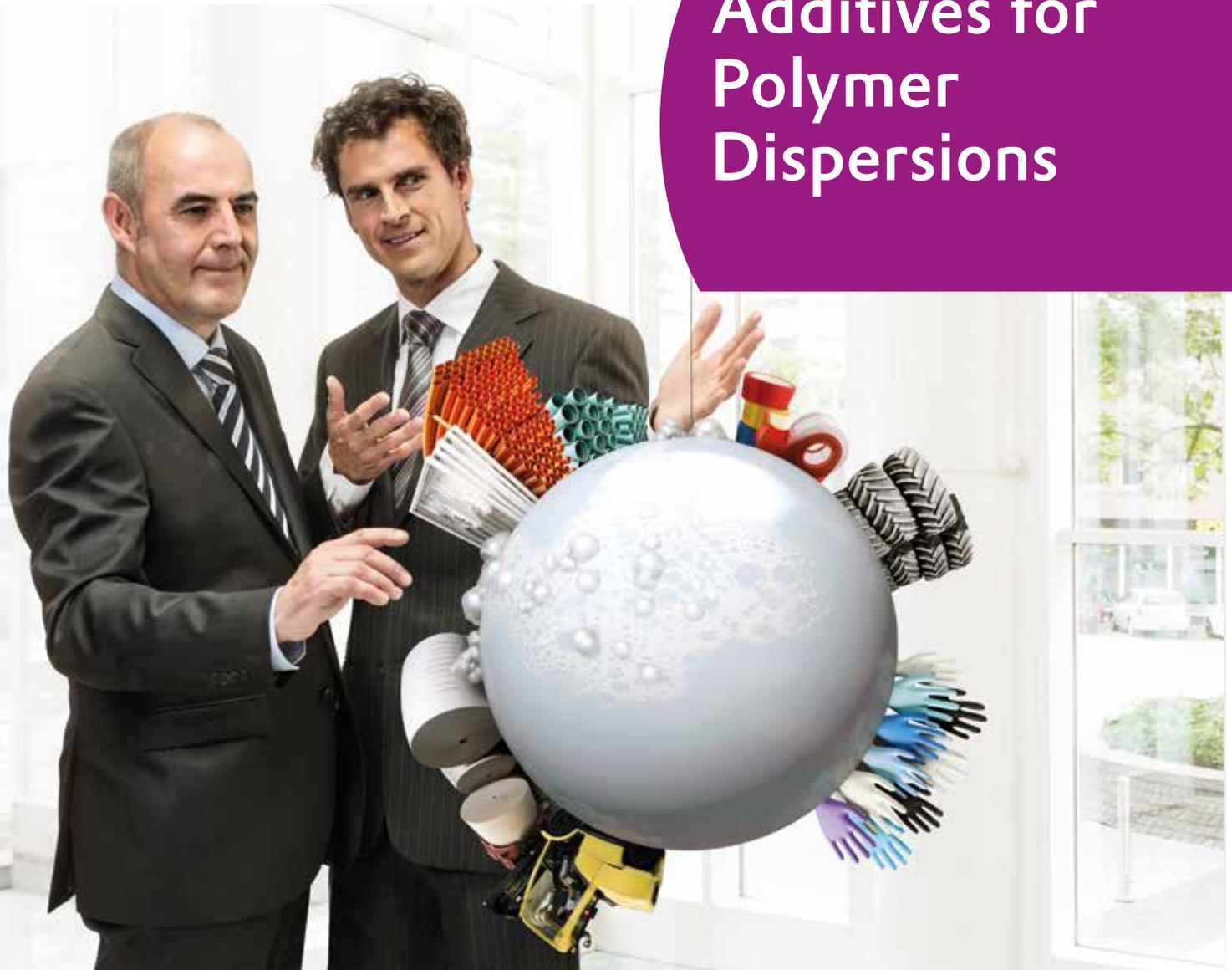


Additives for Polymer Dispersions



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Technology Solutions for Polymer Dispersions

Aqueous systems have become the preferred choice for various applications in numerous industries. Dispersions require additives and process aids during production and in their final application to provide the desired performance.

