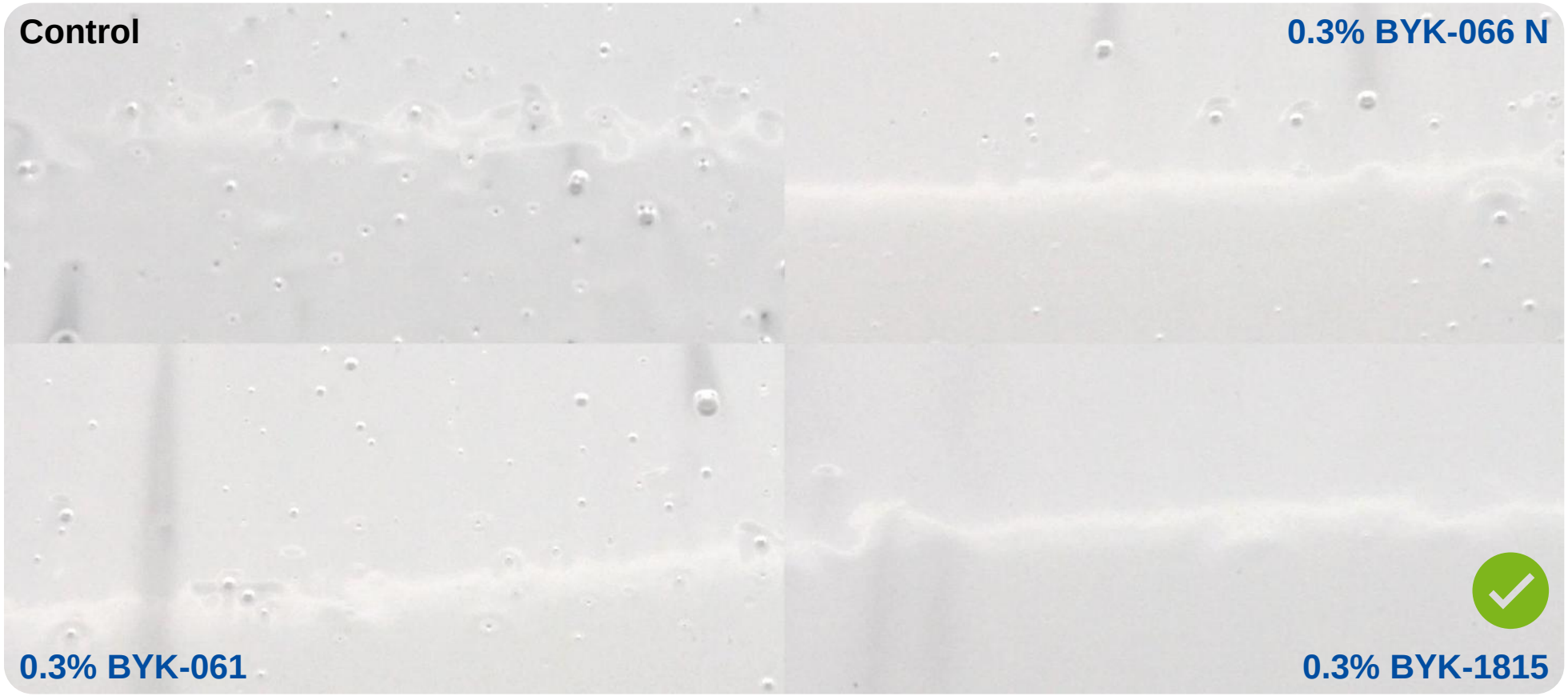
BYK-1818

1% in BuAc

Results by end use
General Industrial Coatings

Results in a high-solid 2-pack PU system

Dosage as supplied



Selection guideline for PFAS free defoamer

Globally evaluated and recommended for all application areas

Ideal:
test them all
to find the
best **PFAS free**
solution for
your system

stronger defoaming effect, more incompatible

Starting point

BYK-1815
BYK-LP D 25710

BYK-1810
BYK-LP D 25910

BYK-1816
BYK-LP D 25912

more compatible

BYK-1818
BYK-LP D 25908

Examples BYK-1815
- polyaspartics
- 2-pack PUR clearcoats
- 2-pack pack epoxy

Examples BYK-1816
- pigmented 2-pack PU topcoats
- radcure systems

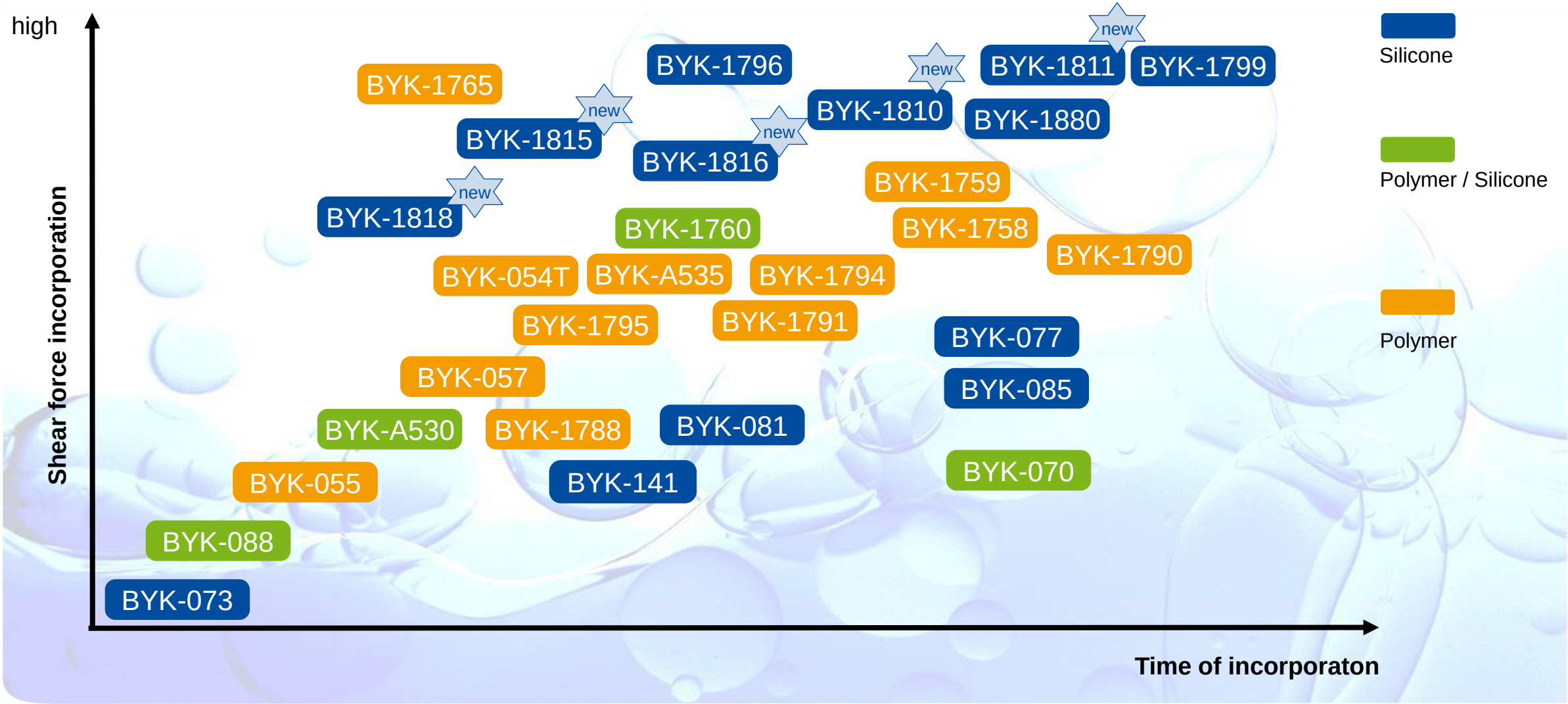
