



**BYK ADDITIVES FOR  
AQUEOUS COATING SYSTEMS**



like working

like widening

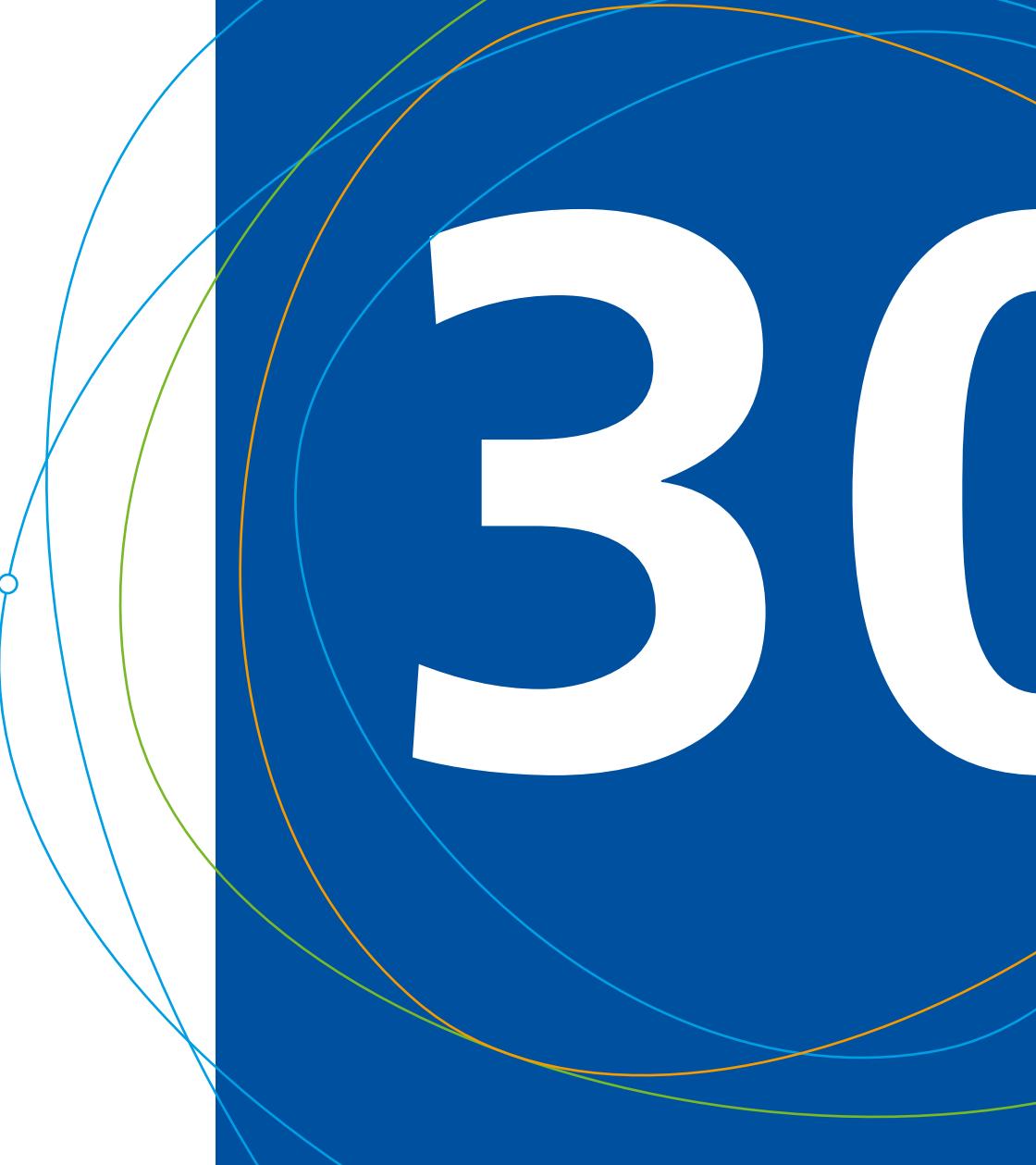
like worthy



**like water**

**like worldwide**

**like well-done**



Industrial  
Coatings

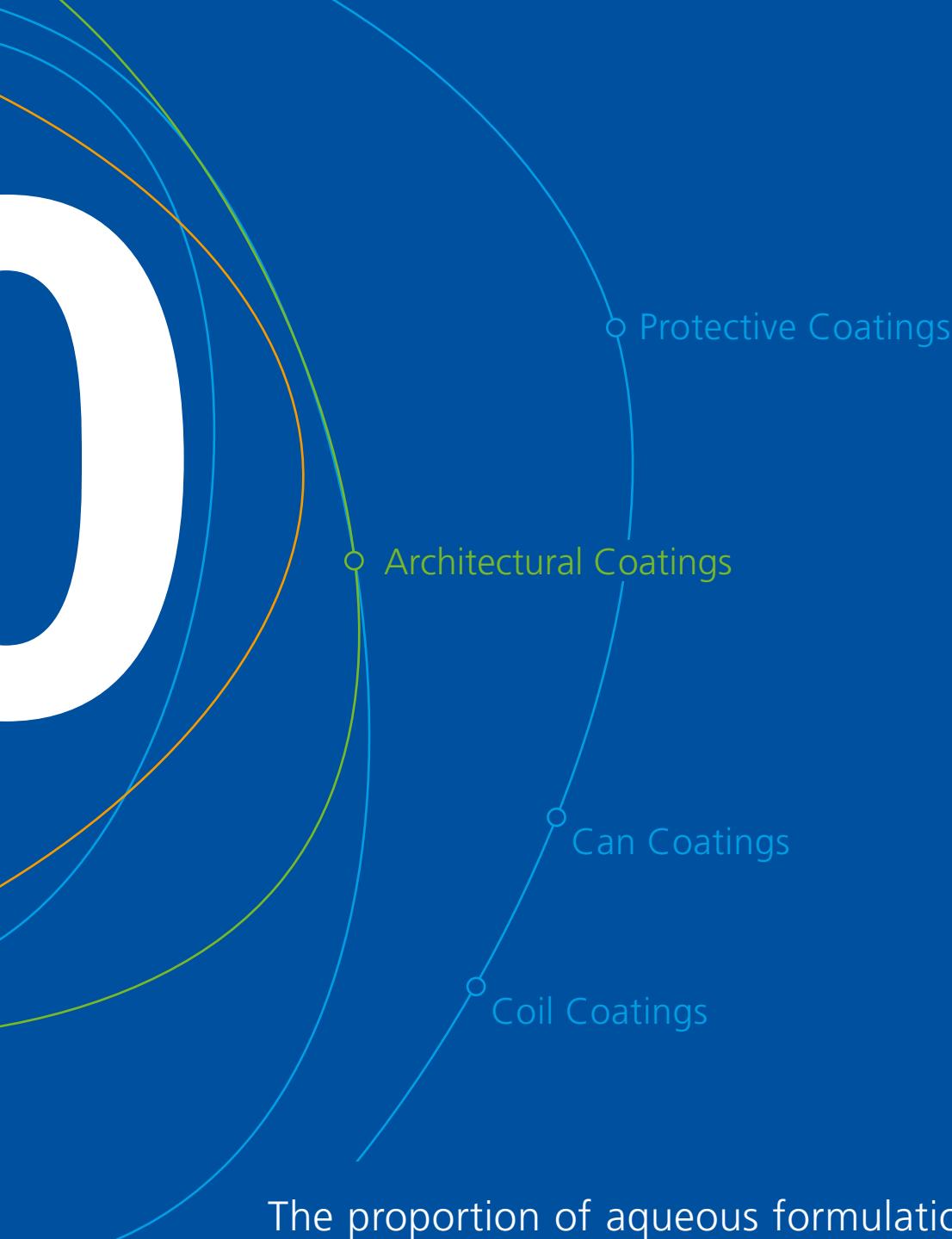
# 30

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Automotive  
Coatings

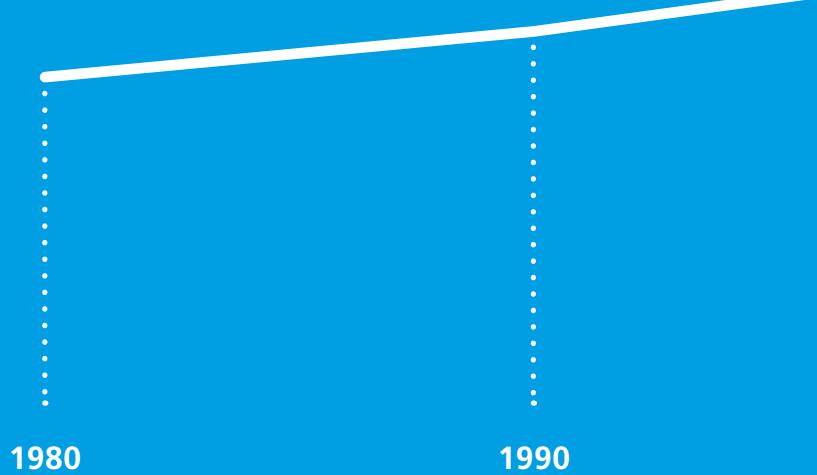
Wood and  
Furniture Coatings

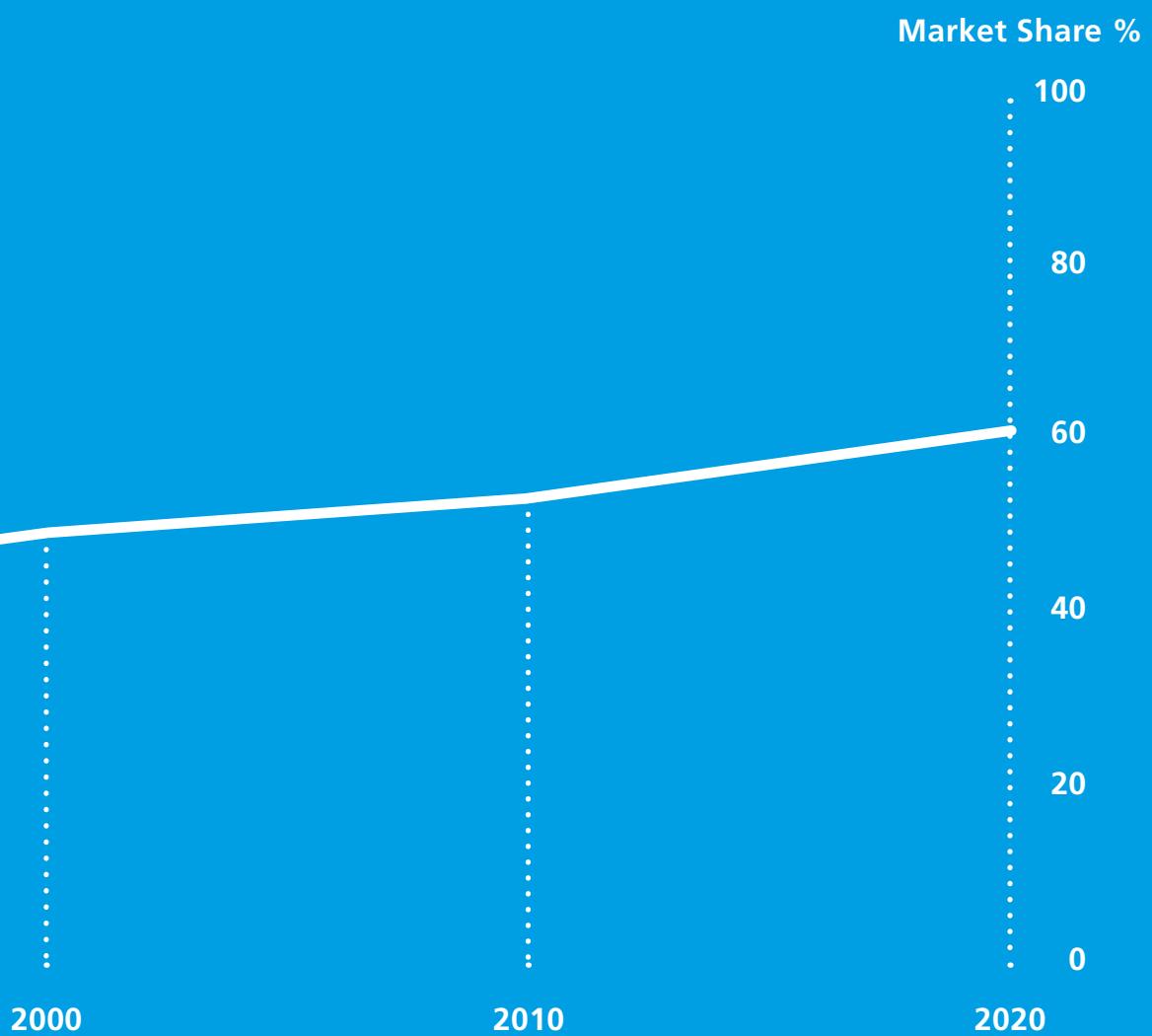


The proportion of aqueous formulations used in the coatings industry has seen a continuous increase for more than thirty years. What started as regionally limited projects with the aim of reducing emissions in living spaces, has since become a global movement that has spread out to virtually all areas of application.

Now, more than half of all coatings are water-based, and it is generally expected that this segment will continue to see above-average growth.

## Aqueous coating systems Trend







At BYK, we recognized this trend early on, and have been leading the development of appropriate additives for decades. We analyze trends and, based on our technical expertise, find solutions to problems in the most varied of applications. One of these milestones has most definitely been the widely applicable DISPERBYK-190 for aqueous coatings, which was introduced to the market back in 1990 and has set the standard ever since.

# DISPER

# BYK-190

The background of the page features a close-up, abstract view of several blue liquid droplets or bubbles. The droplets vary in size and shape, with some appearing as small, sharp-edged spheres and others as larger, more rounded and distorted forms. They are set against a lighter blue background, creating a sense of depth and texture.

BYK offers various additive groups which provide tailored answers to a multitude of technical application queries