Organomodified siloxane based additives – which represent our core technology – outperform conventional organic and silicone based products in most aspects.

In contrast to standard silicone oil formulations organomodified siloxanes combine high surface activity and efficiency with

excellent compatibility in all common dispersion systems. This opens the door to new solutions, particularly in demanding applications. Organomodified siloxanes are a proven and invaluable tool in enhancing product quality and improving production efficiency.

This brochure will give you an overview about the chemistry and the additives that we offer for the production and application of polymer dispersions. We invite you to talk to our technical experts so that we can find the optimum solutions to your problem even then legislations have to be met with the additive package we are prepared.

Additives for the production of

- Acrylate
- Polyvinyl acetate (PVAc)
- Styrene butadiene rubber (SBR)
- Polyvinyl chloride (PVC)
- Polyurethane (PU)

Our product range

- Antifoam agents
- Emulsifiers

Additives for applications such as

- Adhesives
- Paper refinement
- Paper impregnation

Our product range

- Antifoam agents
- Wetting agents
- Dispersing agents
- Thickeners

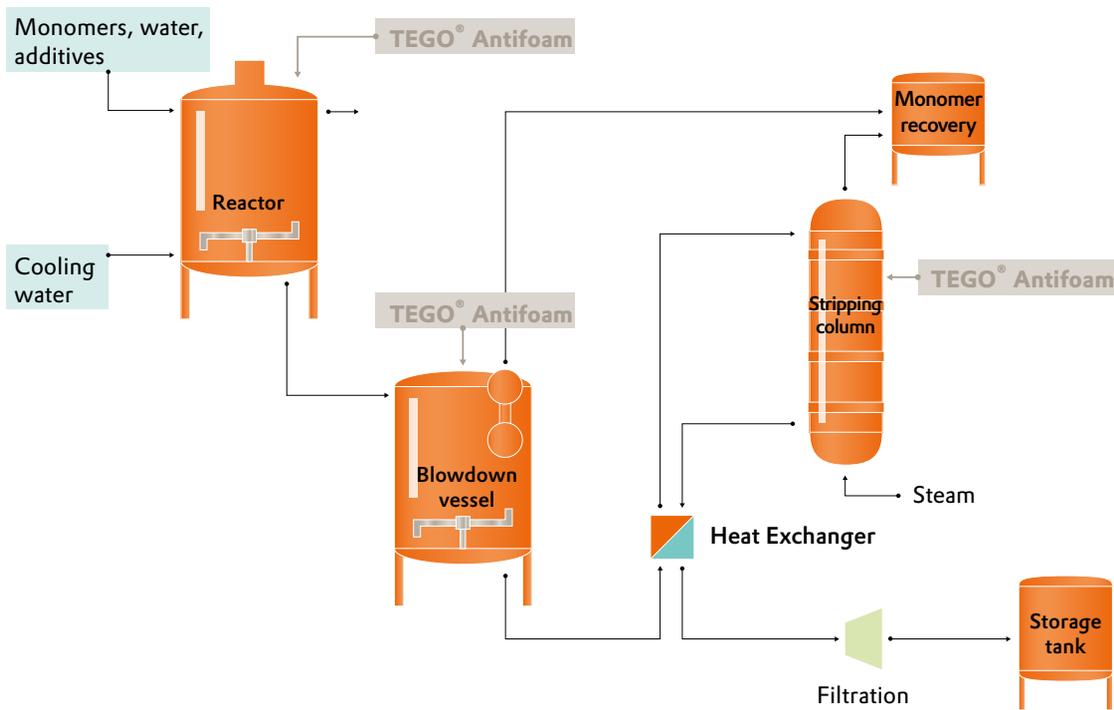
Product Range



Antifoam Agents

Magic Ingredient in Polymerisation Processes and Formulations

Typical polymerisation, e.g. PVC and the use of antifoams



The carefully selected and formulated base materials provide excellent foam control and maximum compatibility at the same time. The well balanced raw material base leads to a wide range of excellent defoamers, suitable for a multitude of industry applications. Our antifoams do not adversely affect the perfor-

mance of dispersions and have long-term stability, providing enhanced efficiency even after storage of the formulated dispersions. Our antifoams permit a high efficiency of production processes due to the avoidance of foam.