Examples BYK-1810
- alkyd paints
- pigmented 2-pack PUR
- 2-pack epoxy

stronger

BYK-1811
BYK-LP D 25911

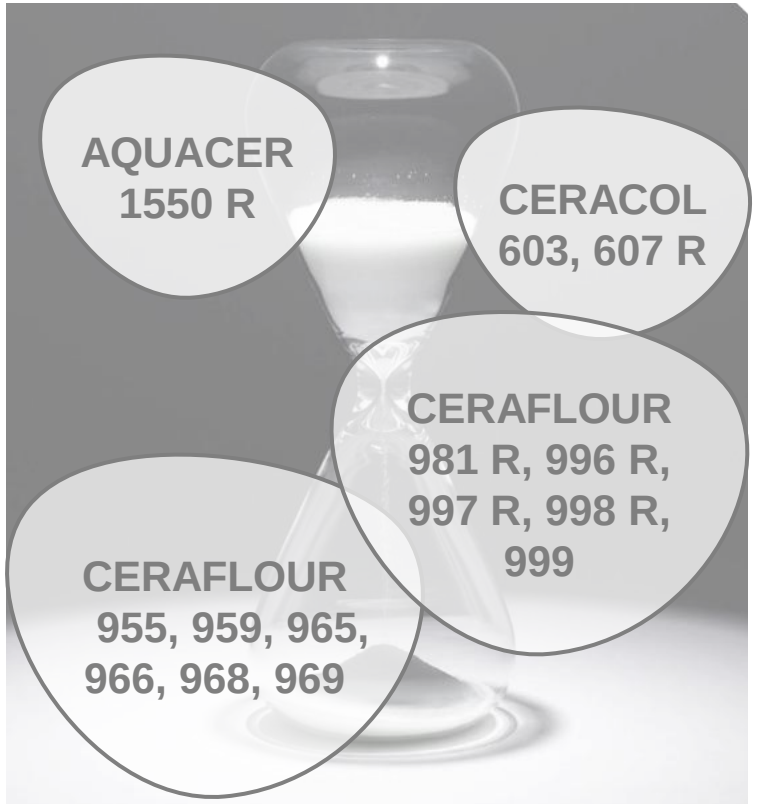
Examples BYK-1811
- **Millbase defoamer**
- 2-pack high-solid epoxy primer
- self leveling PUR
- alkyd paints

Defoamer selection for solvent based / solvent-free systems
General overview



PFAS containing wax additives

New PTFE-free wax additive family



PTFE containing wax additives

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PTFE-free wax additives

Also many other products in the current wax additive portfolio are PTFE-free!

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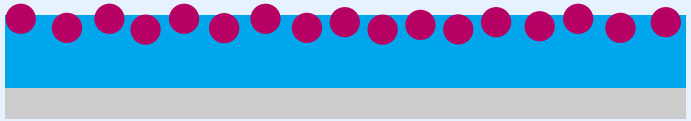
PFAS = PTFE
Why is PTFE so special?

