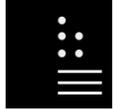


COATING & PAINT ADDITIVES

Pigment dispersants
Emulsifiers for emulsion polymerization
Specialty additives



KAO SURFACTANT TECHNOLOGY

Our solutions, your benefit

KAO CORPORATION

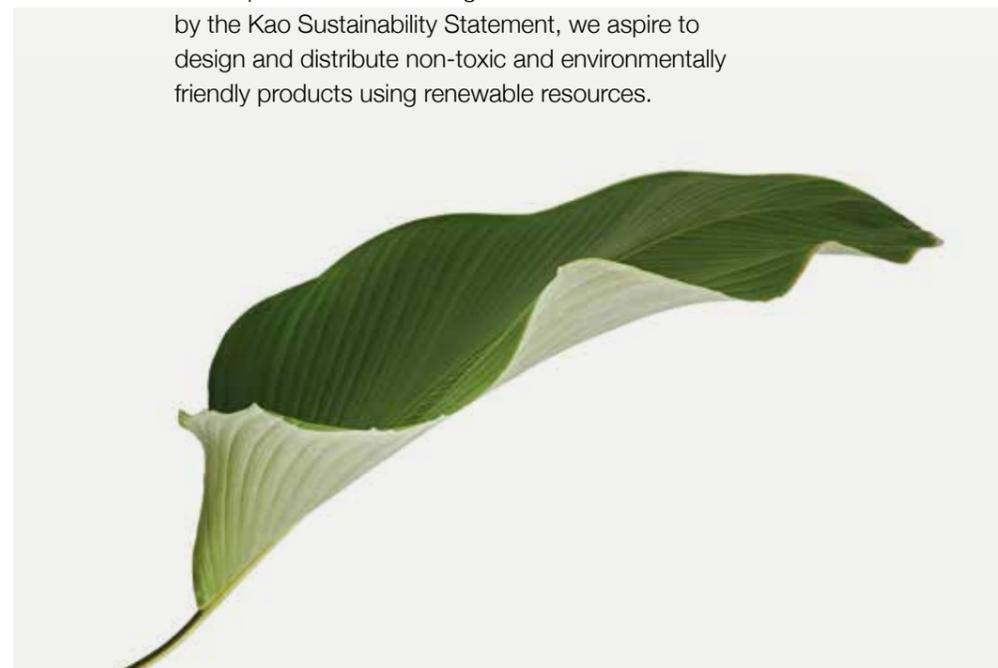
Founded in Japan in 1887, Kao Corporation is a multinational chemical company with a long history of innovation. Today, more than 33,000 employees worldwide are satisfying customer needs around the globe.

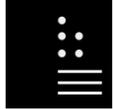
«We aspire to design and distribute non-toxic and environmentally friendly products using renewable resources».

SUSTAINABLE, COLLABORATIVE DEVELOPMENT

Inspired by our corporate philosophy, The Kao Way, and the Yoki-Monozukuri concept that lies at its heart, we are committed to providing excellent products to our customers.

Our close relationship with our customers inspires us to integrate their needs into the concepts and extensive technical knowledge of our Research & Development and Marketing & Sales teams. Guided by the Kao Sustainability Statement, we aspire to design and distribute non-toxic and environmentally friendly products using renewable resources.





PAINT & COATING ADDITIVES

Our clients set the pace

Paint and coating producers are constantly developing new formulations that provide safe, sustainable, and innovative paints and coatings. Additives for paints and coatings improve product properties and help solving difficulties that occur during the formulation and production processes.

Kao Chemicals Europe develops, manufactures, and supplies a wide range of raw materials for high-performing paint and coating formulations. Our additive portfolio includes customized dispersants for pigment grinding and stabilization, emulsifiers, and specialty additives. Our products are used in architectural, automotive OEM, and industrial coatings.

We combine technical know-how and industry expertise with a close collaboration with our customers. Finding solutions for our customer's needs is what drives our development. Our additive solutions not only enhance appearance and

«We work closely together with our customers to effectively address ecological, regulatory, and economic targets».

surface properties, but they also improve functional properties, such as adhesion, corrosion and scratch resistance. In addition, we are actively working on products that meet the growing industry needs for safe, environmental friendly, and sustainable paints and coatings.