Benefits of the TEGO Antifoam Product Range

- High efficiency
- Attractive cost/performance ratio
- Superior compatibility
- No negative side effects
- Long term efficiency
- Good handling characteristics

Test Capabilities

Defoaming is one of the core competencies of the Business Unit Consumer Specialties. The laboratories are able to perform various test methods. They are designed to reflect production as well as application processes.



Sintered glass test: to select appropriate antifoams for water-based polymerisation



Stirring test: to determine foam behavior in the application of polymer dispersions (e.g. adhesives)



Mortar test: to evaluate the air content of emulsions for mortar application used



Draw down test: to evaluate wetting and surface defects in film application

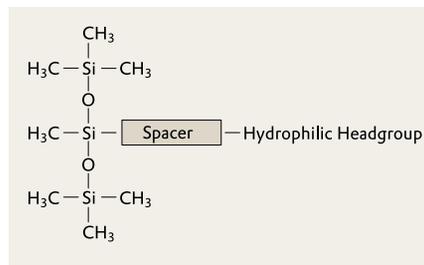
Wetting Agents

Adding a Droplet for Perfect Surfaces

Wetting agents improve the wetting behavior of dispersions on substrates and diminish the defects caused by other additives at the same time. Wetting agents are

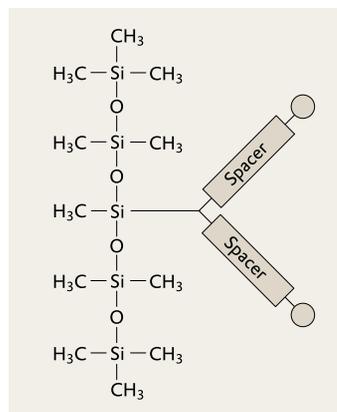
very efficient even at low dosage rates. In order to cover the whole range of wetting applications in the dispersion market, we offer four lines of wetting agents.

For high performance applications (e.g. application of pressure sensitive adhesives on siliconized papers) our wetting agents, based on **organomodified siloxanes**, are perfectly suited to meet demanding requirements.



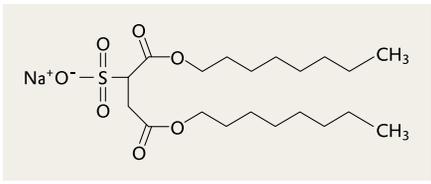
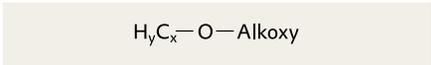
The **Gemini Technology** is characterized by very efficient wetting agents, which can act as such, even at lower concentrations.

They can be considered as two-in-one additives providing a combined property profile of excellent wetting behavior and good defoaming characteristics.