Orientation of wax additives in the coating film



Most wax additives: orientation to the paint surface

PTFE: orientation throughout the coating film

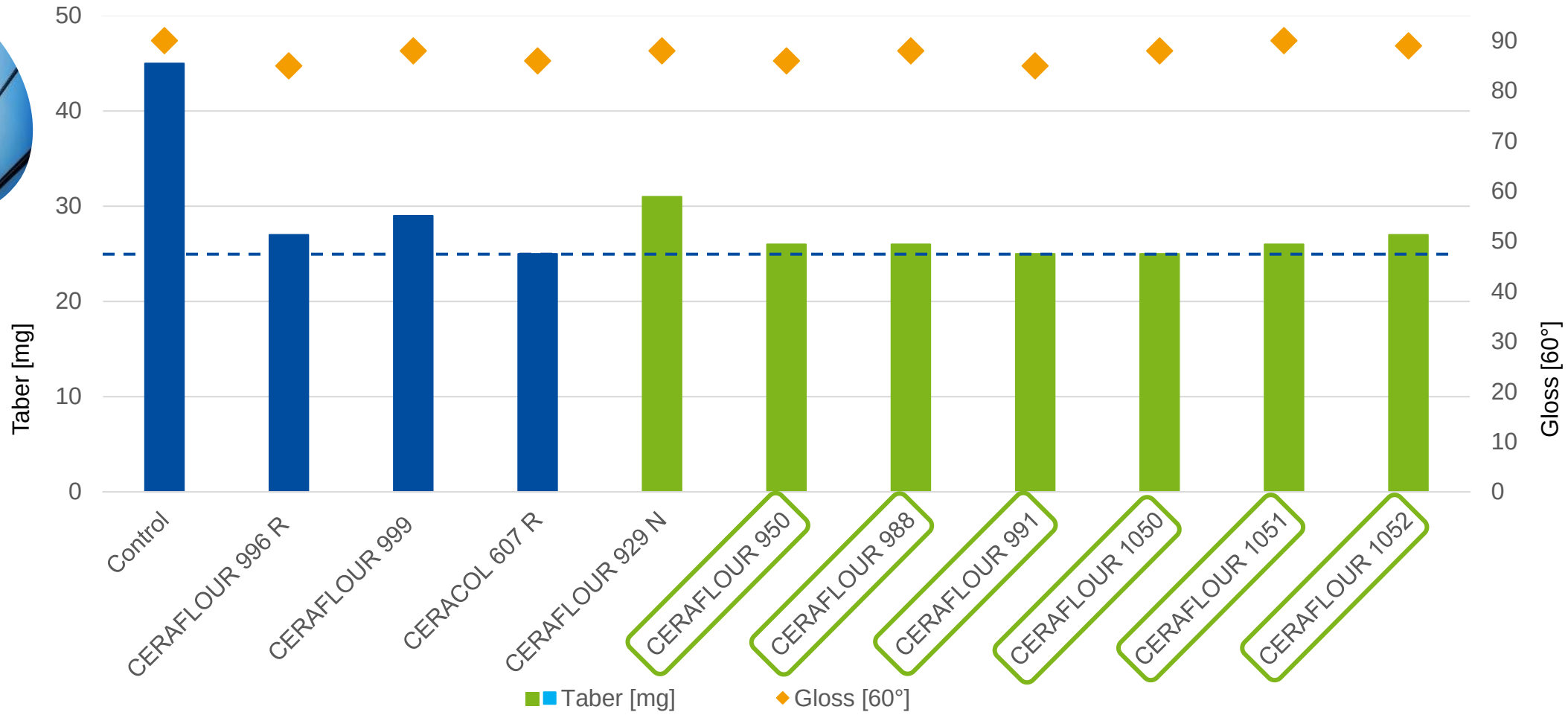
Key properties of PTFE:

- Very good abrasion resistance
- Chemically inert
- Temperature-resistant
- Higher density compared to other wax additives and therefore, different orientation in the coating film

Hard to match exactly these properties:
Focus on abrasion

Free of PTFE! wax additives in Coil Coatings

Comparison of Taber abrasion and gloss in a polyester / melamine coating



CERAFLOUR 996 R, CERAFLOUR 999,
CERACOL 607 R are based on PE / PTFE

Test conditions Taber abrasion:
CS10 wheels, 1000 rounds, weight 500g

Dosage: 1% solid wax

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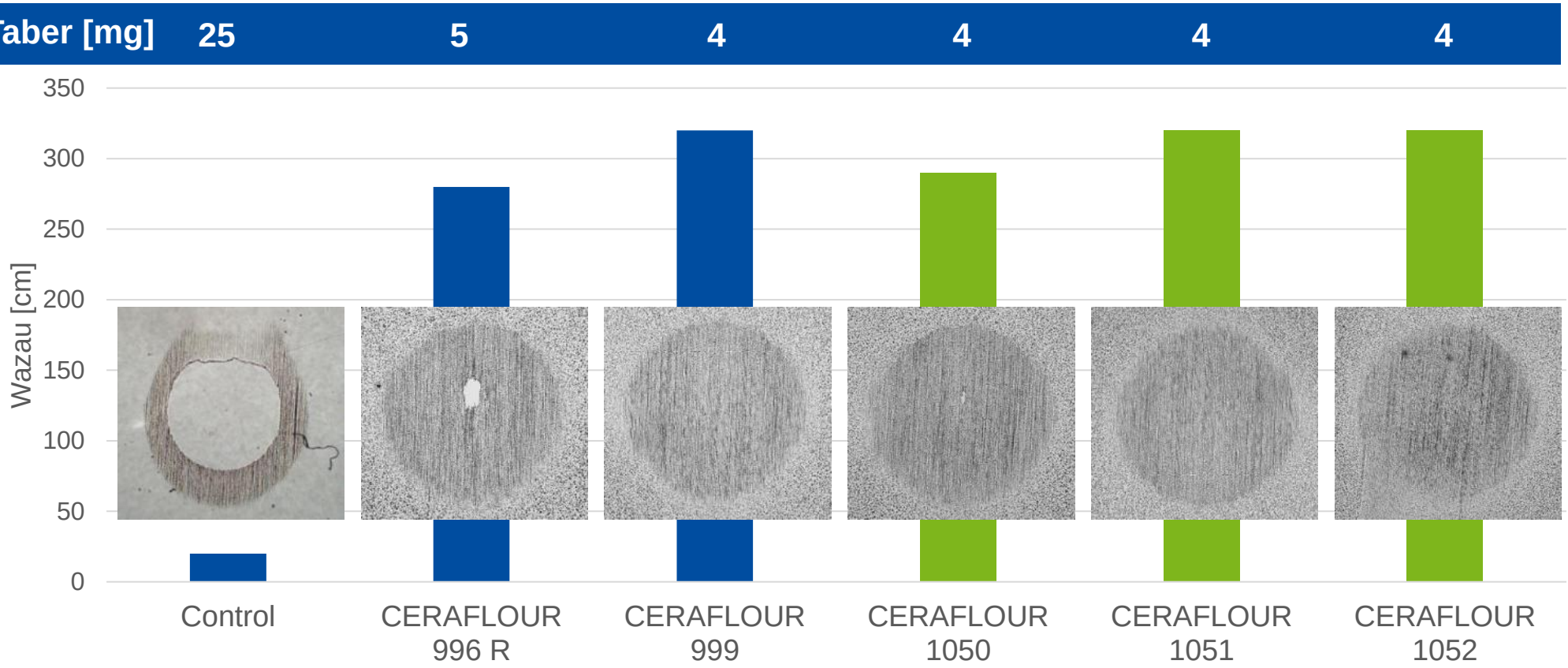
„Free of PTFE“ wax additives in water-based General Industrial Coating
Superb Taber and Wazau results