Aqueous coatings do more than fulfill the requirements for increased environmental friendliness. From a technical perspective, they are also often on a par with solvent-borne systems. For the user, they certainly offer additional advantages and require fewer health and safety precautions when producing and applying coatings.

Admittedly, aqueous formulations do pose new challenges. Due to the high surface tension of the water, some characteristics must be observed, for example, the correct pigments must be used, wetted and stabilized in the system, the viscosity must be checked for an optimum coating production, and active defoaming is essential. The problems are generally known, and their solution requires the use of special additives.

# **Wetting and Dispersing Additives**



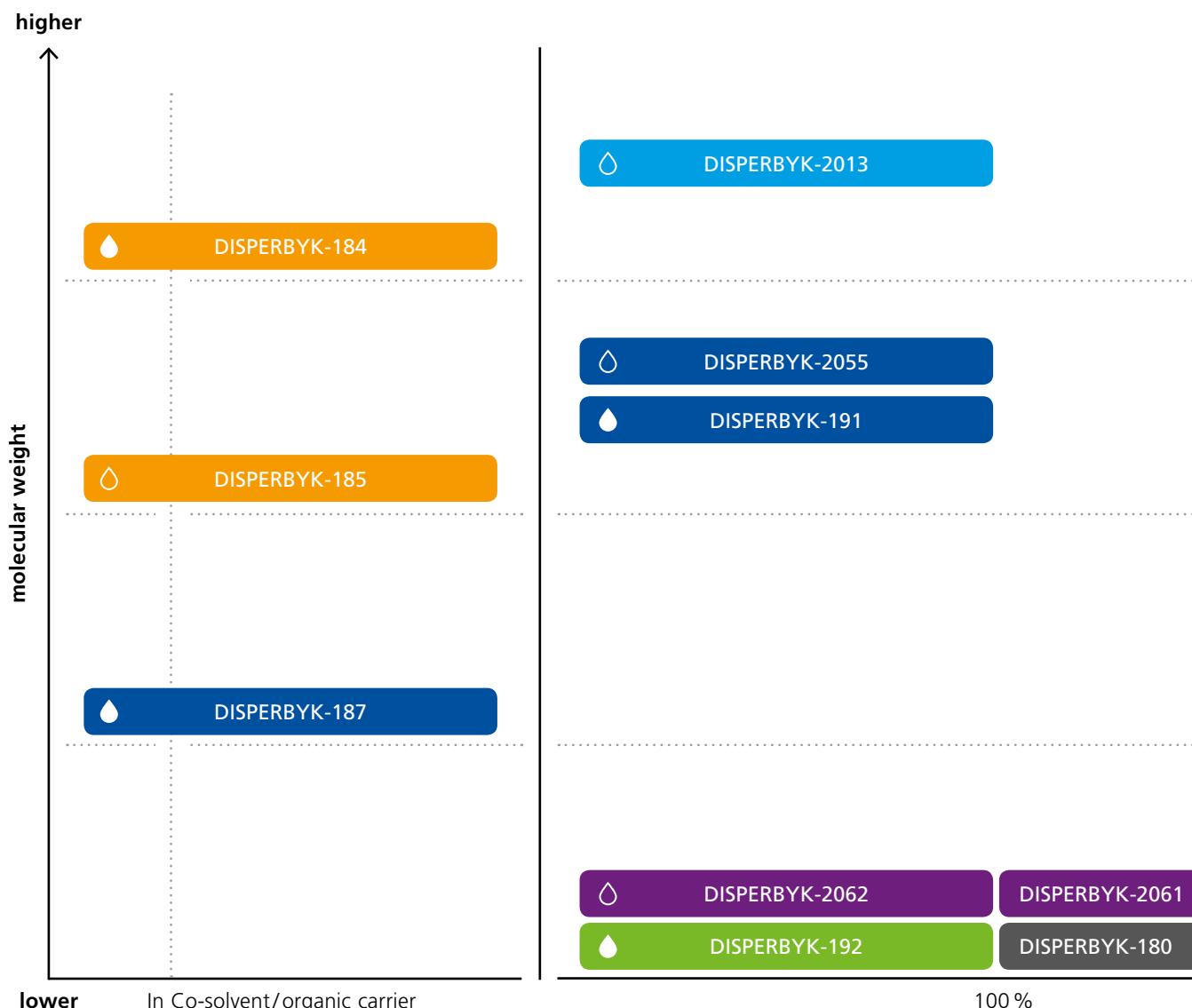
# Wetting and Dispersing Additives

While standard products suffice for the polar surfaces of inorganic pigments and fillers, tailored additive solutions are required for organic pigments and their large, low-energy surfaces, in order to achieve a good wetting and stabilization in the system.

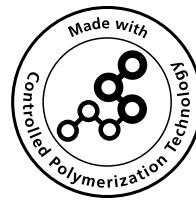
At BYK, these highly effective wetting and dispersing additives have been developed based on the most varied of technologies. They are polymers with different chemical structures:

- Acrylate copolymers
- Phosphoric acid derivatives
- Polyalkoxylates
- Fatty acid derivatives
- Polyurethanes

## Overview of Wetting and Dispersing Additives

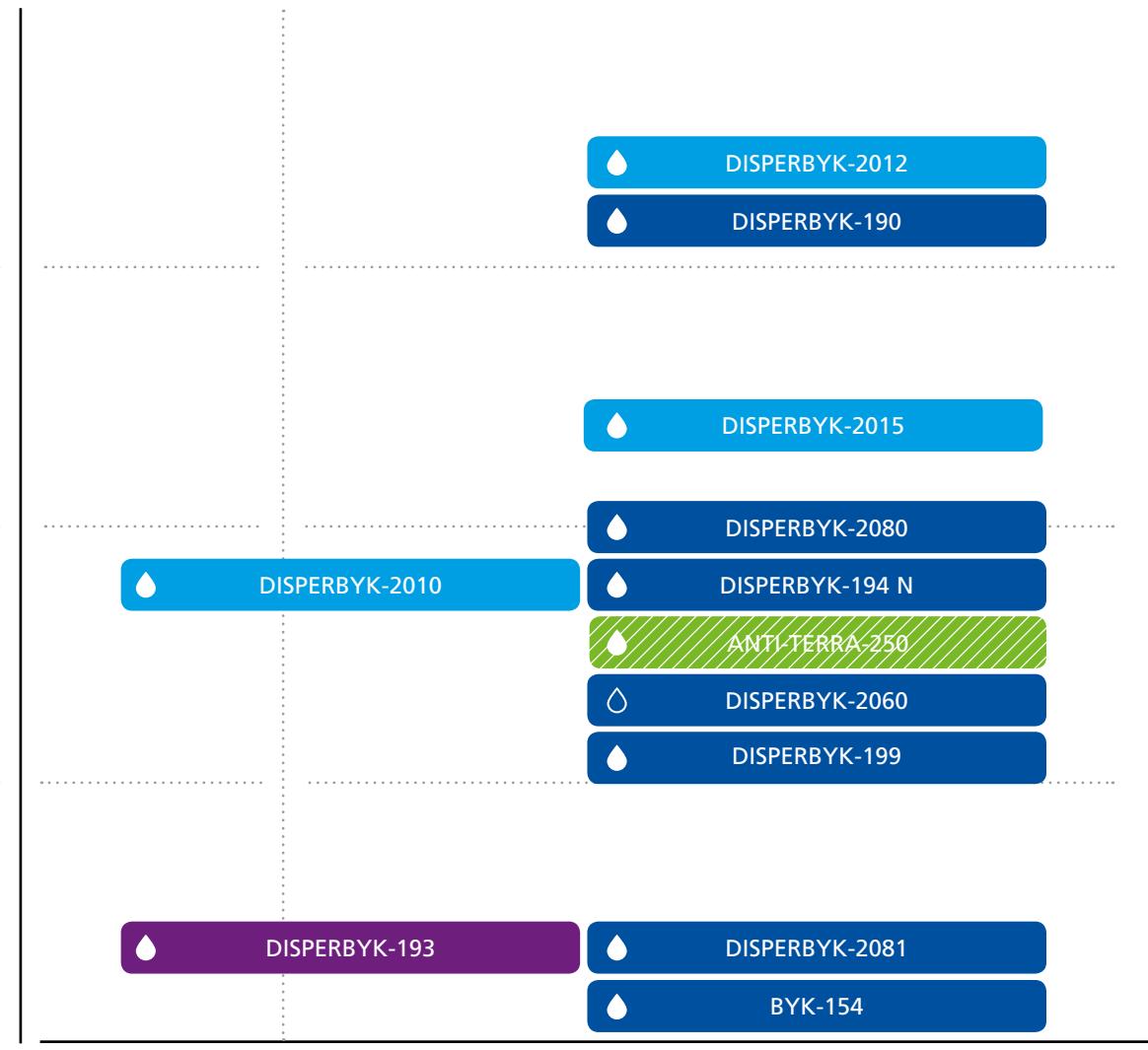


A special sub-group of the acrylate copolymers consists of those additives which are based on controlled polymerization technology, in short, CPT. This procedure enables a product design that is particularly tailored to the application requirements. With CPT, not only different monomers can be selected and polymerized, sections with specific functionalities and properties can also be integrated into the polymer structure, therefore covering a complex requirement profile using just one additive.