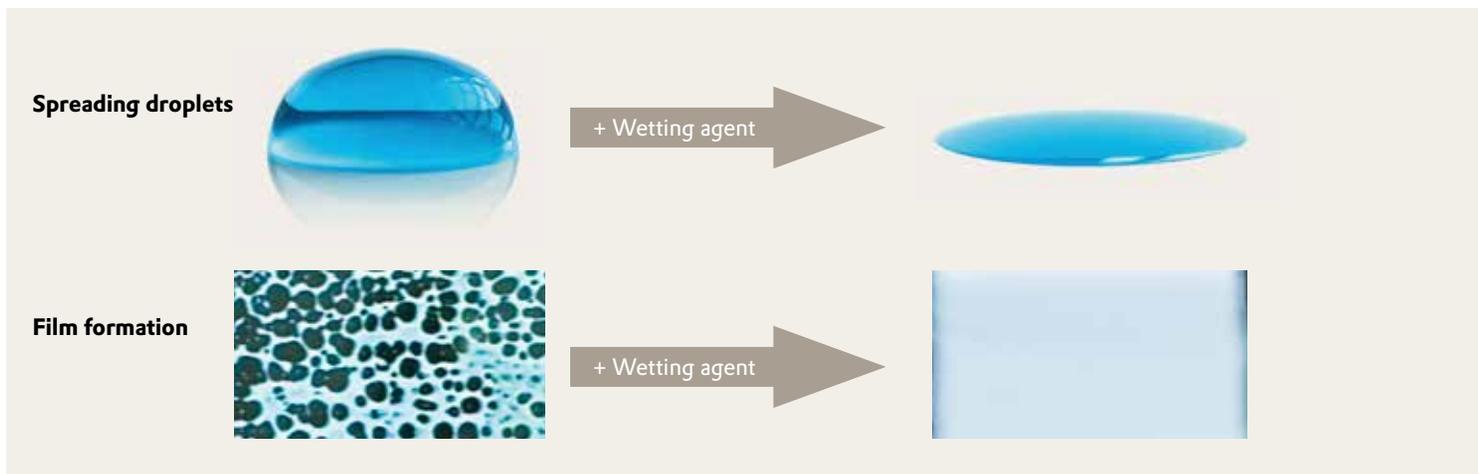
Alcohol alkoxyates are preferably recommended for highly dynamic processes. This product class is characterized by a very fast migration to the surface and by low foaming, which is beneficial for demanding applications of dispersion used in quick processes.

For standard applications, products based on sulfosuccinates are available.

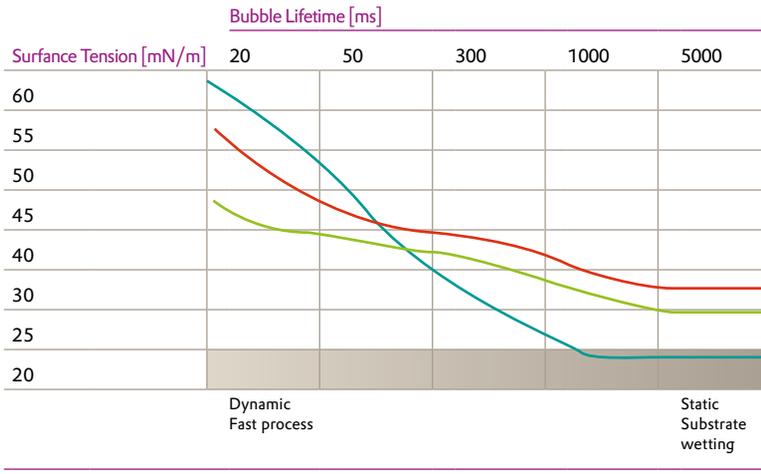


Improvement of Wetting Behavior and Decrease of Surface Defects

The improved wetting of low energy substrates can be guaranteed by the use of our organomodified siloxane technology which lowers the static surface tension efficiently.



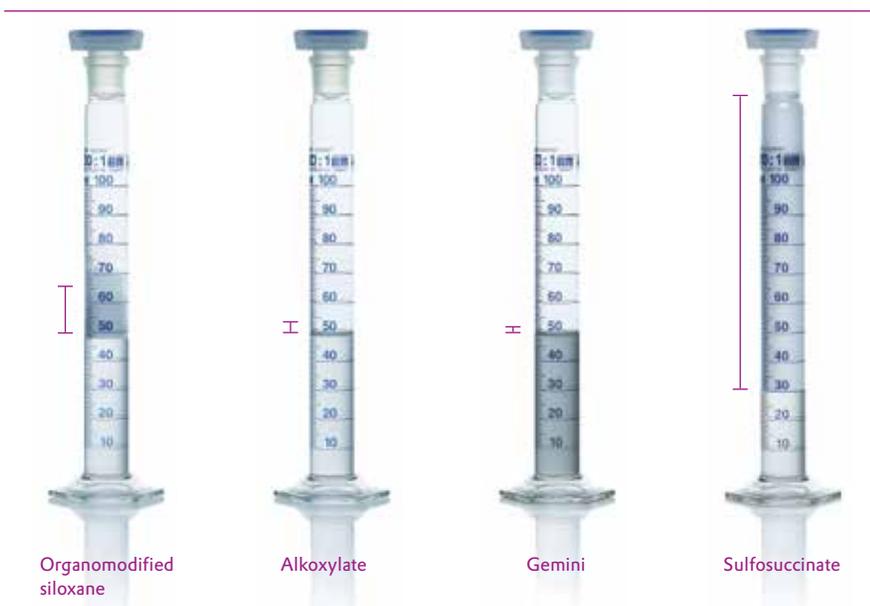
Surface Tension (Bubble Pressure Tensiometer)



