Cleaning applications

Europe, the Middle East and Africa edition

Nouryon

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1. Introduction

Customer oriented around the globe

Global reach, local focus

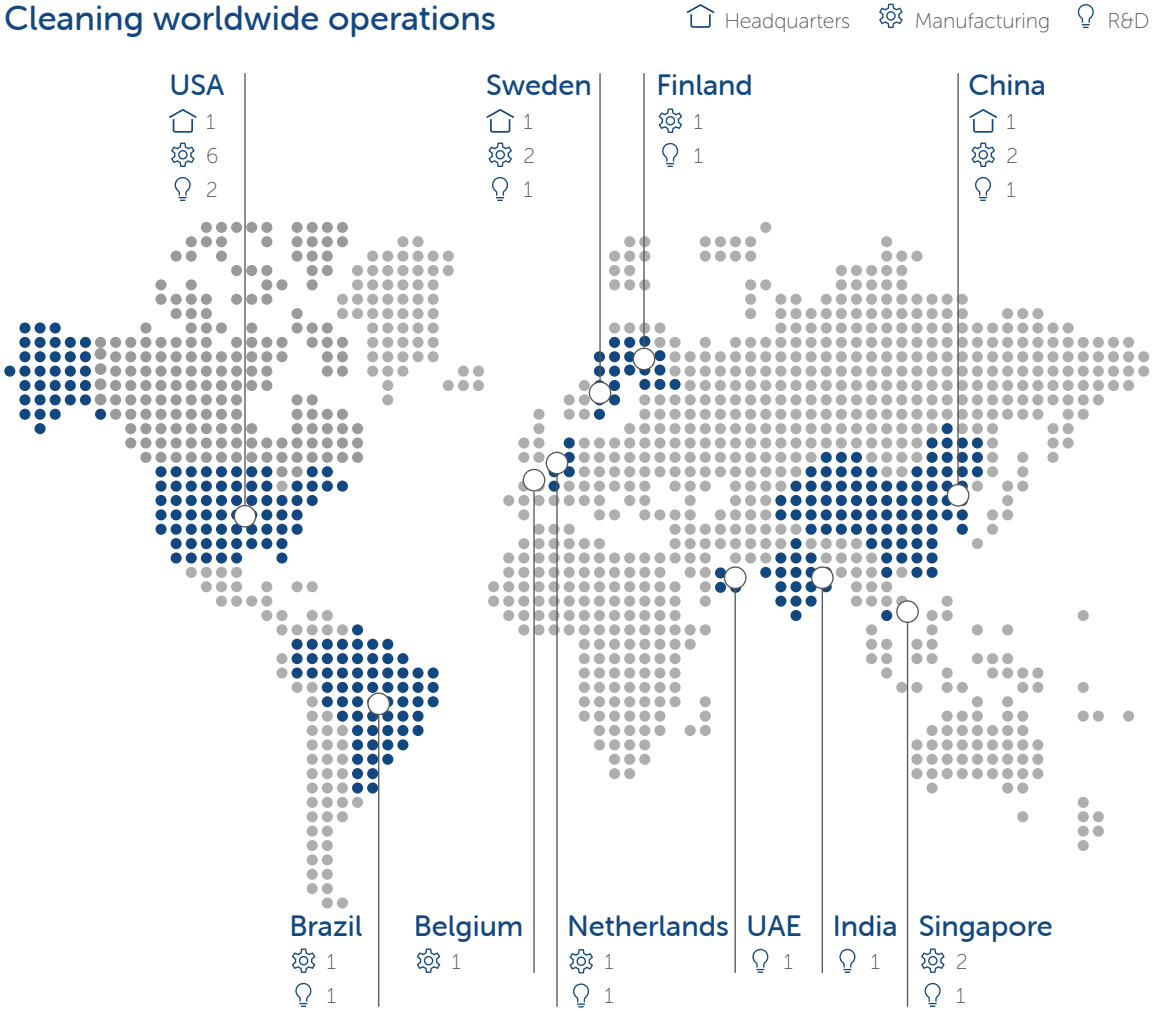
This catalog contains information about the specialty chemicals offered by Nouryon for the cleaning segment in Europe, Middle East and Africa (EMEA) region.