At Kao we want to deliver real solutions to our customers. For that reason we work closely together with our customers to effectively address ecological, regulatory, and economic targets.





HOW IS THE PAINT MANUFACTURING PROCESS?

Look at our scheme



1. WETTING

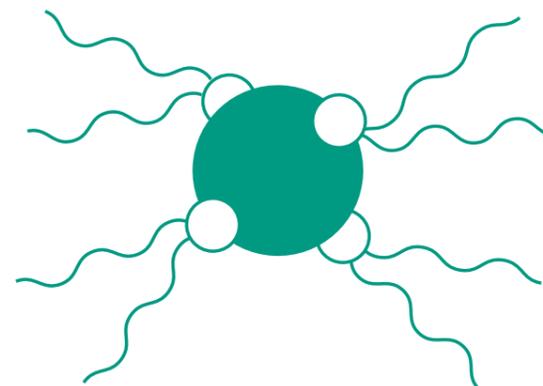


2. DISPERSING



3. STABILIZING

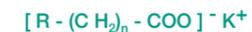
LOW-MOLECULAR WEIGHT WETTING AND DISPERSING ADDITIVES



INTERFACIAL ACTIVE COMPOUNDS

Schematic diagram of the structure of various surfactant types.

ANIONIC



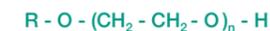
CATIONIC



AMPHOIERIC



NON-IONIC



PIGMENT DISPERSION

The dispersion of solid pigments or fillers into the liquid phase of binder solutions is an important process step in the preparation of paint and coatings. The dispersion level has a direct influence on optical properties, such as colour strength, transparency, and gloss as well as physical properties, such as rheology, stability, and flocculation.

Pigment dispersion control additives are used to improve and accelerate the dispersion process and to stabilize the formulation during storage. Dispersion control additives also play a crucial role in ensuring good performance throughout the lifecycle of paint, from production and storage to application and film properties.