With our range of wetting agents we offer solutions for different application demands, ensuring outstanding lowering surface tension for fast running processes where the dynamic surface tension has to be lowered or for very low static surface tension to guarantee quick substrate wetting.

■ Organommodified Siloxane
 ■ Alkoxyates
 ■ Sulfosuccinate

Foam Tendency



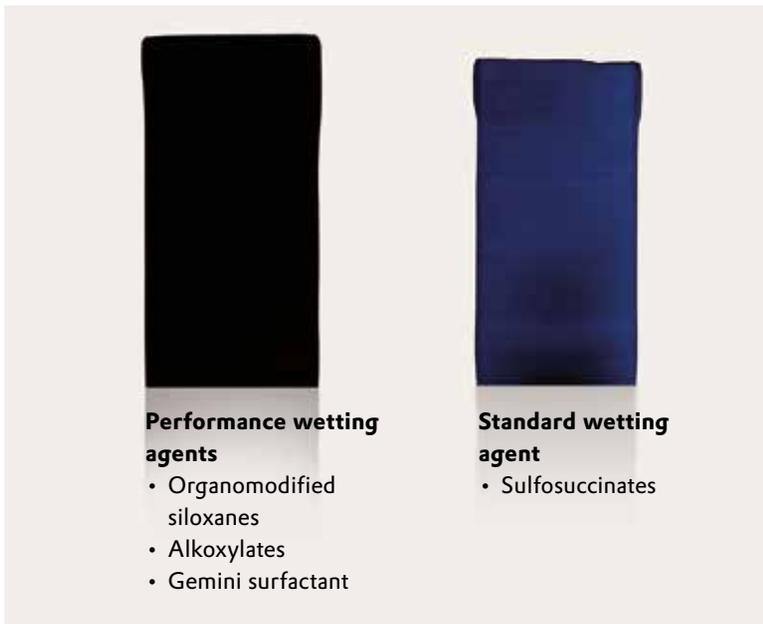
Shaking tests of surfactants in water show the low foaming behavior of our special wetting agents in comparison to classical sulfosuccinates. There are suitable products in our portfolio for your specific demand.

Water Resistance

The influence on the water resistance of polymer dispersions is a critical issue oftentimes. Although wetting agents are known to influence the water resistance significantly, they are indispensable in many applications. Common wetting agents like anionic surfactants, e.g.

sulfosuccinates show significant influence on the water resistance, which results in reduction of adhesion power and turbid films. Due to that reason, other wetting agent technologies are needed to meet this requirement. Within our product range we offer wetting agents providing

both good wetting abilities and good water resistance which can be illustrated by the good transparency of an applied adhesive film on black paper. Finally labels may have a better adhesive strength in a humid surrounding.



Performance Benefits

- Sulfosuccinates are the most common wetting agents. They show good wetting properties, but also significant foam formation.
- Organomodified siloxanes are outstandingly lowering the surface tension of aqueous media while showing a low foam formation.

- Alcohol alkoxylates are very fast and low foaming wetting agents. They are recommended for highly dynamic processes.
- Two-in-one Gemini additives providing excellent wetting behavior and good defoaming properties.