Our product portfolio includes chelating agents, specialty surfactants (anionic, cationic and nonionic), as well as co-surfactants with excellent soil removal capabilities.

In addition, a range of natural, hybrid and synthetic polymeric products are available offering rheology modification, dispersancy, scale inhibition and anti redeposition benefits. Finally, our biocides and amphoteric products portfolio offer differentiated and enhanced cleaning and disinfection benefits to cleaning formulations.

We offer the formulator a robust portfolio of sustainable ingredients to choose from. Many of our products meet regional and global eco-labeling standards. Our chemical technology expertise, efficient manufacturing facilities, research and development support help fulfill our promise to deliver quality products to customers. This enables our customers to formulate superior cleaning solutions in both household and industrial and institutional application.

Cleaning worldwide operations



2. Chelating agents

The world of Dissolvine® chelating agents

Dissolvine® chelating agent (also called chelant or sequeestering agent) is our brand name for products known as chemicals that control the reactivity of metal ions. Metal ions have a powerful influence on chemical processes as well as on the performance of many products. A wide range of problems associated with metal ions can be solved using Dissolvine® chelating agents, from improving the efficiency of pulp bleaching to cleaning dairies, from increasing crop quality and yields to preserving food quality. The good performance of chelating agents in cleaning such as automatic dish washing, laundry, hard surface cleaning and machine dish washing has contributed to the wide-spread use of these products.

The hard water metal cations calcium and magnesium, but also metals like iron or barium can form low water-soluble salts with hydroxides, carbonates, sulfates and phosphates that precipitate out of aqueous systems. These precipitates form scales that are extremely difficult to remove and reduce the efficiency of boilers and chemical processing equipment.

When Dissolvine® chelating agents are added to these systems, they complex the metal ions into a water-soluble form and dissolve the scale deposit so that it is removed in the cleaning process. In virtually any industrial process which uses water, Dissolvine® chelants can add or remove metals ions or alter metal ions properties in a controlled way.

Cleaning and detergents

Dissolvine® chelating agents are powerful builders. They enhance the cleaning power of a cleaner/detergent by catching the hard water ions, calcium and magnsium, and removing those based residues which bind most dirt to surfaces. They also prevent the deactivation of anionic surfactants from hard water metal ions, so less surfactant can be used.

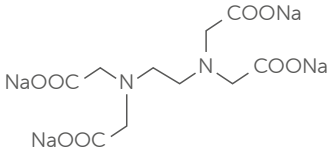
Dissolvine® chelating agent is our brand name for products known as chemicals that control the reactivity of metal ions.

Besides this, Dissolvine® chelating agents deactivate the unwanted transition metal ions that are often introduced through raw materials in the manufacture of soap and of detergents that contain peroxides like hydrogen peroxide, percarbonates and perborates. In biocidal detergents chelating agents greatly enhance the effectiveness of biocides so the amount needed to be effective can be reduced. They also boost the performance of preservatives in liquid detergents. Therefore, less can be used and cost savings can be made.

Industrial cleaning

Metal salts can cause scaling problems in boilers, heat exchangers and other water circulation systems found in the power, brewing, sugar and dairy industries. Dissolvine® chelating agents form stable, water-soluble metal complexes with all potentially harmful metal ions, dissolving existing scale formations and preventing new scales from forming.