- Acrylate copolymer
- CPT-based acrylate copolymer
- Fatty acid derivative

- Phosphoric acid derivative
- Polyurethane
- Polyalkoxylate
- Controlled flocculating
- Aqueous systems
- Solvent-borne + aqueous systems



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## **DISPERBYK-190**

DISPERBYK-190 is a wetting and dispersing additive which was brought to market in 1990 and is suitable for all pigments. Due to its excellent wetting and dispersing quality, it produces a high level of gloss and transparency in conjunction with low viscosity, thereby enabling a better flow behavior and increased pigmentation. DISPERBYK-190 is particularly suitable for producing binder-free pigment concentrates. This impressive product profile has established it as an industry standard worldwide.

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## **DISPERBYK-199**

DISPERBYK-199 is a VOC-free wetting and dispersing additive - the first to use electrosteric stabilization, and which best combines the increased quality requirements and the demand for greater efficiency. It therefore represents a good alternative to the polyelectrolyte-based dispersing additives or the high molecular weight wetting and dispersing additives which are often used in aqueous systems. DISPERBYK-199 is ideal for inorganic and organic pigments, and particularly recommended for aqueous coatings (PVC 16–35) and highly filled pigment concentrates.

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## **DISPERBYK-2015**

DISPERBYK-2015 is a specialist for high-quality, aqueous pigment concentrates, which was developed based on CPT (controlled polymerization technology). This technology enables a close, defined molecular weight distribution that guarantees an application in many different binder systems. DISPERBYK-2015 enables a high level of gloss and exceptional color strengths with optimum viscosity and good leveling properties.

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# Highlights

	Active substance (%)	Grind			Pigments			Binder systems							Hybrid systems	Water-soluble systems	Baking systems	Two-component PU systems	Two-component epoxy systems		
								Emulsion paints		Emulsions											
		With binder	Without binder/slurry	Universal colorants	Inorganic, fillers	Organic, carbon blacks		Higher PVC content (35–40)	Lower PVC content (16–35)	Acrylate	PUR	Alkyd									
DISPERBYK-180	100	●			●					○	○				●	●	●	●			
DISPERBYK-184	52	●			●	●									●	●	●	○	○		
DISPERBYK-185	52	●			●	●				○	○	●				●	●				
DISPERBYK-187	70	●						●	●	●	●	●					○				
DISPERBYK-190	40		●		●	●			○	○	●	●			●	○	●	○	●	○	
DISPERBYK-191	100	●	●		●	●			○	●	●	●							○	○	
DISPERBYK-192	100		●		●				○	●	●	●			●		○	●	●		
DISPERBYK-193	40	●			●	●				●						●					
DISPERBYK-194 N	57		●		●	●				○								○	●	●	●
DISPERBYK-199	40	●	●		●	●		○	●	●	●	○				○				○	
DISPERBYK-2010	40		●		●	●				●	●	●					○	●	●	●	
DISPERBYK-2012	40	●	●		●	●			○	●	●	●				●		●	○	○	
DISPERBYK-2013	100	●	●		●	●			○	●	●	●				●	●	●	●	○	○
DISPERBYK-2015	40		●		●	●			○	○	○	●				●		●	●	○	
DISPERBYK-2055	100	○	●		●	●				●	●	○				●	●	●	●	●	●
DISPERBYK-2060	95			●	●																
DISPERBYK-2061	100			●		●															
DISPERBYK-2062	100			●		●															
DISPERBYK-2080	30	○	●		●					●	●	●				●	○	●	●	●	●
DISPERBYK-2081	45		●		●					●	●	●				●	○	●	●	○	○
ANTI-TERRA-250	70	●	●		●			●	○	●	●	●				●		○	○	●	●
BYK-154	42		●		●			●	○												

● especially recommended   ○ recommended

## Which Aqueous Wetting and Dispersing Additive is Suitable for Which System?

### Selection Criteria – Grinding Method

Grinding can take place either without a binder (slurry) or with a binder. The decision depends on which properties the coating manufacturer considers to be the most important:

Property	With Binder	Without Binder	Due to the greater flexibility and better results, BYK recommends using a binder-free grind.
Compatibility	-	+	
Level of Pigmentation	-	+	
Foam Stabilization	-	+	
Deflocculation/Stabilization	○	+	
Storage Stability	+	+	

+ good   ○ neutral   - poor



# Defo



# amers

# Defoamers

In principle, the development of foam when producing and applying coatings is not a problem specific to aqueous systems. Nevertheless, when producing aqueous binders, emulsifiers which create foam are used, and also the previously mentioned wetting and dispersing additives along with non-associative effective thickeners, which have hydrophilic components, can promote the formation of foam. Regardless of the cause, foam is not just annoying, delaying the production and application process, it also has a negative impact on the appearance and the mechanical protective effect of the coating. Defoamers are therefore indispensable in the production of coatings.

To achieve the desired defoaming effect, the defoamer should have a certain degree of incompatibility in the system. Therefore, when formulating aqueous coatings, additives which generally have the following chemical structure are required:

- Mineral oil defoamers
- Silicone defoamers
- Silicone-free polymer defoamers

The defoaming effect is generally based on a combination of hydrophobic particles and an oil component.

## Profiles of Different Defoamer Classes

### Mineral oil defoamers

- Highly economic
- Only a limited effect in systems with a high binder content

### Silicone-free polymer defoamers

- Very effective
- Minor influence on the surface tension
- Stable in a broad pH range (3–12)

### Silicone defoamers

- Exceptionally effective and spontaneously defoaming
- Incompatible in some binder systems
- pH-sensitive ( $\text{pH} > 10$ )

A large, stylized, blue-outlined text "APE" is centered at the bottom of the page. The letters are bold and have a slight drop shadow, giving them a three-dimensional appearance. The background behind the letters is white.