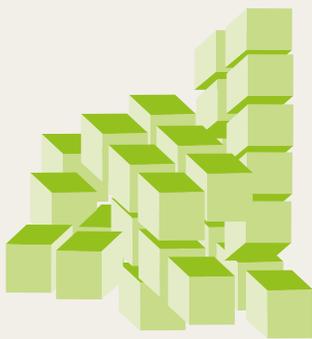
We are able to provide the right solution for your application.

Dispersing Agents

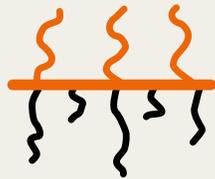
Stabilizing with Know How

Dispersing agents are surface-active ingredients, which ease the incorporation of pigments and fillers into a liquid. Agglomerates are broken up by shearing whereby new surfaces are created. They are wetted by dispersing agents which stabilize the aggregates of pigments or fillers. Dispersing agents have an amphiphilic structure which combines the following requirements:

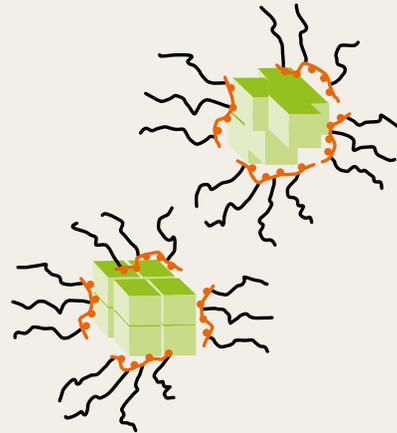
Specific anchoring groups give them the ability of being strongly absorbed onto the particle surface. As a second requirement the molecule must contain polymeric chains that give steric stabilization in the required system. Dispersing agents can provide ionic stabilization if they contain anionic or cationic structure elements.