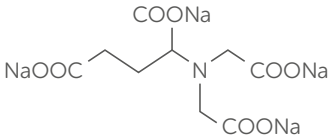
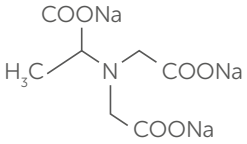
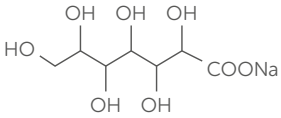
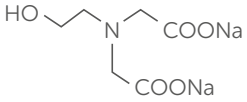
EDTA chelating agents

Structure and chemical name	Product	Chemical formula	Physical form	Molecular mass	Density kg/m³	pH typical value*	Specific properties
 Ethylenediaminetetraacetic tetrasodium salt EDTA-Na_4	Dissolvine® E-39	EDTA-Na_4	Liquid (39%)	380.2	1300	11.5	Most widely used liquid chelating agent
	Dissolvine® 100-S	EDTA-Na_4	Liquid (38%)	380.2	1270	11.5	High purity (NTA free)
	Dissolvine® Na	EDTA-Na_4	Micro-granular	380.2	600	11.5	Most widely used solid chelating agent
	Dissolvine® Na-X	EDTA-Na_4 Tetrahydrate	Crystalline	452.2	900	11.5	High purity (low NTA)
	Dissolvine® 220-S	EDTA-Na_4 Tetrahydrate	Crystalline	452.2	750	11.5	High purity (NTA free)
	Dissolvine® Na2	EDTA-Na_2H_2 dihydrate	Crystalline	372.2	600	4.5	Slightly acidic without inorganic salt
	Dissolvine® Na2-P	EDTA-Na_2H_2 dihydrate	Crystalline	372.2	550	4.5	High purity, NTA free (< 0.1wt%) (a)
	Dissolvine® Na2-S	EDTA-Na_2H_2 dihydrate	Crystalline	372.2	600	4.5	High purity, NTA free (< 0.1wt%)
	Dissolvine® Am2-45	EDTA-$(NH_4)_2H_2$	Liquid (45%)	326.3	1200	5	Sodium free
	Dissolvine® Z	EDTA-H_4	Crystalline	292.2	700	2.5	High purity, low pH, solid
	Dissolvine® Z-S	EDTA-H_4	Crystalline	292.2		2.5	High purity (NTA free)

* as 1% solution or saturated solution if solubility is <1%
(a) meeting the Pharmacopeia (USP/FCC/EP/96-77-EC) test requirements

Separate brochures are available on the complete product line chelating agents and for our green chelants GLDA and MGDA

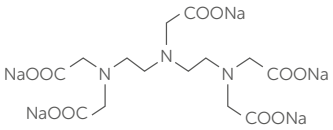
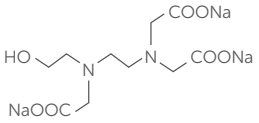
Readily biodegradable chelating agents

Structure and chemical name	Product	Chemical formula	Physical form	Molecular mass	Density kg/m³	pH typical value*	Specific properties
 Glutamic acid, N,N-diacetic tetrasodium salt, GLDA-Na_4	Dissolvine® GL-38	GLDA-Na_4	Liquid (38%)	351.1	1360	11.5	Highly soluble
	Dissolvine® GL-47-S	GLDA-Na_4	Liquid (47%)	351.1	1400	11.5	Highly soluble, high purity (NTA free)
	Dissolvine® GL Premium	GLDA-Na_4	Liquid (55%)	351.1	1430	10.2	Highly soluble, high purity (NTA free)
 Methylglycine N,N-diacetic trisodium salt, MDGA-Na_3	Dissolvine® M-40	MDGA-Na_3	Liquid (40%	271.1	1331	11.5	Highly soluble, NTA free
	Dissolvine® M-X	MDGA-Na_3	Granular	271.1	800	11.5	Highly soluble
 Glucoheptonic sodium salt	Dissolvine® CSA	Sodium glucoheptonate	Liquid (30%)	248.2	1180	8.5	For application at high alkalinity, main part originates from natural sustainable source
 Ethanoldiglycinic disodium salt, EDG-Na_2	Dissolvine® EDG	EDG-Na_2	Liquid (27.5%)	221.1	1180	11.5	Also referred to as HEIDA

* as 1% solution or saturated solution if solubility is <1%
suitable for EU Ecolabel

Separate brochures are available on the complete product line chelating agents and for our green chelants GLDA and MGDA