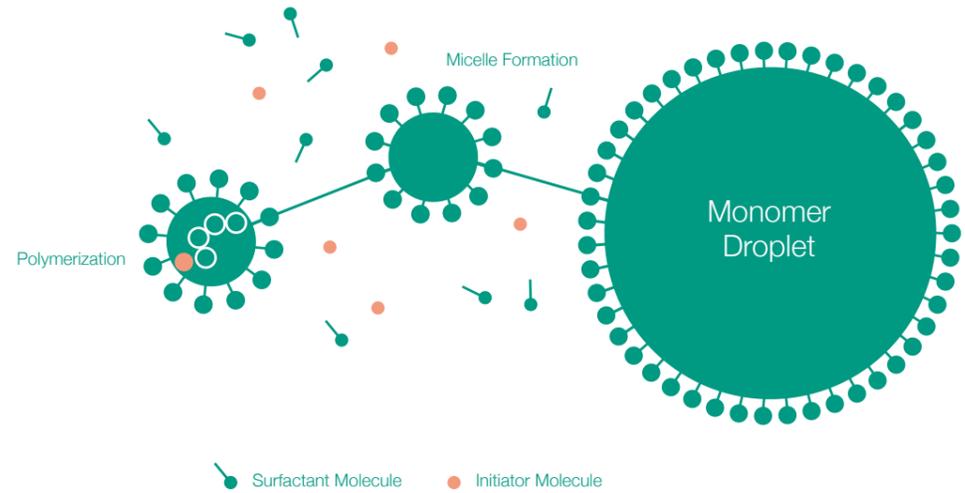
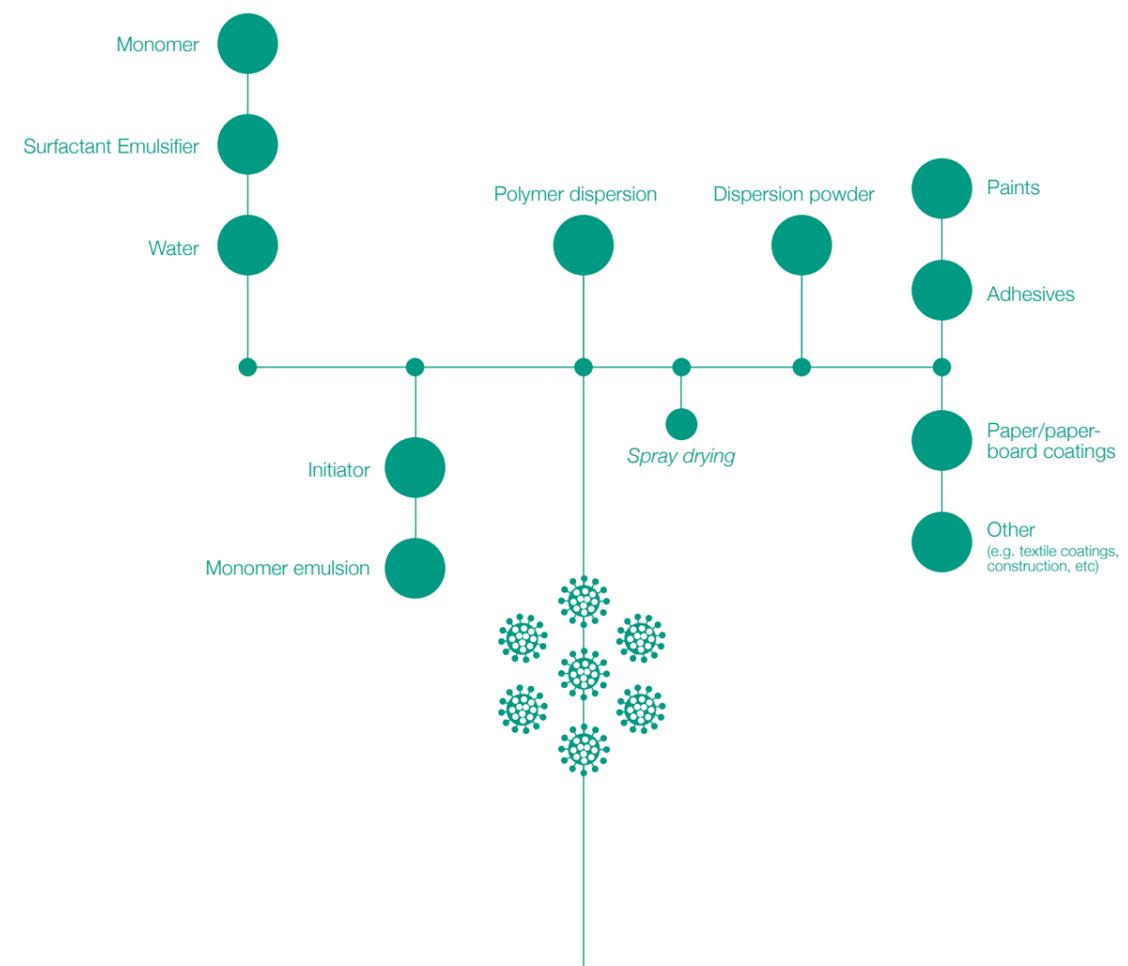


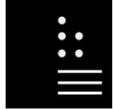
EMULSION POLYMERIZATION

Kao offers a full range of surfactants for emulsion polymerization based on our core technologies of sulfonation, alkoxylation, and phosphorylation. AKYPO, MELIOSOL, and LATEMUL are used in the production of acrylics, vinyl acetates, polyvinyl chlorides, styrene butadiene, and alkyds. Kao's portfolio includes anionic and non-ionic emulsifiers with improved environmental profile (APEO free and low VOC).

Kao surfactants provide efficiency, consistency and high performance. Important attributes for the emulsion polymerization process and the end-use application include good polymerization kinetics, particle size and distribution control, water resistance, improved electrolyte and, freeze-thaw stability, as well as reduced grid formation.