Agglomerates



TEGOMER® DA
→

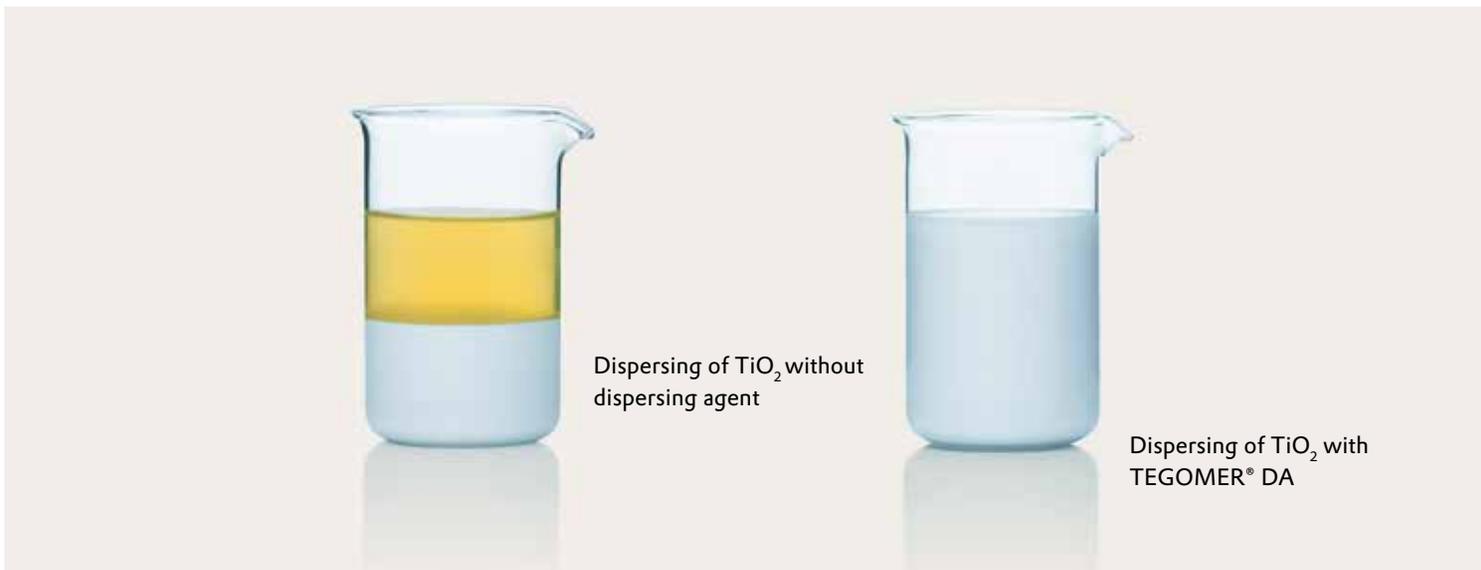


Aggregates

Low molecular surfactant structures with anionic groups are used in highly-filled inorganic pigment or filler pastes due to strong viscosity reduction, but can be used for organic pigments as well.

Amphiphilic structures with high molecular weight have to be used in higher concentrations calculated on pigment in compari-

son to those discussed above. They are always recommended for pastes with requirements for long-term stability. Especially for expensive organic pigments this structure principle is technically and economically beneficial. Even titanium dioxide as high density material can be stabilized without significant settlement for several months.



Benefits of TEGOMER® DA

Dispersing Additives

- Higher loading of pigments and fillers
- Increased coloration or hiding power
- Reduction of specks
- Improved mechanical properties
- Excellent dilution behavior
- No settlement

Dispersing agents do not only allow to make efficient use of the pigments coloration but guarantee stable dispersions without settlement and syneresis as well.

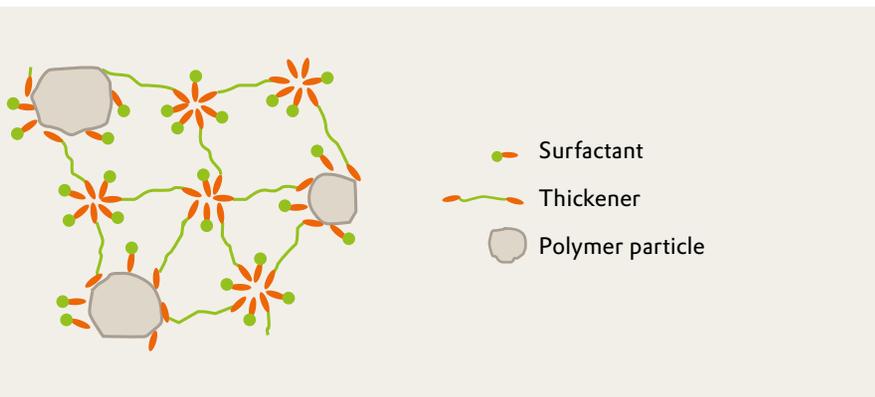
Polyurethane Thickeners

Providing Optimized Rheological Profiles

Thickeners are not only used to increase the viscosity of dispersions, but to adjust their rheological profiles, required for certain types of application processes. Our TEGO® Rheo additives, associative polyurethane thickeners, provide either Newtonian or pseudoplastic flow behavior.

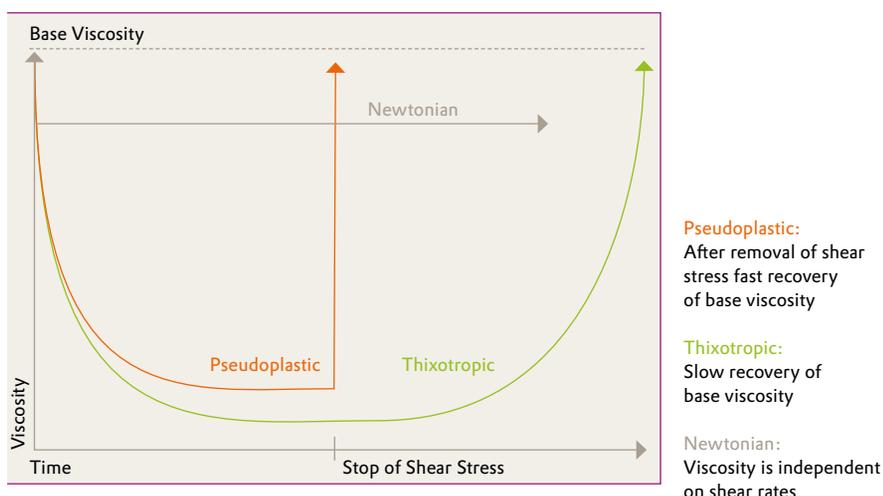
The achievable thickening properties are excellent even at low pH-values. Moreover the product offers antimisting properties for gravure roll applications. Our polyurethane thickeners can be used for systems which need to show shear-thinning behavior as well as for systems that