Special chelating agents

Structure and chemical name	Product	Chemical formula	Physical form	Molecular mass	Density kg/m^3	pH typical value*	Specific properties
 Diethylenetriaminepentaacetic pentasodium salt DTPA-Na_5	Dissolvine® D-40	DTPA-Na_5	Liquid (40%)	503.3	1280	11.5	
	Dissolvine® D-50	DTPA-Na_5	Liquid (50%)	503.3	1370	11.5	Regular DTPA
	Dissolvine® DZ	DTPA-H_5	Crystalline	393.4	600	2	High purity
 Hydroxyethylethylenediaminetriacetic trisodium salt HEDTA-Na_3	Dissolvine® H-40	HEDTA-Na_3	Liquid (43%)	344.2	1280	11.5	Chelating agent for iron at low alkalinity
	Dissolvine® H-50-GS	HEDTA-Na_3 / HEDTA-H_3	Liquid (50%)	-	1320	5-9	Chelating agent for iron at low alkalinity
	Dissolvine® H-88-X	HEDTA-Na_3 2.5 hydrate	Crystalline	389.2	600	11-5	Chelating agent for iron at low alkalinity

** as 1% solution or saturated solution if solubility is <1%

Separate brochures are available on the complete product line chelating agents and for our green chelants GLDA and MGDA

Choosing the right Dissolvine® chelant

Dissolvine® chelating agents can be used directly in chemical processes or formulated as water soluble products.

The type and quantity of metal ions as well as the anions involved in the process need to be considered. An important factor is the strength of the complex formed between the metal ion and the chelating agent. This determines whether the complex will be formed in the presence of competing anions. The stability or equilibrium constant (K), expressed as log K, has been determined for many metals and chelating agents. For each metal complex there is an optimum pH in which the metal complex is stable.

We supply the following Dissolvine® chelating agents.

Metals to control	High acidity	Low acidity	Low alkalinity	High alkalinity
Divalent metals	GLDA, MGDA, EDTA, DTPA, HEDTA			
Water hardness	No chelant applicable	GLDA, MGDA, HEDTA	GLDA, MGDA, EDTA, DTPA, EDG, HEDTA	
Iron control	GLDA	GLDA, MGDA, HEDTA, EDTA, DTPA	DTPA, HEDTA	Glucoheptonate

GLDA: A strong, and the greenest chelate in our product range. Safe and readily biodegradable chelating agent that can be used as alternative for NTA, EDTA, phosphates and phosphonates, especially in cleaning applications. It has a high solubility over a wide pH range. It is soluble in acids and in several non aqueous solvents. The largest part of the molecule originates from a natural sustainable source.

MGDA: A safe and readily biodegradable strong chelating agent available in a solid and liquid form that can be used as alternative for NTA, EDTA, phosphates and phosphonates, especially in short contact time cleaning applications.

EDTA: The most widely used, very strong, cost effective and general purpose chelating agent.

Glucoheptonate: A biodegradable chelating agent based on a carbohydrate. It is generally weaker than the aminopolycarboxylates (APCs) mentioned above. However, it exhibits an exceptional chelating ability for iron hydroxides and other transition metal ions at high pH. As with GLDA, the largest part of the molecule originates from a natural sustainable source.

EDG: A readily biodegradable chelating agent, effective when a relatively weak chelating agent can be used.

DTPA: Recommended when an exceptional strong chelating agent is needed, such as during peroxide bleaching of pulp. It remains more effective under oxidizing conditions. It is also especially suitable for descaling in oilfield applications.

HEDTA: A chelating agent with similar efficacy to EDTA, but labelled with less hazard phrases and pictograms. Particularly useful when high solubility is needed at low pH and for stabilizing iron ions at high pH.

2. Specialty surfactants and co-surfactants

Boosting your cleaning performance

Surfactants are an essential ingredient in most cleaning formulations. They increase the penetration of the cleaning solution by reducing surface tension. They also help to emulsify and suspend soils so that they are more easily dispersed into solution and removed from the soiled surface.