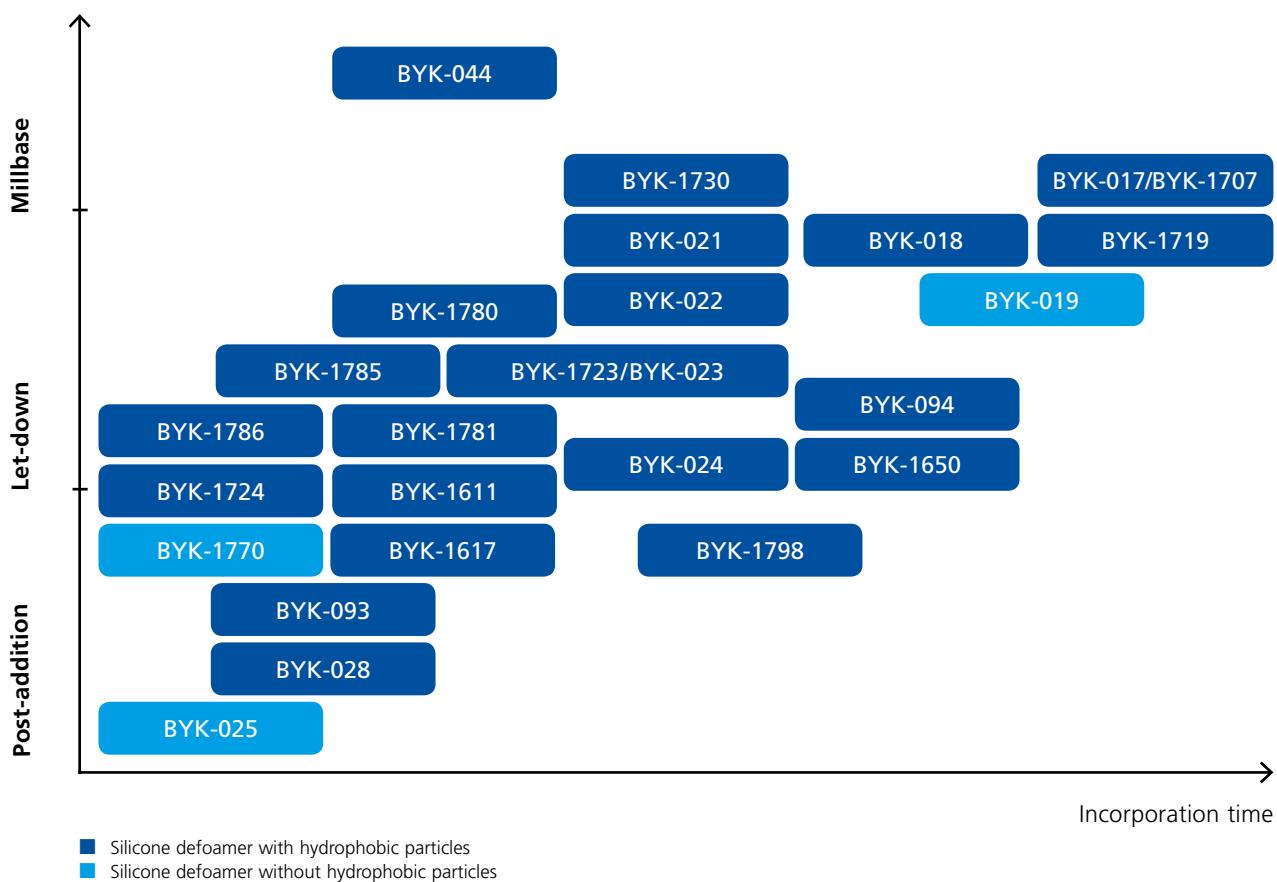
O-free

# Defoamers

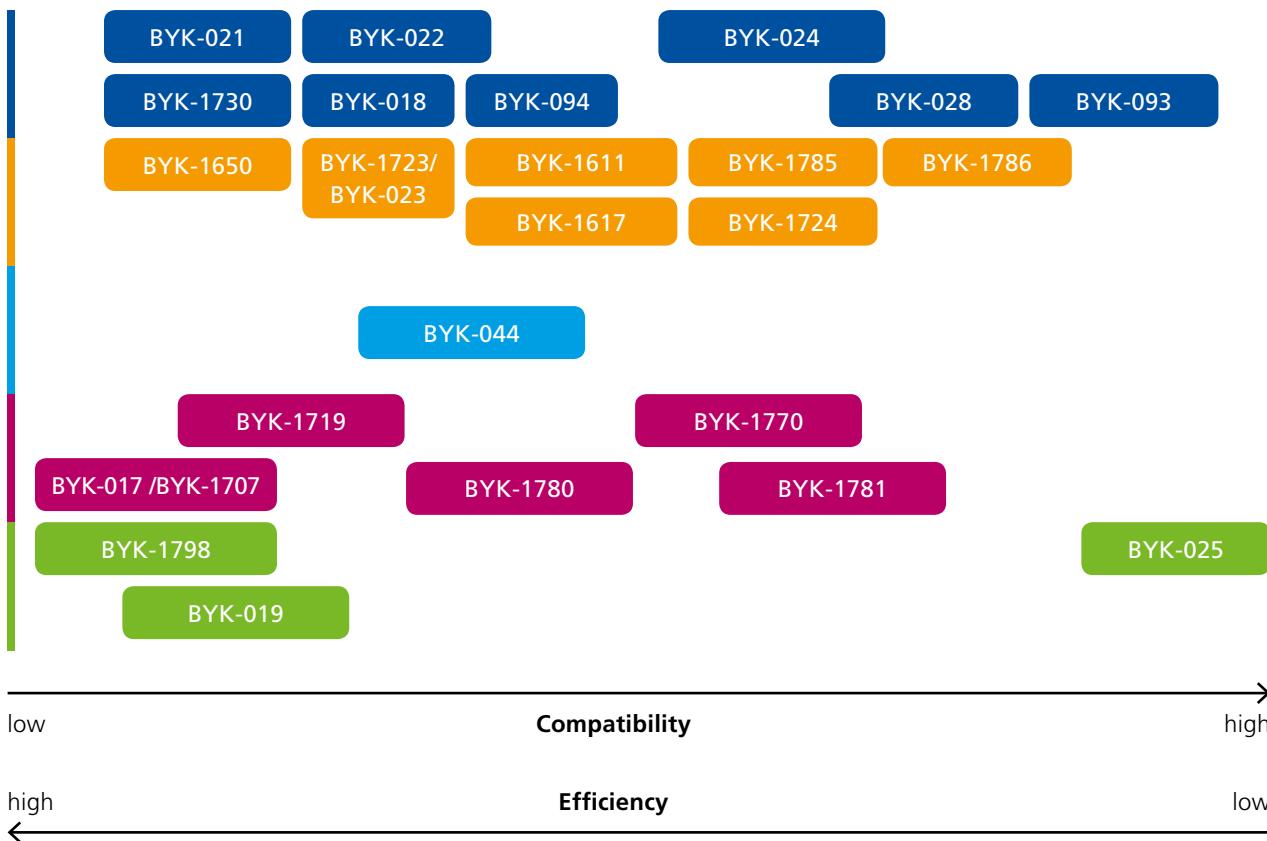
## Silicone Defoamers

### Overview

Shear forces/  
time of addition



## Compatibility and Efficiency

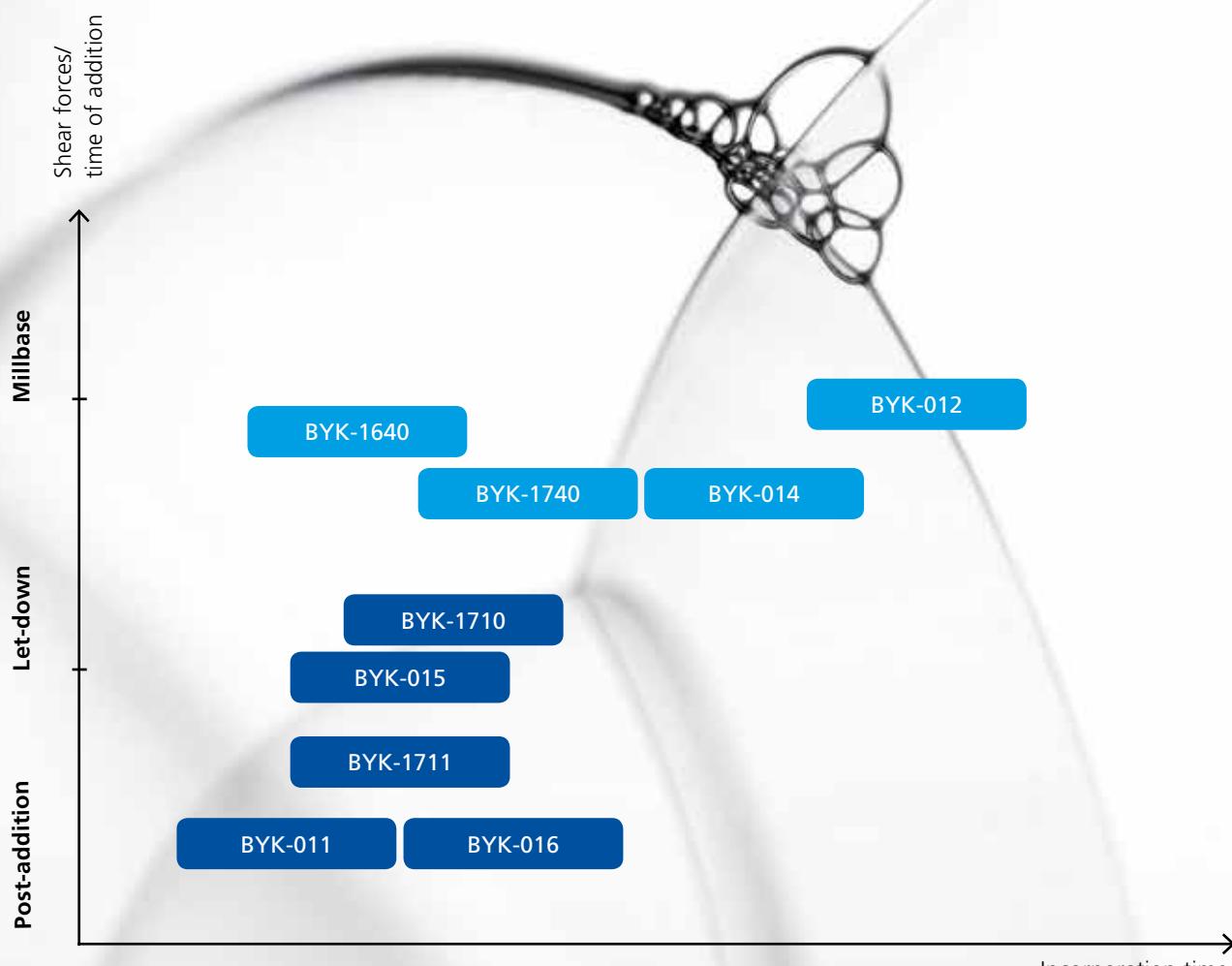


- Silicone defoamers in a carrier
- Silicone defoamer emulsion (oil/water)
- Silicone defoamer emulsion (water/oil)
- 100 % silicone defoamer
- Silicone defoamer solution

# Defoamers

## Silicone-free Polymer Defoamers

### Overview

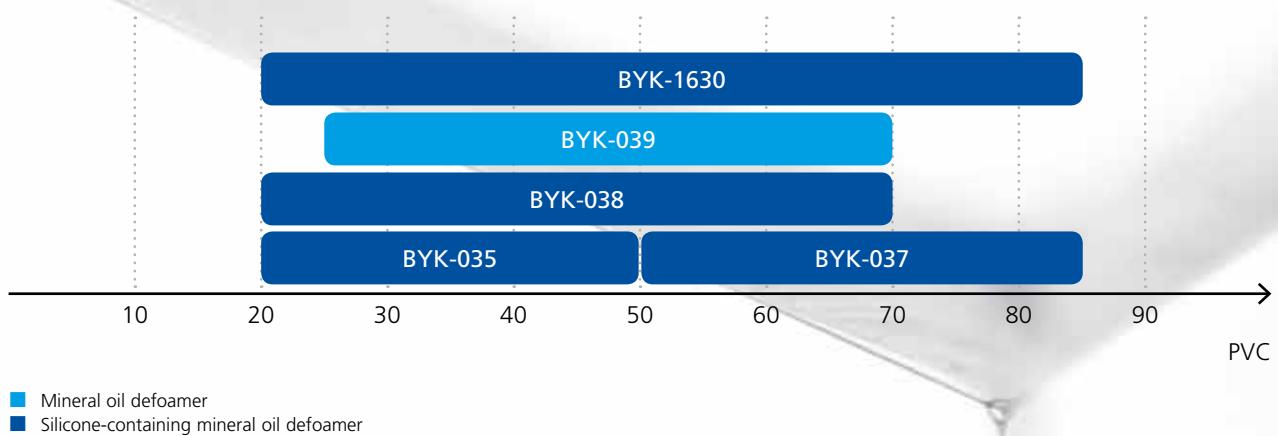


- For pigment concentrates, emulsion paints and plasters
- For industrial coatings, wood coatings, automotive coatings, architectural coatings

## Stable in a Broad pH Range

# Mineral Oil Defoamers

## Defoamer usage according to the PVC of the system



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## **BYK-024**

BYK-024 is a VOC-free silicone defoamer with a balanced ratio of efficiency and compatibility. This, and the fact that it is easy to incorporate, have made it a popular and widely used additive. It is particularly suitable for many different aqueous systems and the most varied of applications.

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## **BYK-093**

BYK-093 is an additional VOC-free silicone-containing defoamer for aqueous wood, architectural and industrial coatings. It is all-purpose and therefore excellently suited as a standard defoamer in the formulation of aqueous systems. Due to its balanced compatibility, it causes virtually no surface defects such as cratering or fogging. BYK-093 can be used both in pigmented and non-pigmented coatings, and is particularly recommended for contemporary, co-solvent-free binders which form the basis of VOC-free or low-VOC formulations. BYK-093 also supports the excellent long-term stability of the finished coating (both at high as well as low temperatures), is easy to incorporate, and suitable for all standard types of application.

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## **BYK-1640**

BYK-1640 is a very versatile, odorless, polymer defoamer for aqueous systems. It is chemically based on a new kind of polyamide particle technology, which enables fulfilling the requirements for greater efficiency and also environmental friendliness. BYK-1640 is both silicone- and mineral oil-free and is specifically suitable for VOC-free systems; it is therefore particularly recommended for the production and application of emulsion paints and plasters in the PVC range of 30–85. BYK-1640 has a spontaneous defoaming effect and is also suitable for preventing microfoam. BYK-1640 exhibits optimum performance even at the lowest dosage, is stable against acids and alkalis, and can be used in the pH range 3–12. It is also suitable for internal protective coatings (pigmented and clear) in can coatings, and approved for applications that come into contact with food (FDA sections 175.105, 175.300).