require a stable viscosity independent from shear forces, e.g. thick layer application. We offer even a polyurethane thickener which allows to meet European and FDA related food application requirements.



Associative polyurethane thickener – mode of action

Flow behavior



Emulsifiers

Working at Interfaces Balancing the Amphiphilicity

Evonik offers a broad range of emulsifiers based on different kinds of chemistry. Emulsifiers are organic chemicals consisting of a hydrophilic and a lipophilic part. This structure allows these materials to work at interfaces.

The non-polar lipophilic part of such a surfactant (surface active agent) is commonly a hydrocarbon chain, which can be linear or branched. Therefore, the affinity of the lipophilic part to water is low.

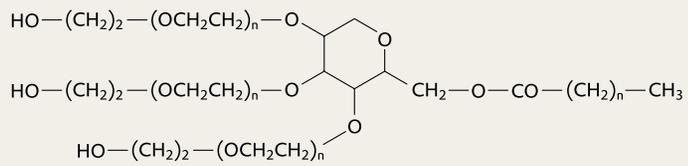
On the other hand the hydrophilic part interacts strongly with water due to functional groups such as carboxyl, hydroxyl and phosphate groups. By balancing the hydrophilic and lipophilic parts the properties of a surfactant can be adjusted to the needs of different application.

Evonik has even special emulsifier technologies for inverse polymerisation, e.g. polyacryl amides or a reactive emulsifier which is used for polyurethane manufacturing. This emulsifier is used instead of DMPA (dimethylol propionic acid) and guarantees a wider pH stability of the emulsion combined with better chemical and water resistance of the PU film.

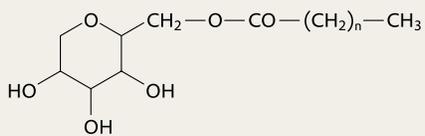


Our performance emulsifier leads to finer particle size materials with high transparency and having no coagulation tendency whereas standard sorbitane ester based emulsifiers cannot guarantee that advantages in inverse emulsification processes.

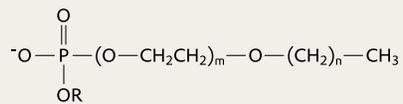
Available Chemistry for Emulsifiers



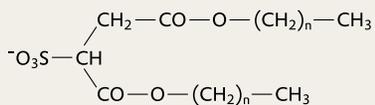
Ethoxylated sorbitan ester



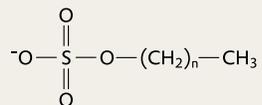
Sorbitan ester



Phosphate ester



Sodium sulfosuccinate



Sulphate ester

www.evonik.com/polymer-dispersions



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EVONIK
INDUSTRIES

Europe | Middle East | Africa

Evonik Nutrition & Care GmbH

Goldschmidtstraße 100
45127 Essen
Germany

PHONE +49 201 173-2665

FAX +49 201 173-1990

www.evonik.com

Asia | Pacific

**Evonik Specialty Chemicals
(Shanghai) Co., Ltd.**

55, Chundong Road
Xinzhuang Industry Park
Shanghai, 201108
PR China

PHONE +86 21 6119-1125

FAX +86 21 6119-1406

The Americas

Evonik Corporation

7801 Whitepine Road
P.O. Box 34628
Richmond, VA 23234
USA

PHONE +1 804 727-0700

FAX +1 804 727-0855

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