The type of surfactant chosen for a cleaning formulation depends on multiple factors such as pH, the type of soil, the substrate and other ingredients included in the formulation. We offer a broad portfolio of specialty surfactants for household and Industrial applications.

Our nonionic surfactants provide good compatibility with most formulations and provide degreasing benefits at low concentrations. At the heart of our specialty surfactant portfolio are the narrow range ethoxylates. Narrow range ethoxylates offer superior cleaning, low foam, easier handling and lower odor than the standard range counterparts.

We offer a broad range surfactants and hydrotropes for your sustainable cleaning applications.

Demand for alcohol ethoxylates is growing due to increasing needs for liquid detergents and concentrated unit dosage forms. Ethoxylates can be used at higher concentrations, which is preferable for producing new forms of liquid laundry detergents. Nitrogen based nonionic surfactants are used in a variety of applications.

Many formulations, especially those used in heavy degreasing operations required in industrial and institutional processes, are made in concentrated form. This minimizes space demands in storage and transport, reduces packaging waste and offers the formulator the ability to produce a concentrated product that may be diluted to different strengths for different demands. Preparing such products poses the challenge of keeping the whole formulation together to obtain a stable solution.

Our specialty surfactants are a unique portfolio of materials that have been optimized to meet effective soil removal, meeting the cleaning industry needs for sustainable and cost effective solutions.

To overcome this, hydrotropes are used. With hydrotropes, the lipophilic chain is relatively small compared with the hydrophilic head unlike surfactants where the opposite applies. This structure enables the hydrotrope molecules to aggregate with the surfactant molecules and become a part of the micelle structure. Our product portfolio includes several types of co-surfactants, which can be used in different conditions (very alkaline and high concentrations of electrolytes, low and high foaming, etc.). Through our core competence in nitrogen chemistry, we have developed highly effective cationic and nonionic co-surfactants.

2.1 Nonionic surfactants

Our nonionic surfactants get surfaces clean

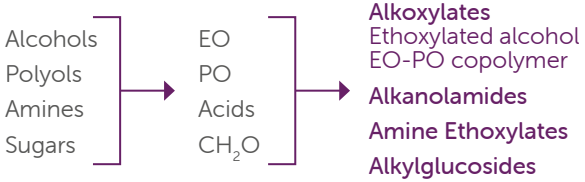
Nonionic surfactants by definition contain no structural element that has a formal charge. Surface activity derives from a balance of hydrophobic and hydrophilic structures contained in the surfactant molecule. Altering the balance towards more hydrophobic or more hydrophilic influences the surfactant's functional properties to achieve a desired effect.

Nonionic surfactants for degreasing:
- **highly targeted performance**
- **effective at very low concentrations**
- **excellent low temperature handling**

Our unique portfolio with essential cleaning ingredients provides the best cost performance solution for the customer. Efficient and sustainable cleaning formulations begin with these products.

The following figure illustrates the process chemistries we employ.

Nonionic process chemistries



Below are listed the trademarks we use to identify the nonionic surfactants we market.

Brand	Surfactant type
AG™	Alkylglucosides
Berol®, Ethylan®	Narrow range, EO, EO/PO alkoxylated and mixtures
Ethomeen®	Amine ethoxylates

Nonionic surfactants have attributes that make their use advantageous over other surfactant types.
Due to their lack of charge, they are compatible with both cationic and anionic surfactants, as well as other nonionic surfactants.

A narrow range ethoxylated alcohol, also called "a peaked ethoxylate", has a distribution curve that is narrower than the equivalent standard alcohol ethoxylate with a considerably lower content of unreacted alcohol and lower foam than standard ethoxylates.

Narrow range ethoxylates have targeted properties to improve degreasing performance at lower use concentration, while eliminating the need for hazardous solvents in the final formulation. At the same time narrow range ethoxylates are compatible with most commonly used surfactants and builder grades.

Functionalities that can be optimized:
- Detergency
- Wetting
- Emulsification
- Foam boosting
- Defoaming
- Viscosifying
- Solubilization

We are working on expanding the portfolio of natural, vegetable-based surfactants to meet customer need and enhance the sustainability aspirations of end users.