CERAFLOUR 996 R and CERAFLOUR 999 are based on PE / PTFE

Test conditions Taber abrasion:
CS10 wheels, 500 rounds, weight 500g

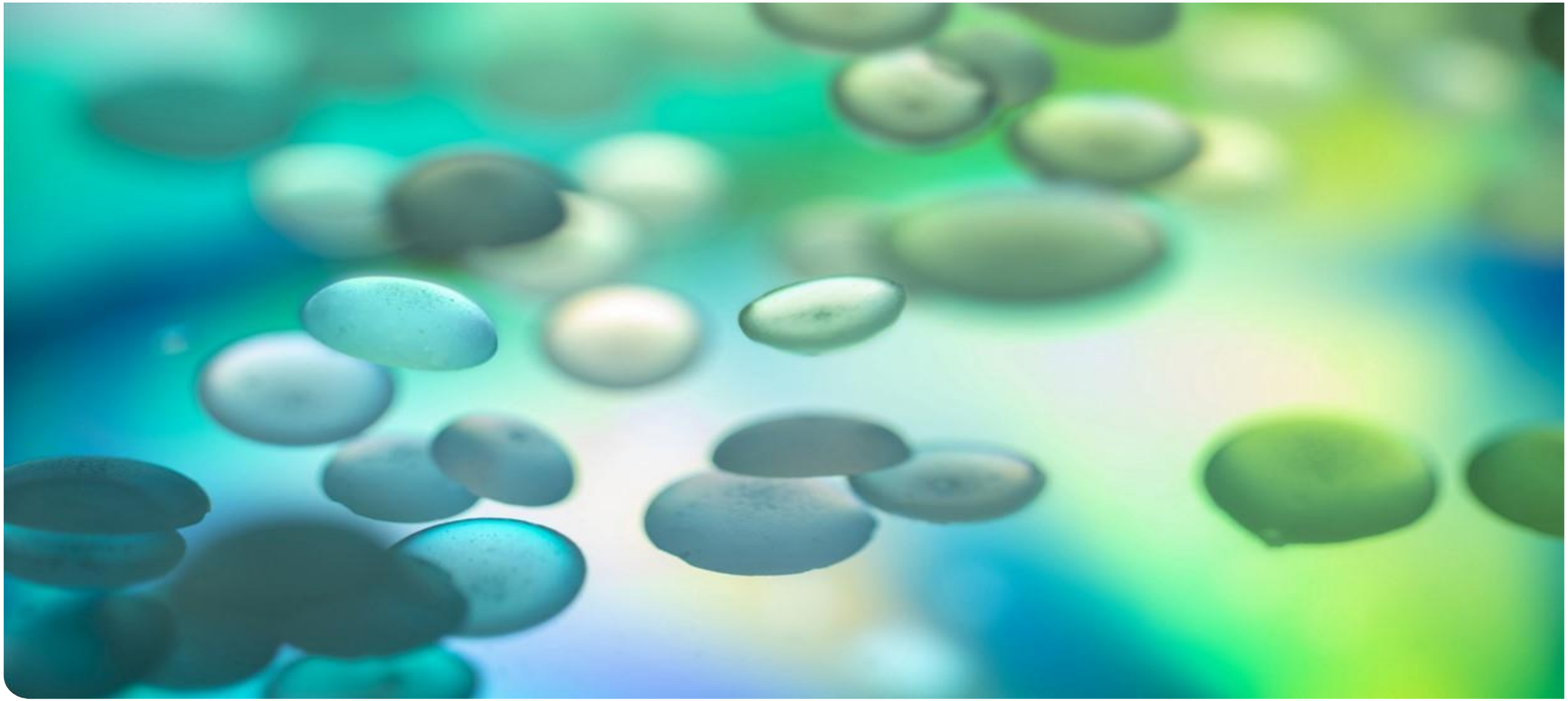
Pictures:
Wazau abrasion at 300 cm paper length, 2.5 times magnification