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# Highlights

## Mineral Oil Defoamers

	Composition				Recommended for emulsion paints and plasters		Recommended for emulsion binders	Recommended for industrial emulsion paints	PVC range
	Mineral oil	Hydrophobic solids	Silicone	Water	Gloss and silky gloss	Matt			
BYK-035	+	+	+		○	○			20-40
BYK-037	+	+	+	+	○	●	●		50-85
BYK-038	+	+	+		●	●	●	●	20-70
BYK-039	+	+			●	●			35-70
BYK-1630	+	+	+		●	●	●	●	30-85

● especially recommended ○ recommended

## Polymer Defoamer

	2-component PU	Alkyd dispersions	2-component epoxides	Water-soluble alkyd resins	PU dispersions	Aqueous UV systems	Properties
BYK-011	●	●	○	○	○	●	Particularly effective in 2-component PU systems
BYK-015	○	●	○	○	○	○	Anti-popping effect
BYK-1710	○	●	●	●	●	○	VOC-free, conforms to AGBB
BYK-1711	●	○	●	○	○	○	

	Emulsion paints and plasters PVC 30-85	Polymerization process	Pigmented acrylate/melamine systems	Properties
BYK-012	○	○	●	
BYK-014	●	○	○	
BYK-016	○	●	○	Approved in accordance with FDA sections §§ 175.105, 175.300, 175.320, 176.200, 176.210
BYK-1640	●	●	●	Polymer emulsion, approved in accordance with FDA sections 175.105 and 175.300
BYK-1740	●	●	○	Green defoamer based on renewable raw materials

● especially recommended ○ recommended

## Silicone Defoamers

	Solvent/carrier	Use in			Recommended for			Applications/properties	
		Millbase	Let-down	Post addition	Clear coating	Gloss + silky gloss	Matt coating		
BYK-017		●				●	○	For glycol pastes and aqueous pigment concentrates	
BYK-018	Polyglycol	●				●	○	PVC 18-25, effective against microfoam	
BYK-019	Dipropylene glycol monomethyl ether	●				●	○	For PU and PU/acrylate systems	
BYK-021	Polyglycol	●				●	○	PVC 18-25, also for airless application, VOC-free	
BYK-022	Polyglycol	●	○			●	●	PVC 18-25, effective against microfoam, VOC-free	
BYK-023	Water	●	○			●	●	PVC 30-50, emulsion, VOC-free	
BYK-024	Polyglycol	○	●		●	●	●	PVC 0-25, VOC-free	
BYK-025	Dipropylene glycol monomethyl ether		●	●	●	●	○	Very easy incorporation; also for casting machines	
<b>BYK-028</b>	Polyglycol	○	●	●	●	●	○	VOC-free	
BYK-044		●			Pigment concentrates			For glycol pastes + aqueous pigment concentrates, emulsion	
BYK-081	Propylene glycol	●	●		●	●	●		
<b>BYK-093</b>	Polyglycol	●	●	○	●	●	●	Very wide range of applications, VOC-free	
BYK-094	Polyglycol	●	●		●	●	○	VOC-free	
BYK-1610	Water	○	●			●	●	Emulsion paints with medium PVC and emulsion plasters, VOC-free	
BYK-1611	Water	○	●			●	●	PVC 35-70, VOC-free	
BYK-1615	Water	○	●			●	●	Highly filled emulsion paints, VOC-free	
BYK-1617	Water	○	●			●	●	PVC 60-85, VOC-free	
BYK-1650	Water	○	●			●	●	PVC 18-35, emulsion, VOC-free	
BYK-1707		●				●	○	For glycol pastes + aqueous pigment concentrates. Low-cycle variant of BYK-017, i.e. content of D4, D5, D6 in each case < 0.1 %	
BYK-1719		●			●	○		Glycol- and VOC-free	
BYK-1723	Water	●	●			●	●	PVC 60-85, VOC-free	
<b>BYK-1724</b>	Water	○	●			●	●	PVC 0-25, emulsion, VOC-free	
BYK-1730	Polyglycol	●				●	●	PVC 20-45, VOC-free	
BYK-1770		○	●	○	●	●	●	Airless/airmix	
BYK-1780		●	●		●	●	○	Airless/airmix	
BYK-1781		●	●		●	●	○	Airless/airmix	
BYK-1785	Water	○	●		●	●	○	Airless/airmix, emulsion	
BYK-1786	Water	○	●	●	●	●	●	Airless/airmix, emulsion	
BYK-1798	Butylglycol/ethylhexanol/white spirit 6/2/1		○			●			

**Bold print:** Standard silicone defoamers which are recommended as a starting point for aqueous formulations.



# Rheology



# Additives

# Rheology Additives

## Our Portfolio for Aqueous Coating Systems

The flow behavior of a coating system determines to a considerable extent its producibility and applicability, storage stability, sag resistance and its visual appearance after application. That's why BYK offers a comprehensive portfolio of rheology additives so as to be able to establish and optimize the viscosity profile of each coating for the respective application purpose.

### RHEOBYK – Organic Rheology Additives

"RHEOBYK" is the brand for organic rheology additives from BYK. The special feature of RHEOBYK is that it offers a range of different basic technologies and the possibility of providing an optimum selection of additives under one roof. RHEOBYK also stands for the proven BYK quality and competence in the application consulting.

#### Urea-based RHEOBYK Additives

After incorporation in the coating, the urea-based RHEOBYK additives form a network of urea crystals that generate a pronounced thixotropic flow behavior.

The advantages are:

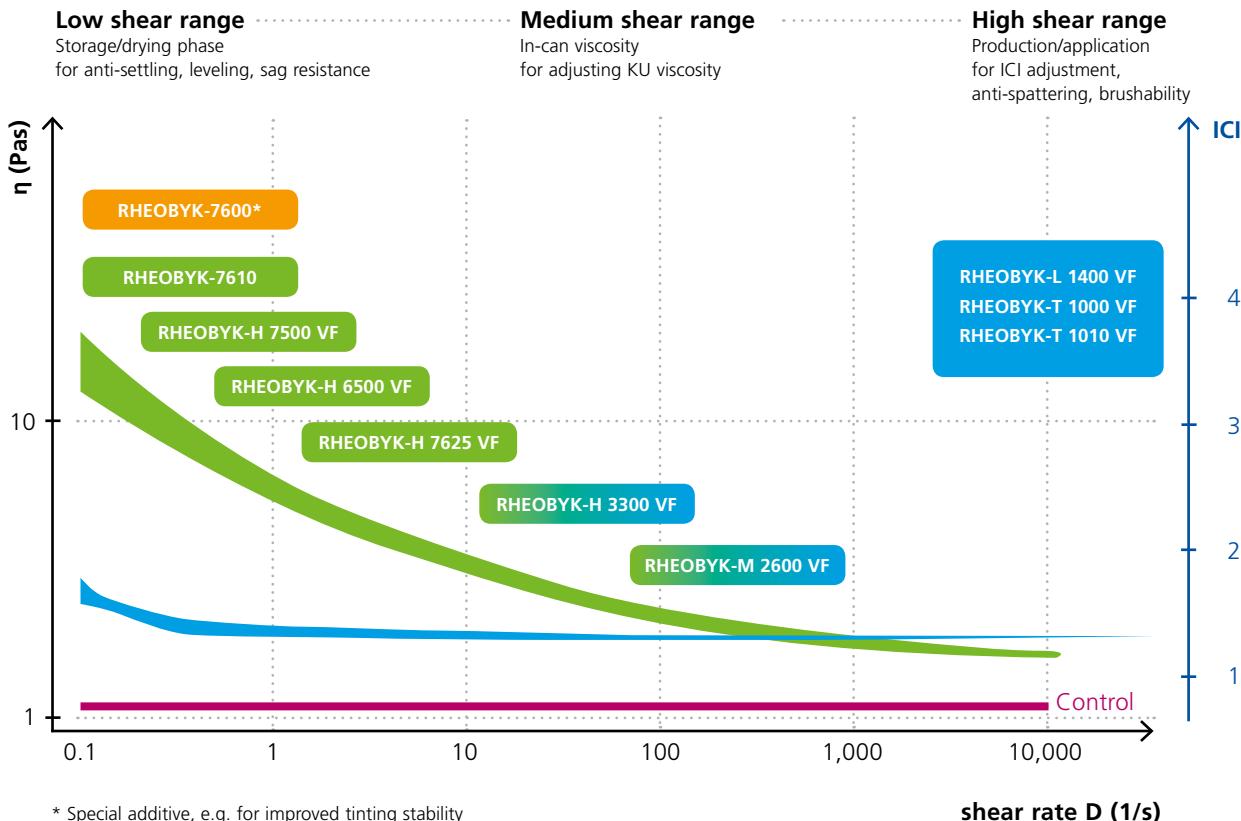
- Simultaneous improvement of storage stability and stability
- Very strong shear thinning effect
- Low application viscosity, ideal for spray applications
- Good leveling and good substrate wetting

The incorporation is easy on account of its liquid supply form, and can be carried out during, but also after (post-addition) the coating production.

#### Polyamide-based RHEOBYK Additives

Polyamide-based RHEOBYK additives require no activation, are easy to incorporate into the coating (also post-addition) and have a highly pronounced pseudoplastic flow behavior. They are very effective and storable. BYK now also offers this technology for aqueous systems. Polyamide-based RHEOBYK additives offer

- A fast structural build-up with a strong shear thinning effect
- An improved storage stability and sag resistance



## RHEOBYK – Liquid Associative Thickeners

These RHEOBYK additives are liquid associative thickeners which are predominantly based on HEUR technology (hydrophobically modified ethoxylated urethanes).

After adding to the coating system, they develop interactions both with one another as well as with other formulation components. This creates a reversible three-dimensional network which increases the viscosity. Targeted chemical modification of the individual RHEOBYK associative thickeners makes it possible to define exactly in which shear range this viscosity increase will take place.

Together, they cover a broad application spectrum and are also characterized by additional properties:

- Good leveling
- No negative influence on the degree of gloss, water resistance, film forming and transparency
- Easy to incorporate
- Positive influence on the spraying behavior
- pH-stable/pH value-independent
- APEO-, VOC- and tin-free

## OPTIGEL – Natural Phyllosilicates

OPTIGEL additives are based on powdered phyllosilicates which are acquired and processed from natural sources. They can be organically modified for special application purposes and greater efficiency.

The additives are made up of platelet-forming particles which are dispersed and form a network when added to the coating system. This network creates a thixotropic or pseudoplastic flow behavior which significantly improves parameters such as storage stability and sag behavior.