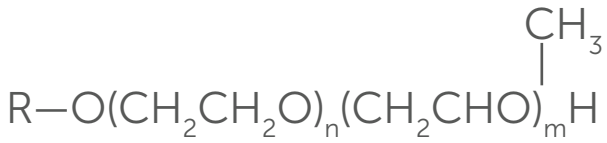
Alcohol ethoxylates – Narrow range

$R—O(CH_2CH_2O)_nH$

Product	Description	Appearance 20°C	Active content %	Surface tension mN/m*	Wetting power sec**	Cloud point °C	HLB	Solubility in 5% water	Application	Aircraft/trains/boats/aluminium cleaning	Alkaline cleaning	Automatic dishwashing	Car wash/rinse/polish	CIP cleaning	General and household cleaning	High pressure cleaning	Industrial and institutional cleaning	Laundry liquids/manual dishwash	Property / Function	Degreaser	Emulsifier	Low foam	Wetting
Berol® 260	C_9-C_{11} alcohol ethoxylate	Liquid	99	27	11	55-59 (a)	10.5	D		•	•		•		•	•	•			•	•	•	•
Berol® 266	C_9-C_{11} alcohol ethoxylate	Liquid	99	27	15	24-29 (b) & 54-59 (b)	12	S		•	•		•		•		•	•		•	•		•
Berol® 360 (c)	C_{10} natural alcohol ethoxylate	Liquid	99	27	11	55-59 (a)	10.5	D		•	•		•		•	•	•			•	•	•	•
Berol® 366 (c)	C_{10} natural alcohol ethoxylate	Liquid	99	27	15	24-29 (b) & 54-59 (b)	12	S		•	•		•		•		•	•		•	•		•
Berol® 840	C_8 alcohol ethoxylate	Liquid	99	32	90	49-54 (a)	11.5	D			•			•	•		•			•		•	
Ethylan® 1003	C_{10} alcohol ethoxylate	Liquid	99	27	4	31-37 (a)	10	D			•		•	•	•	•	•			•	•	•	•
Ethylan® 1005	C_{10} alcohol ethoxylate	Liquid	99	27	3	47-53 (a)	11.6	D			•	•	•	•	•	•	•			•	•	•	•

* according to du Noüy, 25°C, 0.1% DIN 53914
** according to Draves, 25°C, 0.1%
(a) 5 g product in 25 ml 25% butyldiglycol
(b) 1% in water
(c) certified RSPO source
S soluble
D dispersible
suitable for EU Ecolabel

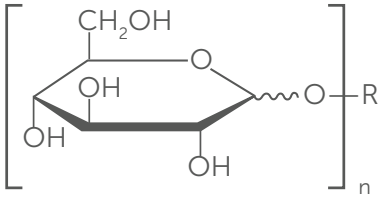
Alcohol alkoxylates



Product	Description	Appearance 20°C	Active content %	Surface tension mN/m*	Wetting power sec**	Cloud point °C	HLB	Solubility in 5% water	Application	Automatic dishwashing	Car wash/rinse/polish	CIP cleaning	General and household cleaning	High pressure cleaning	Industrial and institutional cleaning	Industril metal cleaning	Laundry liquids/manual dishwash	Property / Function	Defoamer	Degreaser	Dispersant	Emulsifier	Foam boosting	Low foam	Wetting
Berol® 087	C_{12}-C_{16} alcohol alkoxylate	Liquid	100	31	13	39-43 (a)	11.5	S		•	•	•								•		•	•		•
Berol® 175	C_{12}-C_{16} alcohol ethoxylate	Liquid	90	29	15	58-64 (a)	12.5	S					•		•		•					•			•
Berol® 185	Alcohol alkoxylate	Liquid	90	30	10	64-70 (a)	13.5	S			•		•		•		•			•	•	•			•
Berol® 185 PO	Alcohol alkoxylate	Liquid	90	30	10	64-70 (a)	13.5	S			•		•		•		•			•	•	•			•
Ethylan® 1008	C_{10} alcohol ethoxylate	Liquid	100	29	11	64-68 (a)	14	S			•		•	•			•			•		•			•
Ethylan® 1008W	C_{10} alcohol ethoxylate	Liquid	90	30	15	64-67 (a)	14	S			•		•	•			•			•		•			•
Ethylan® 2624	Alcohol alkoxylate	Liquid	100	30	25	55-59	8.4	S			•		•		•	•				•					•
Ethylan® CPG7545	Alcohol alkoxylate	Liquid	99	32	14	35-38 (a)		S		•		•		•	•	•				•				•	•
Ethylan® HB4	Phenol ethoxylate	Liquid	100	49	>300	66-68 (b)	8.8	S			•										•				
Ethylan® TB345 (c)	Block EO/PO copolymer	Liquid	100	-	-	74 (d)	17.9	S		•	•	•			•				•						
Ethylan® TD1085	Tridecyl alcohol ethoxylate	Liquid	85	28	11	65-73 (a)	14	S			•				•						•		•		•