Dosage: 1% solid wax

Free of PTFE!
Many alternatives to PTFE wax additives available

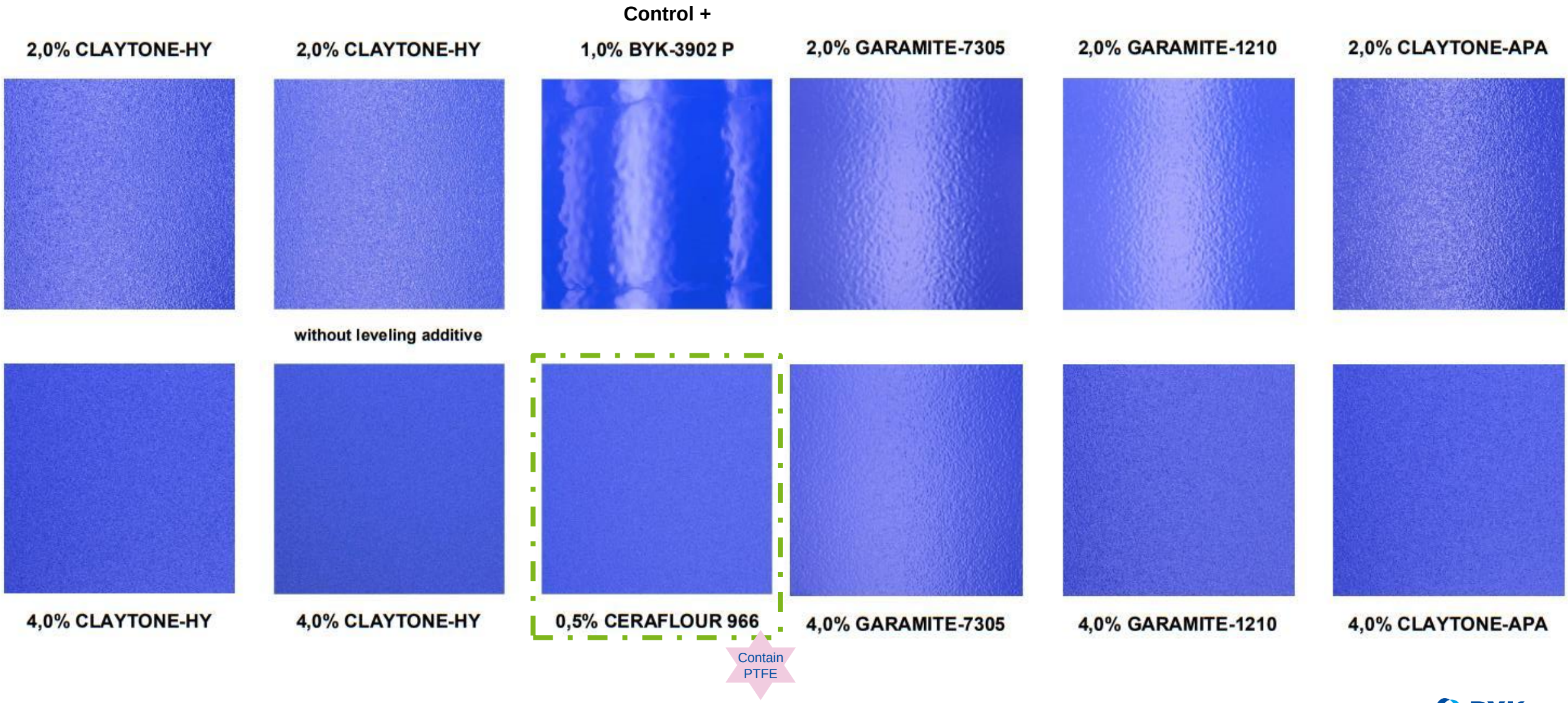
Further
Free of PTFE!
options:
CERAFLOUR 925 N
CERAFLOUR 929 N
CERAFLOUR 988
CERAFLOUR 991

PTFE free alternatives for textures in powder coatings



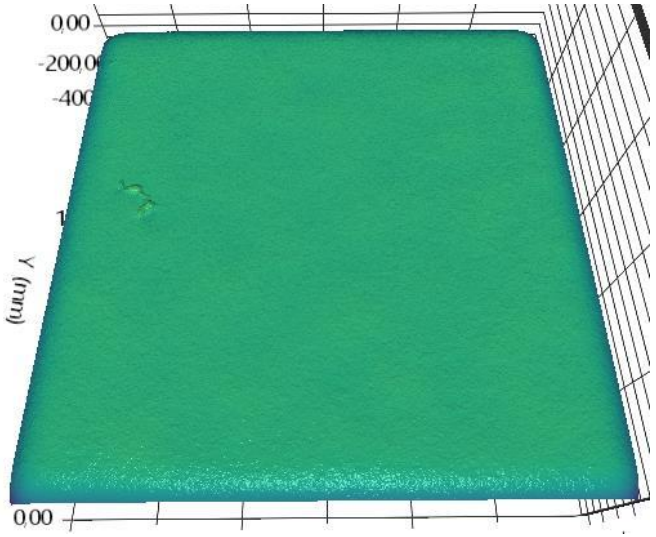
„Free of PTFE“ alternatives for textures in powder coatings

CLAYTONE & GARAMITE as PTFE-free alternatives

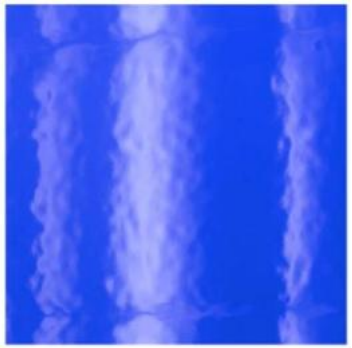


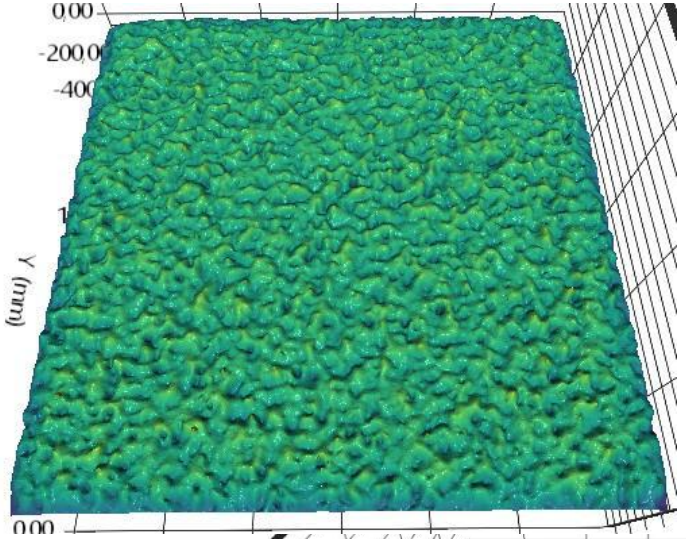
„Free of PTFE“ alternatives for textures in powder coatings