The products of the OPTIGEL family are characterized by the following advantages:

- Widely applicable in a whole variety of applications
- Produced from natural raw materials, environmentally friendly
- VOC-free
- Outstanding price-performance ratio
- Insensitive to co-solvents

# Rheology Additives

## Our Portfolio for Aqueous Coating Systems

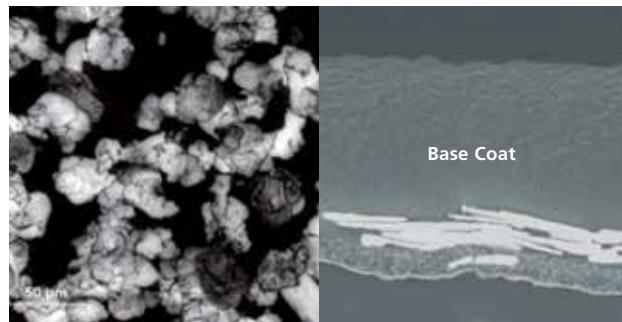
### AQUATIX 8421 – Liquid Wax-based Rheology Additive

The wax emulsion is a specialist for effect pigment coatings. It significantly improves the settling behavior and ensures a perfect orientation of various effect pigments, and therefore an outstanding flip-flop effect. The additive does not have to be pre-diluted and can be incorporated in a formulation at low shear forces.

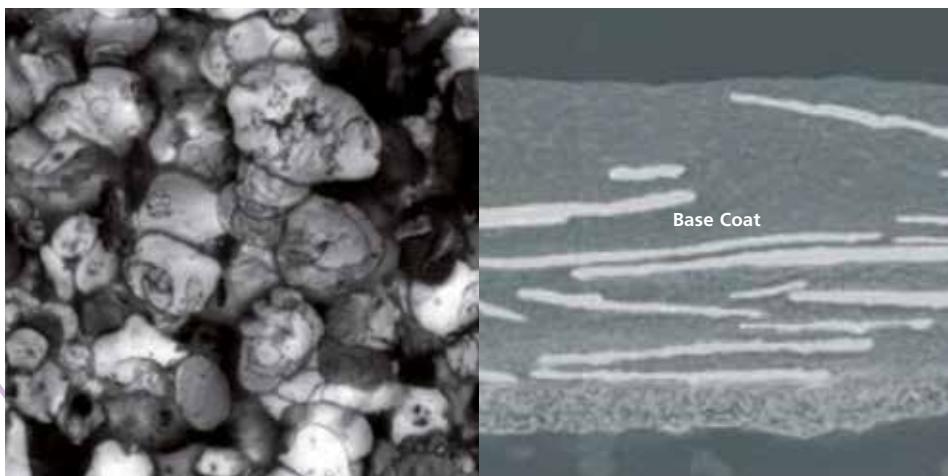
AQUATIX 8421 at a glance:

- Perfect orientation of effect pigments, outstanding flip-flop effect
- Improved settling behavior
- Low clouding/mottling
- Easy to use

Without AQUATIX 8421



With AQUATIX 8421



## LAPONITE – Synthetic Phyllosilicates

LAPONITE rheology additives are phyllosilicates which, in contrast to natural standard products, have been produced synthetically under defined conditions and with the utmost precision. Therefore, LAPONITE products are characterized by outstanding properties such as high efficiency, purity and a neutral intrinsic color. They are particularly suitable for high-quality applications, special applications and effect coatings.

LAPONITES are also the first port of call when producing multi-color paints (MCP).

**Increase in conductivity (anti-static)**  
(e.g. of textiles, carpets and flooring, etc.)

**Viscoelastic flow behavior**  
Ensures a fast structural build-up, anti-settling and anti-sagging, increases the storage stability and effect pigment orientation



### Stabilization of emulsions

Prevents separation of emulsions (water/oil – oil/water)



**Production and stabilization**  
of multi-color paints



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## RHEOBYK-440

The new RHEOBYK-440 based on BYK's polyamide technology is, however, the first additive in this series which has been specially developed for aqueous systems such as acrylate, PU and, in particular, epoxy dispersions. Rapid structural build-up after high shear thinning allows RHEOBYK-440 to achieve considerable levels of sag resistance and good processing conditions. The additive is particularly effective in the low shear range, and therefore generates outstanding anti-sagging and anti-settling properties. In addition, the good pH value stability provides excellent storage conditions. RHEOBYK-440 has a wide range of applications, such as in aqueous systems which require a good effect pigment orientation.

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## RHEOBYK-L 1400 VF

The associative thickener, RHEOBYK-L 1400 VF, is an additive that brings about a Newtonian flow behavior. Its use is recommended if the coating has an excessively strong shear thinning effect and the viscosity decreases too much during application. The product ensures that the viscosity in the high shear ranges, such as in coating or roller applications, remains at a high level. This results in a stronger coating resistance, an increase in the achievable coating thickness and a reduction in spattering. RHEOBYK-L 1400 VF has a very broad range of applications and can be used in various dispersion coatings (acrylate, styrene acrylate, vinyl acetate, epoxy) as well as in alkyd emulsions. The additive is suitable for any production step and also for post-addition. RHEOBYK-L 1400 VF requires no temperature activation or control of the pH value.

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## RHEOBYK-D 420 / RHEOBYK-7420 ES

RHEOBYK-D 420/RHEOBYK-7420 ES are the additives to choose if you need to improve the storage stability without adversely affecting the leveling or the application properties. After incorporation, a three-dimensional network is developed which can be destroyed by shearing, allowing a strong shear thinning to then take place. This strong shear thinning facilitates, for example, the dosing of pigment concentrates, with a simultaneously good storage stability. The re-establishment of the network takes place with a time delay (thixotropic), which promotes the leveling after the application of coating systems. The simple incorporation is also outstanding: RHEOBYK-D 420/RHEOBYK-7420 ES are liquid and can be added at any stage of the process, including post-addition.

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# Highlights

## Rheology Additives – Overview

Technology	Product name	Supplied as		Incorporation				Thickening in			Rheology profile		
		Liquid	Powder form	Post-addition	Medium shear forces	High shear forces	Premix	Low shear range	Medium shear range	High shear range	Newtonian	Pseudoplastic	Thixotropic
Urea/PU	RHEOBYK	x		●	○	○		x					x
Associative	RHEOBYK	x		●	○	○	○	x	x	x	x	x	
Polyamides	RHEOBYK	x		●	○	○		x	x		x	x	
Natural phyllosilicates	OPTIGEL		x		●		○	x			x	x	x
Synthetic phyllosilicates	LAPONITE	x	x	○	○	○	●	x			x	x	x
Wax emulsion	AQUATIX	x		●				x					x

● highly recommended ○ recommended

### OPTIGEL

OPTIGEL-CK	Natural phyllosilicates	All-purpose, high degree of fineness
OPTIGEL-CMO		Cost-optimized, for applications with thick layers
OPTIGEL-CG		For applications with high PVC
OPTIGEL-WX		All-purpose, very good anti-settling behavior
OPTIGEL-W 724		Particularly suitable for industrial and protective coatings
OPTIGEL-WA		Suitable for systems with high PVC
OPTIGEL-WM		Suitable for emulsion paints, no influence on water resistance
OPTIGEL-LX		Comparable with OPTIGEL-WM, with greater in-can viscosity

### LAPONITE

	Benefits	Applications
LAPONITE-RD	<ul style="list-style-type: none"> <li>Versatile additive</li> <li>Strongest increase in viscosity</li> <li>Thixotropic flow behavior, pseudoplastic at higher dosage levels (&gt;1.5 %)</li> </ul>	<ul style="list-style-type: none"> <li>Broad application profile in aqueous coatings</li> <li>Effect pigment orientation in automotive coatings</li> <li>Architectural coatings</li> <li>Multi-color paints</li> </ul>
LAPONITE-RDS	<ul style="list-style-type: none"> <li>Easy to disperse</li> <li>Longer processing period</li> <li>Greater tolerance of Ca<sup>2+</sup>/Mg<sup>2+</sup>ions</li> </ul>	<ul style="list-style-type: none"> <li>Similar to LAPONITE-RD</li> <li>Particularly suitable for formulations with low water content</li> </ul>
LAPONITE-S 482	<ul style="list-style-type: none"> <li>Powdered, for producing a liquid intermediate product with higher concentration levels (up to 25 %)</li> <li>Suitable for higher dosages</li> <li>Suitable for post-addition</li> </ul>	<ul style="list-style-type: none"> <li>Broad applicability in many end applications</li> <li>General industrial coatings</li> <li>Wood and furniture coatings</li> <li>To increase the conductivity and the barrier properties</li> <li>Multi-color paints</li> </ul>
LAPONITE-SL 25	<ul style="list-style-type: none"> <li>Liquid product for direct processing</li> <li>Suitable for post-addition</li> </ul>	<ul style="list-style-type: none"> <li>Broad applicability in many end applications</li> <li>General industrial coatings</li> <li>Wood and furniture coatings</li> <li>To increase the conductivity and the barrier properties</li> </ul>
LAPONITE-EP	<ul style="list-style-type: none"> <li>Organically modified</li> <li>To adjust the in-can viscosity</li> <li>Suitable for broad pH range</li> </ul>	<ul style="list-style-type: none"> <li>Thick-layer coating systems, e.g. protective coatings</li> <li>General industrial coatings</li> </ul>

### RHEOBYK

Non-volatile matter (%)	Supplied as/ solvent	Incorporation		Viscosity increase		Resulting flow behavior	Properties/applications	
		Post-add and stir	At a high shear rate	At low shear rates	At moderate shear rates (KU)		Pseudoplastic	Thixotropic
15	Water	●		●		●		HEUR, very good anti-sagging and leveling
20	Water	●		●	○	●		Especially recommended for airless/airmix and HVLP application
17.5	Water	●		○	●	●		HEUR, extremely all-purpose
20	Water	●		●	○	●		HEUR, broad application in emulsion paints
17.5	Water	●		●		●		HEUR, very effective in the low shear range
20	Water	●		●	○	●		HEUR, all-purpose
30	Water	●		●	○	●		HASE-based
20	Water	●				●	●	HEUR, especially suitable for acrylate and styrene/acrylate dispersions, very hydrophobic
20	Water	●			●	●		HEUR, especially suitable for colloidal emulsions (VAE)
22.5	Water	●				●	●	HEUR, very Newtonian flow behavior, highest ICI values
22.5	Water	●				●	●	HEUR, very Newtonian flow behavior
12.5	Water	●		○	●	●		HEAT, especially recommended for the rheology adjustment of colorants