RAW MATERIAL SELECTION FORMULATION AND MANUFACTURING END-APPLICATION





| PIGMENT DISPERSANT | NAME | DESCRIPTION | APPLICATION |
|-------------------------------|-----------------------------|----------------------------------------|---------------------------------------------------------------------|
| General dispersants | FINDET 10/18 | Alcohol ethoxylate. Liquid. | Pigment wetting and dispersing agent |
| | FINDET 1618 A/18 | Alcohol ethoxylate. Liquid. | Pigment wetting and dispersing agent |
| | FINDET 1618 A/23 | Alcohol ethoxylate. Liquid. | Pigment wetting and dispersing agent |
| | FINDET 1618 A/35-P | Alcohol ethoxylate. Liquid. | Pigment wetting and dispersing agent |
| | FINDET 1618 A/72-P | Alcohol ethoxylate. Liquid. | Pigment wetting and dispersing agent |
| | FINDET 1816/32-E | Alcohol ethoxylate. Liquid. | Pigment wetting and dispersing agent |
| | FINDET SE-2249 | Alcohol ethoxylate. Liquid. | Pigment wetting and dispersing agent |
| | FINDET SE-2411 | Alcohol ethoxylate propoxylate. Liquid | Low foam pigment wetting and dispersing agent |
| | AKYPO ROX RS-0602N | Alcohol ethoxylate propoxylate. Liquid | Low foam pigment wetting and dispersing agent |
| | AKYPO ROX RS-0606N | Alcohol ethoxylate propoxylate. Liquid | Low foam pigment wetting and dispersing agent |
| | AKYPO ROX RS-0960N | Alcohol ethoxylate propoxylate. Liquid | Low foam pigment wetting and dispersing agent |
| | Organic pigment dispersants | FINDET AR/30 | Castor oil etholate. Liquid/paste. |
| FINDET AR/45 | | Castor oil etholate. Liquid/paste. | Dispersing agent for aqueous formulations |
| FINDET AR/52 | | Castor oil etholate. Liquid/paste. | Dispersing agent for aqueous formulations |
| FINDET ARH/52 | | Hydrogenated castor oil etholate | Dispersing agent. Suitable for carbon black and lipophilic pigments |
| FOSFODET 2EH | | Alcohol phosphate ester. Liquid. | Dispersing agent |
| Inorganic pigment dispersants | DANOX DSP 200 | Polymeric dispersant. Long chain type | Inorganic pigment wetting agent. Indicated for TiO ₂ |
| | DANOX DSP 400 | Polymeric dispersant. Long chain type | Inorganic pigment wetting agent. Indicated for TiO ₂ |
| | DANOX DSP 600 | Polymeric dispersant. Long chain type | Inorganic pigment wetting agent. Indicated for TiO ₂ |

| EMULSION POLYMERIZATION | NAME | DESCRIPTION | APPLICATION |
|------------------------------------------------------------|------------------------|--------------------------------------------|-----------------------------------------------------------------------------------------------------------------|
| Emulsifier for vinyl acrylic and styrene acrylic emulsions | AKYPO LF1 | Ethercarboxylate. Low foaming. | Low foaming emulsifier |
| | AKYPO RO 50 VG | Ethercarboxylate. | Emulsifier with support for corrosion prevention |
| | AKYPO RA 50 | Amide ether carboxylate. | Emulsifier with support for corrosion prevention |
| | AKYPO ROX RLM 45 | Alcohol ethoxylate. Liquid. | Emulsifier for aqueous and non-aqueous formulations |
| | AKYPO TD 70 | Ethercarboxylate. | Co-emulsifier and wetting agent for aqueous and non-aqueous formulations |
| Emulsifiers for PVC | MELIOSOL 30X | Dodecyl benzene sulfonate | Emulsifier for PVC |
| Emulsifier for acrylic emulsions | LATEMUL E-118B | Sodium polyoxyethylene alkyl ether sulfate | APE-free emulsifier for architecture paint, adhesives |
| | LATEMUL E-108MB | Sodium polyoxyethylene alkyl ether sulfate | APE-free emulsifier for architecture paint, adhesives |
| Reactive emulsifiers for acrylic emulsions | LATEMUL PD-104 | Reactive ether sulfate | APE-free reactive emulsifier for polyacrylic emulsion. High polymerization stability and high water resistance. |
| | LATEMUL PD-420/430/450 | Reactive ether | APE-free reactive emulsifier for polyacrylic emulsion. High polymerization stability and high water resistance. |





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