CLAYTONE & GARAMITE as PTFE-free alternatives

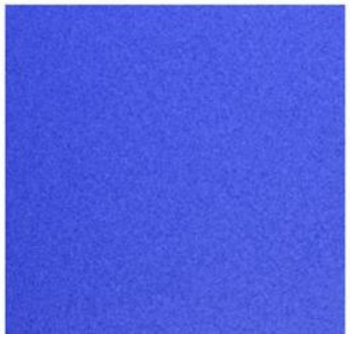


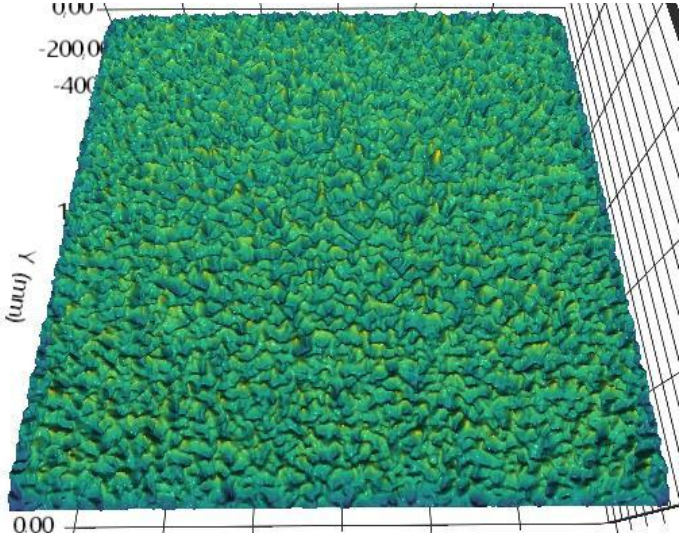
Control



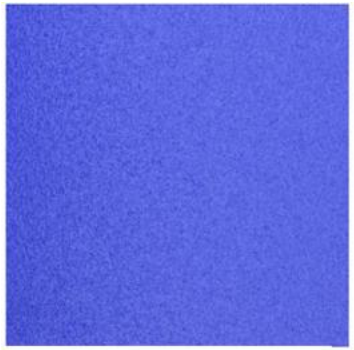


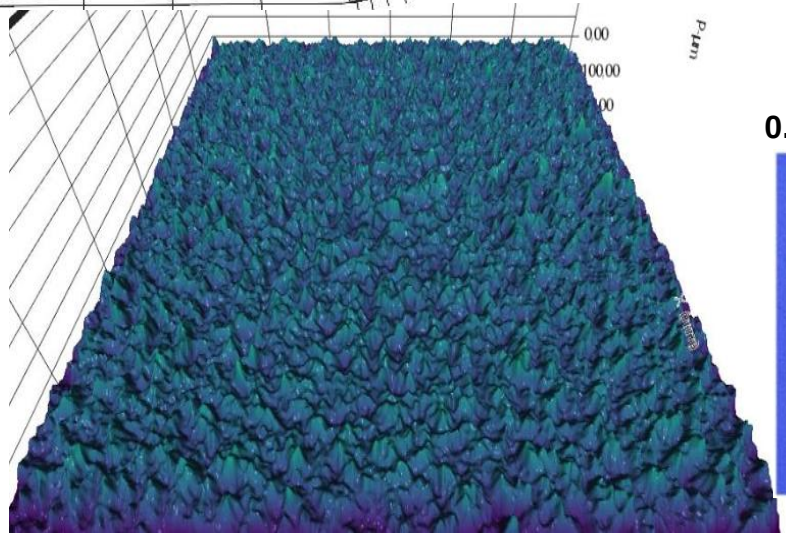
4.0% CLAYTONE HY



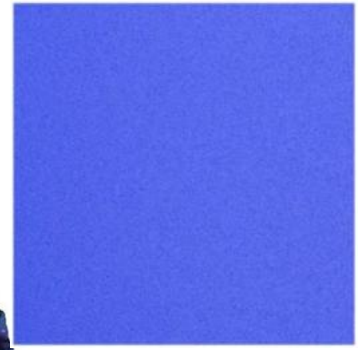


4.0% GARAMITE 1210





0.4% micronized PTFE



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Free of PTFE!
BYK alternatives for PTFE based wax additives for powder coatings