#### Liquid associative thickener

RHEOBYK-7600	15	Water	●		●			●		HEUR, very good anti-sagging and leveling
RHEOBYK-7610	20	Water	●		●		○		●	Especially recommended for airless/airmix and HVLP application
RHEOBYK-H 3300 VF	17.5	Water	●		○	●		●		HEUR, extremely all-purpose
RHEOBYK-H 6500 VF	20	Water	●		●	○		●		HEUR, broad application in emulsion paints
RHEOBYK-H 7500 VF	17.5	Water	●		●			●		HEUR, very effective in the low shear range
RHEOBYK-H 7625 VF	20	Water	●		●	○		●		HEUR, all-purpose
RHEOBYK-HV 80	30	Water	●		●	○		●		HASE-based
RHEOBYK-L 1400 VF	20	Water	●				●	●		HEUR, especially suitable for acrylate and styrene/acrylate dispersions, very hydrophobic
RHEOBYK-M 2600 VF	20	Water	●			●		●		HEUR, especially suitable for colloidal emulsions (VAE)
RHEOBYK-T 1000 VF	22.5	Water	●				●	●		HEUR, very Newtonian flow behavior, highest ICI values
RHEOBYK-T 1010 VF	22.5	Water	●				●	●		HEUR, very Newtonian flow behavior
RHEOBYK-TVS VF	12.5	Water	●		○	●		●		HEAT, especially recommended for the rheology adjustment of colorants

#### Modified urea

RHEOBYK-7420 ES	40	Amide ester	●	○	●			●		Anti-settling, anti-sagging, elasticity, all-purpose
RHEOBYK-D 420	45	Dimethylsulfoxide	●	○	●			●		Anti-settling, anti-sagging, elasticity, all-purpose

#### Polyamide

RHEOBYK-440	25	Alicyclic amide	●		●	●		●		Anti-settling, anti-sagging, high storage and pH value stability, orientation of effect pigments, all-purpose
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● especially recommended ○ recommended



# Surface



# Additives

# Surface Additives

In principle, the quality of a coating can considerably influence the surface tension phenomena. It is necessary to coordinate the surface tension and energy of the substrate and coating to one another, and to avoid surface tension differences in the coating when drying. Due to the high surface tension of the water, this is a particular challenge in aqueous systems, and the development of the appropriate additives requires an intensive understanding of the materials.

To prevent wetting and leveling issues, as well as surface defects, BYK offers a broad assortment of special additives which also have a positive influence on further surface properties:

- Increasing or reducing the surface slip (slip/anti-slip)
- Reducing the adhesiveness (anti-blocking)
- Increasing the scratch and abrasion resistance
- Increasing the open time
- Enhancing the cleanability (easy-to-clean)
- Increasing the surface energy of a cured coating film

## Substrate Wetting

Whether a liquid coating is capable of sufficiently wetting the surface of a substrate without defects depends critically, alongside other factors, on the ratio of the surface tension or the surface energy between the coating and substrate. An optimum wetting can be achieved by adapting the surface tension with the use of surface additives.

When chosen appropriately, these additives enable a good substrate wetting while simultaneously avoiding defects (cratering). In addition, some products have defoaming/degassing effects. Furthermore, there are additives which specifically reduce the dynamic surface tension and therefore ensure the substrate wetting in "fast", dynamic coating processes.

A new additive class is also capable of influencing the surface tension of an already cured coating film to such an extent that a good wetting of the subsequent coating layer is ensured.

## Selection of Surface Additives for Systems with No or Low Co-solvent Content

**Substrate wetting  
+ slight improvement in leveling**

BYK-345  
BYK-346  
BYK-347  
BYK-348  
BYK-349

**Substrate wetting  
+ improvement in leveling**

BYK-3400  
BYK-3450  
BYK-3451  
BYK-3455  
BYK-3456

BYK-381\*  
BYK-DYNWET 800 N\*  
BYK-3410\*  
BYK-3440\*

\* silicone-free

## Improved Leveling

### Substrate Wetting

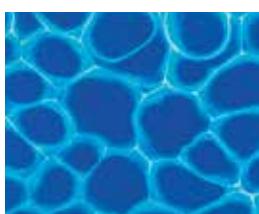


Poor substrate wetting of an aqueous coating on PVC foil



Good wetting by using a surface additive

### Bénard Cells



### Insufficient Flow



While a coating is drying, local differences in the surface tension arise within the liquid film. Along with other problems (Bénard cells/floating), this can cause a poor leveling and, therefore, an undesired appearance. Acrylate-based surface additives are used to address this issue.

They are able to balance out the surface tension differences on the surface of a drying coating, and ensure a uniform appearance. Depending on the compatibility of the additives used, these also have a degassing effect and prevent defects due to boiling solvents (popping).

Moreover, further additive classes can be used, which, for example, increase the open time of a coating and therefore also have a positive effect on the leveling.

### Surface slip + improvement in leveling

BYK-3760  
BYK-378/BYK-3764<sup>1</sup>  
BYK-333  
BYK-307/BYK-3762<sup>2</sup>  
BYK-342/BYK-3754<sup>3</sup>  
BYK-332



<sup>1</sup> BYK-3764 is the low-cycle variant of BYK-378.

<sup>2</sup> BYK-3762 is the low-cycle variant of BYK-307.

<sup>3</sup> BYK-3754 is the low-cycle variant of BYK-342.

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## **BYK-349**

BYK-349 is a silicone surface additive with outstanding wetting properties, suitable for aqueous systems which contain very low levels of or no VOC. In coatings which have a reduced amount of coalescent or emulsifier, BYK-349 causes a significant reduction in the surface tension while simultaneously improving the leveling. It has no foam-stabilizing effect and also does not negatively influence the recoatability of the coating. BYK-349 is extremely versatile and is used in numerous systems.

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## **BYK-3565**

In many coating systems, classic surface additives can control and optimize the wetting and leveling. If, however, a high degree of recoatability and adhesion is required, these technologies do tend to meet their limitations. BYK-3565 increases the surface energy of a cured coating, and simultaneously improves the recoatability and adhesion of the subsequent layers. BYK-3565 is recommended for use in aqueous, solvent-borne and 100 % systems, whereby it also has anti-cratering properties predominantly in the aqueous coatings.

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## **BYK-3760**

BYK-3760 is a surface additive that includes several positive properties in one. It is highly active and can therefore be used at a very low dosage. Its tendency towards the stabilization of foam is very minor, which is why it can be very easily utilized in applications that require high shear forces. At the same time, it has a broad applicability and benefits a variety of systems. BYK-3760 also complies with the current requirements of Ecolabels such as the EU Ecolabel, Nordic Swan, Blue Angel as well as guidelines on use in applications that come into contact with food.

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# Highlights

## Surface Additives, Silicone-free

	Type	Solvent	Active substance (%)	Application
BYK-381	Acrylate copolymer	Dipropylene glycol monomethyl ether	52	Leveling improvement
BYK-3410	Compound of surface-active substances	Alcohol alkoxylates	100	Reducing the dynamic surface tension
BYK-3440	Acrylate copolymer	Dipropylene glycol monomethyl ether	10	Substrate wetting and prevention of cratering
BYK-3441	Acrylate copolymer	Dipropylene glycol monomethyl ether	52	Leveling improvement
BYK-DYNWET 800 N	Alcohol alkoxylates	Alcohol alkoxylates	100	Reduction in the dynamic surface tension, improved substrate wetting
BYKETOL-AQ	Surface-active low-molecular polymers	Methoxypropanol	100	Better leveling, improves the open time
BYKETOL-PC	Modified urea	Water	90	Prevents the drying out of aqueous universal colorants, extends the open time
BYKETOL-WA	Surface-active low-molecular polymers	Butylglycol	100	Better leveling, prevents bubbling, extends the open time

## Surface Additives Based on Macromer Technology to Increase the Surface Energy

	Type	Solvent	Active substance (%)	Application
BYK-3560	Polyether macromer-modified polyacrylate	-	100	Increases the surface energy of the cured coating layer; silicone-free
BYK-3565*	Polyether macromer and silicone macromer-modified polyacrylate	-	100	Increases the surface energy of the cured coating layer and improves the leveling properties
BYK-3566*	Polyether macromer and silicone-modified polyacrylate	-	100	Increases the surface energy of the cured coating layer and improves the leveling properties

\* In each case, the specified additives contain below 0.1 % of the cyclic siloxanes D4, D5 and D6. Therefore, no SVHC labeling is required in the EU safety data sheet.

## Surface Additives, Silicone-containing

	Type	Solvent	Active substance (%)	Reduction of surface tension		Substrate wetting	Slip	Leveling	Reactive groups
				Strong	Medium				
BYK-302	Polyether-modified polydimethylsiloxane	-	100		●	○	○	○	
BYK-307	Polyether-modified polydimethylsiloxane	-	100	●		●	●		
BYK-326*	Solution of a polyether-modified polymethylalkylsiloxane	-	100		●	○	○	●	
BYK-331	Polyether-modified polydimethylsiloxane	-	100		●	○	○	○	
BYK-332*	Polyether-modified polydimethylsiloxane	-	100		●	○	○	●	
BYK-333*	Polyether-modified polydimethylsiloxane	-	100	●		●	●		
BYK-342	Solution of a polyether-modified polydimethylsiloxane	Dipropylene glycol monomethyl ether	52		●	●	○	○	
BYK-345*	Polyether-modified siloxane	-	100	●		●		○	
BYK-346*	Solution of a polyether-modified siloxane	Dipropylene glycol monomethyl ether	52	●		●		○	
BYK-347*	Polyether-modified siloxane	-	100	●		●		○	
BYK-348*	Polyether-modified siloxane	-	100	●		●		○	
BYK-349*	Polyether-modified siloxane	-	100	●		●		○	
BYK-375	Solution of a polyether-polyester-modified hydroxyfunctional polydimethylsiloxane	Dipropylene glycol monomethyl ether	25	●		●	●		Hydroxyl
BYK-378	Polyether-modified polydimethylsiloxane	-	100	●		●	●	○	
BYK-3400*	Combination of surface-active substances	Water	70	●		●		○	
BYK-3450*	Polyether-modified polydimethylsiloxane	-	100	●		●		●	
BYK-3451*	Polyether-modified polydimethylsiloxane	-	100	●		●		●	
BYK-3455*	Polyether-modified polydimethylsiloxane	-	100	●		●		●	
BYK-3456*	Polyether-modified polydimethylsiloxane	-	100	●		●		●	
BYK-3752*	Polyether-modified polydimethylsiloxane	-	100		●	○	○	○	
BYK-3754*	Solution of a polyether-modified polydimethylsiloxane	Dipropylene glycol monomethyl ether	52		●	●	○	○	
BYK-3760*	Polyether-modified polydimethylsiloxane	-	100	●		●	●	●	
BYK-3762*	Polyether-modified polydimethylsiloxane	-	100	●		●	●	●	
BYK-3764*	Polyether-modified polydimethylsiloxane	-	100	●		●	●	●	
BYK-SILCLEAN 3720*	Solution of polyether-modified, hydroxy-functional polydimethylsiloxane	Methoxypropanol	25	○		Improved cleanability (easy-clean)			Hydroxyl

● especially recommended ○ recommended

\* In each case, the specified additives contain below 0.1 % of the cyclic siloxanes D4, D5 and D6. Therefore, no SVHC labeling is required in the EU safety data sheet.