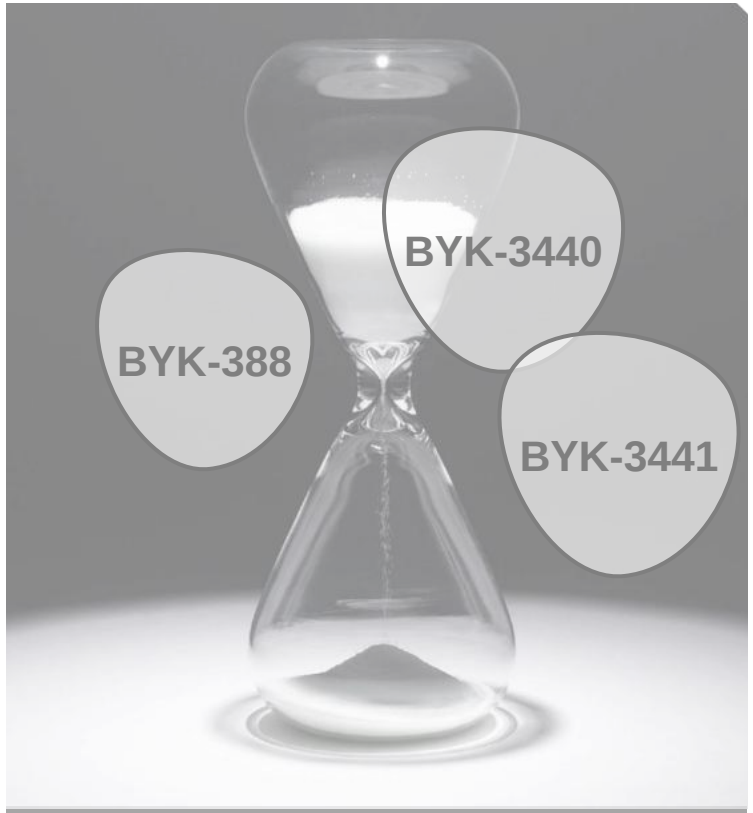
Purpose/Function	Hybrid System	HAA System	Other Systems
Texture	**CLAYTONE-HY** CLAYTONE-40 CLAYTONE-APA GARMITE-1210	**GARAMITE-1210** GARAMITE-1958 GARAMITE-7305 CLAYTONE-HY	**CLAYTONE-HY** **GARAMITE-1210**
Abrasion resistance Scratch resistance	**BYK-3932 P**	**BYK-3932 P**	**BYK-3932 P**

First recommendation Second recommendation

Hybrid System: Combination polyester and epoxy
HAA System: Combination polyester and ß-Hydroxyalkylamid

Where do you find PFAS in BYK additives?
Product overview

PFAS-free surface additives



PFAS containing surface additives

3

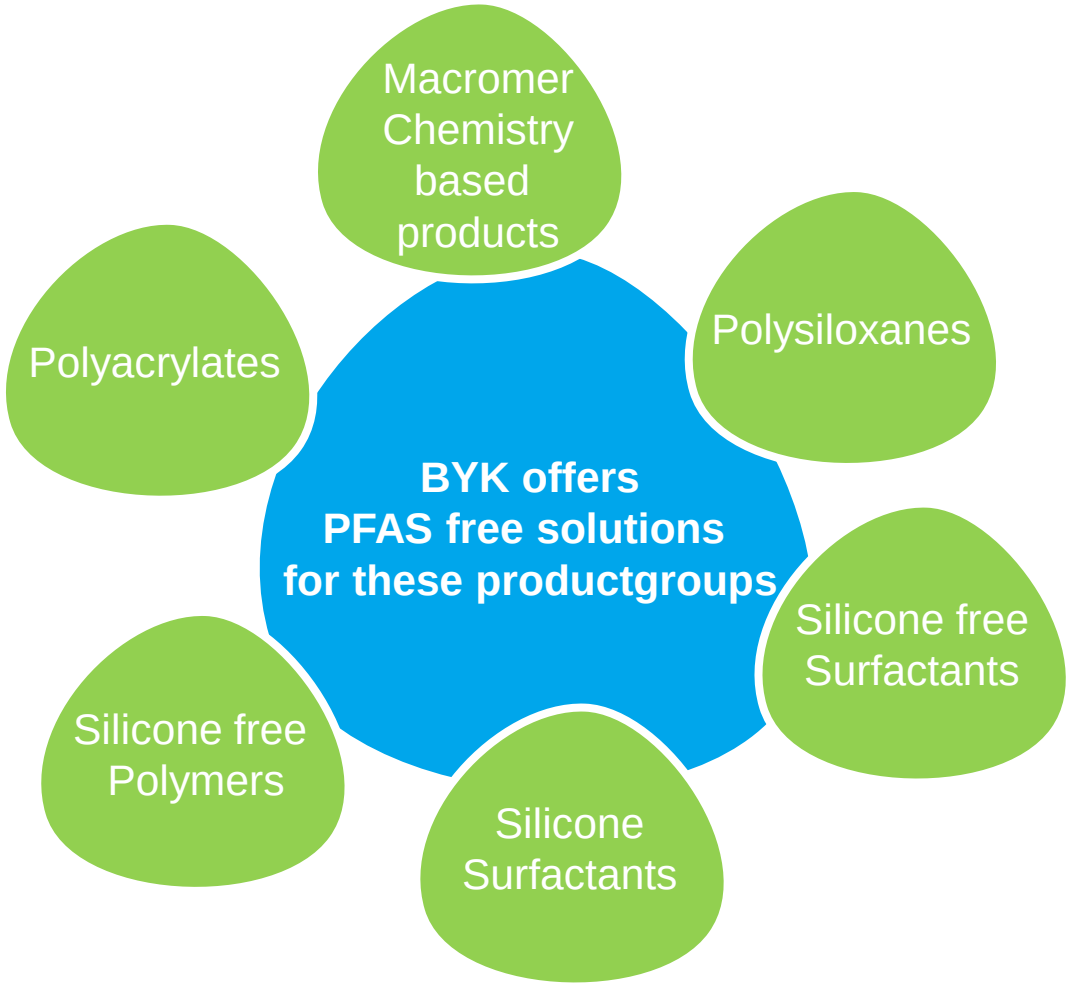
Surface additives

Even silicon free or Macromer technology are possible to replace PFAS-containing surface additives

PFAS-containing fluoro surfactants

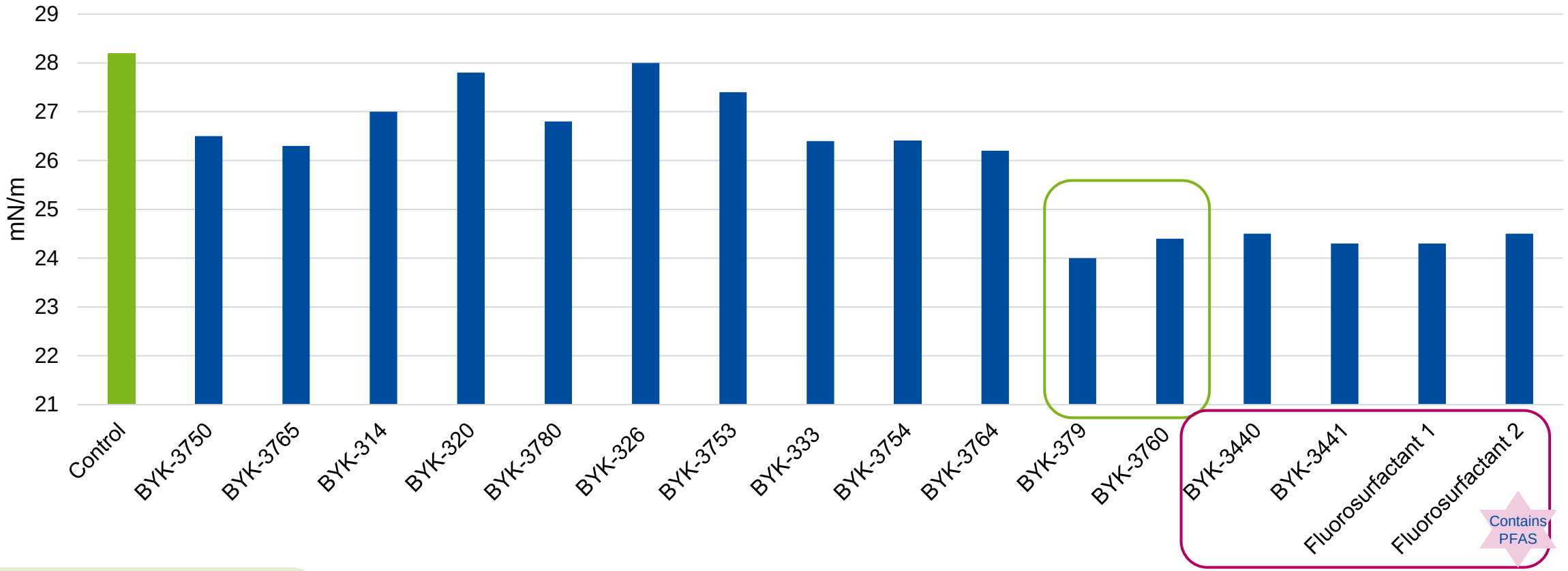
Fluoro surfactants are used in the market for creating surface properties in Coatings and inks like

- Good leveling
- Improved substrate wetting
- Anti-crater effect
- Recoatability
- Oil and water repellency



Effective surface tension reduction with Polysiloxanes

Solvent-based 2 pack PU clearcoat

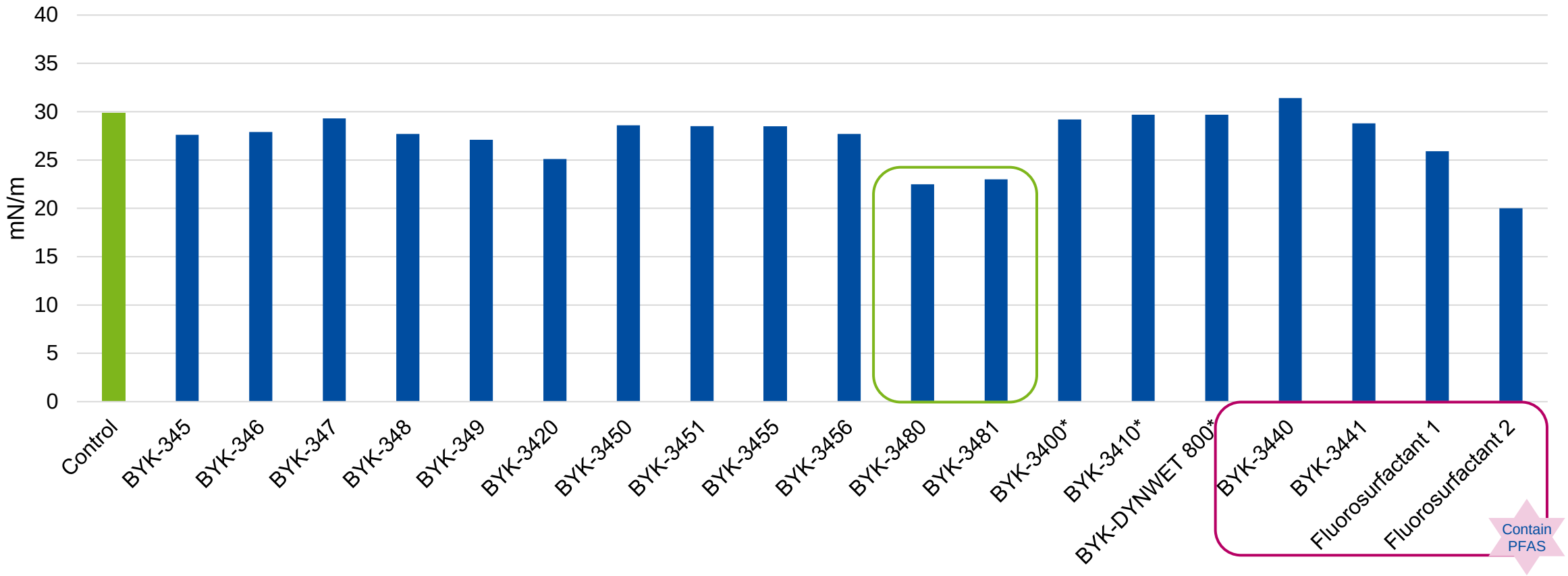


Test method:
Measurement of surface tension wet by
Du Noüy ring method

Dosage: 0.1% active substance

Effective surface tension reduction with silicone surfactants

Water-based 2 pack PU system



***reduce dynamic surface tension** **Dosage: 0.5% as supplied**

The BYK road into a sunny PFAS free future

Thank you for your attention.