# Wax Add





# itives

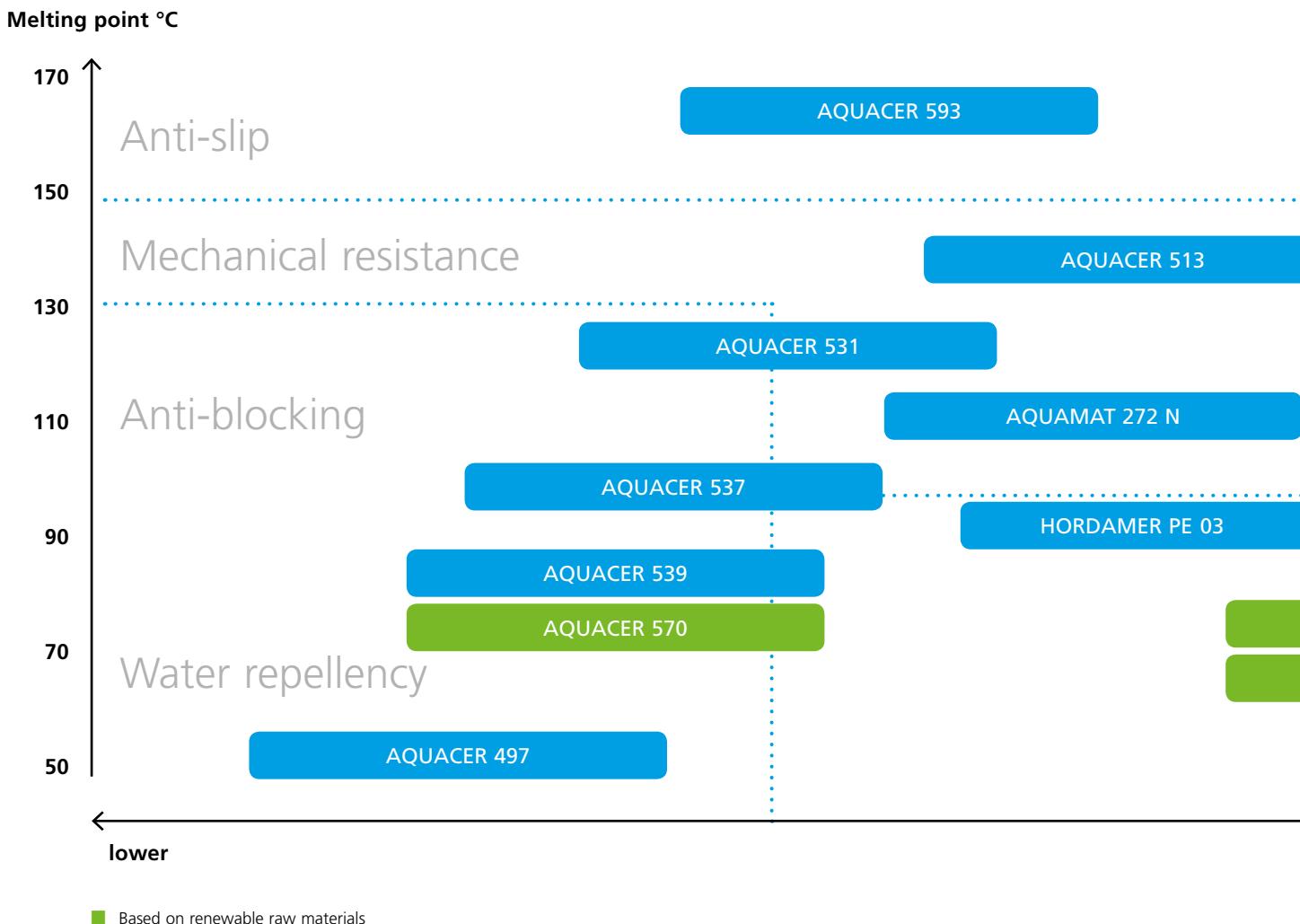
# Wax Additives

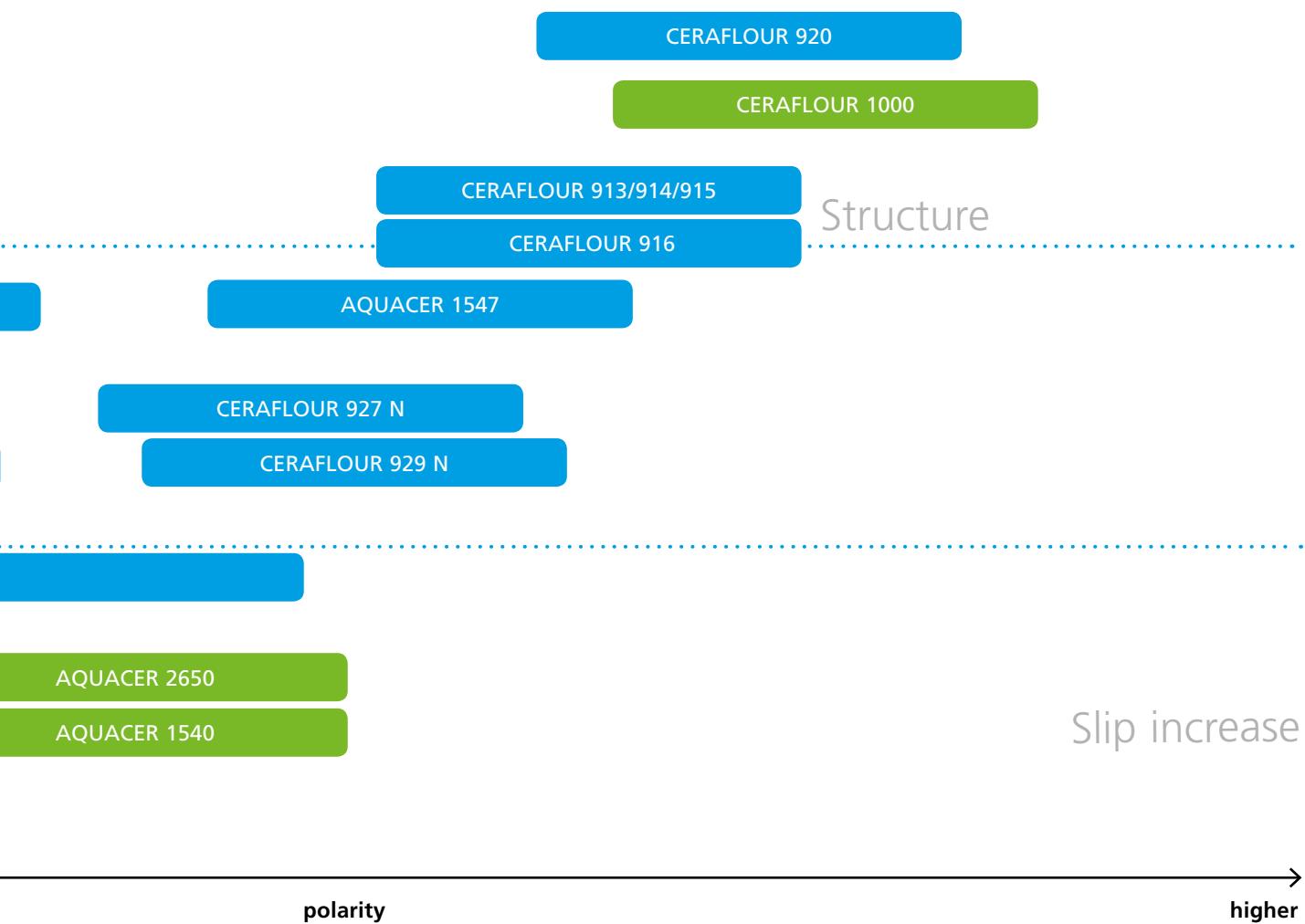
One option for specifically improving the surface properties of coating systems is to use wax additives.

These additives can influence a multitude of parameters, including:

- Increasing the scratch resistance/abrasion resistance
- Influencing the surface slip (slip/anti-slip, soft feel)
- Matting/gloss reduction
- Anti-blocking/increasing the water repellency
- Targeted influencing of the structure of a coating
- Effect pigment orientation

BYK offers wax additives which can be used directly in coating formulations. Liquid wax emulsions and dispersions as well as solid micronized wax additives are offered.





## CERAFLOUR 1000

New standards have been set with the development of CERAFLOUR 1000, a micronized additive. It offers not only an outstanding matting effect with high transparency, a soft-feel effect and anti-blocking properties, but is made of 100 % renewable raw materials and is completely biodegradable. Moreover, CERAFLOUR 1000 is suitable for aqueous systems, as well as solvent-borne and UV-curable systems.

## CERAFLOUR 927 N

The efficiency of a wax additive is often dependent on a sufficient and thorough incorporation. It is only with a sufficient dispersion that the desired effects can be achieved without having any negative influences. An increased amount of dispersion is necessary to incorporate micronized wax additives, especially when using aqueous systems without a co-solvent. CERAFLOUR 927 N improves the mechanical properties of aqueous coating systems and is impressive with its easy dispersibility. Merely low shear forces are required to incorporate it, even in co-solvent-free systems. The equal distribution of the additive in the coating also ensures excellent storage capability.

## AQUACER 1013 and AQUACER 1039

For a coating system to achieve an Ecolabel such as Nordic Swan or Blue Angel, it is not only the entire system that must fulfill the regulatory requirements, but also the additive components contained within it. The wax additives AQUACER 1013 and AQUACER 1039 have been specially developed with regard to an Ecolabel conformity. They can be fully employed in eco-sensitive formulations, without having to renounce the expected improvement in surface properties (including abrasion and scratch resistance).

# Highlights







# Adhesion Promoters

# Adhesion Promoters

Aqueous coatings represent more of a challenge than solvent-borne systems where the adhesion, particularly on low energy surfaces, is concerned. The cause is again the high surface tension of the water, which makes it difficult to achieve a thorough and complete wetting of the substrate – a key requirement for a sustained adhesion. Moreover, aqueous coatings have a reduced tolerance to impurities in the substrate. It is true that today's aqueous binders are generally well coordinated to the substrate composition, but it can still be necessary to use additional special adhesion promoters.

BYK adhesion promoters for aqueous coatings consist of a polymer basic structure which guarantees the compatibility in the binder and therefore a solid incorporation in the coating matrix, and functional groups which are responsible for anchoring to the various substrates. BYK adhesion promoters are easy to incorporate and do not reduce the storage stability or the physical properties.

	<b>Non-volatile matter %</b>	<b>Solvent</b>	<b>Acid value</b>	<b>Amine value</b>	<b>Chemical nature</b>	<b>Application area</b>
BYK-4500	40	Trimethylpentane diolisobutyrate (Texanol)	-	28	High molecular-weight block polymer	Architectural coatings: improves the adhesion on aged substrates  Baking systems: improves flexibility
BYK-4509	80	Propylene glycol methyl ether	28	28	Neutralized version of BYK-4510	Baking systems and 2-component systems, mainly for metal substrates
BYK-4513	41	Dipropylene glycol methyl ether	-	60	Copolymer with functional groups	2-component epoxy systems in the area of corrosion protection and industrial coatings



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