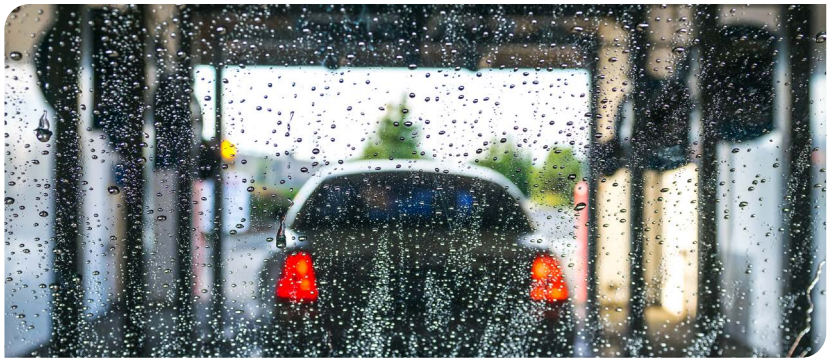
* according to du Noüy, 25°C, 0.1% DIN 53914
** according to Draves, 25°C, 0.1%
(a) 1% in water
(b) 10% w/v in water
S soluble
(c) unsuitable for inclusion in formulations dictated by the European Detergent Directive
(d) 1% in 10% NaCl
suitable for EU Ecolabel

Alkylglucosides



Product	Description	Appearance 20°C	Active content %	Surface tension mN/m*	Wetting power sec**	Foam height mm*** Immediately	Foam height mm*** After 5 min	Solubility in 5% water	Application	Alkaline cleaning	Automatic dishwashing	Car wash/rinse/polish	CIP cleaning	High pressure cleaning	Industrial and institutional cleaning	Property / Function	Co-surfactant/hydrotrope	Dispersant	Foam booster	Low foam
AG™ 6202	C_8 alkylglucoside	Liquid (a)	65	33	>300	8	0	S		•	•	•	•		•		•			•
AG™ 6206	C_6 alkylglucoside	Liquid	75	34	>300	0	0	S		•	•	•	•	•	•		•			•
AG™ 6210 (b)	C_8-C_{10} alkylglucoside	Liquid	61	27	200	100	90	S		•		•			•			•	•	

* according to du Noüy, 25°C, 0.1% DIN 53914
** according to Draves, 25°C, 0.1%
*** according to Ross-Miles, 50°C, 0.05%
(a) 30°C
(b) certified RSPO source
S soluble
suitable for EU Ecolabel



Nitrogen based nonionic surfactants – a science for cleaning

Functional properties

The molecular structure of fatty amines and derivatives is characterized by one or more C_8 to C_{22} aliphatic alkyl groups, with one or more amine functionalities.

The surface active properties of many fatty amines and derivatives are responsible for e.g. emulsification, foaming, wetting and thickening functionalities.

Substantivity refers to the adsorptive properties of cationic surfactants and related nitrogen derivatives. Adsorption, particularly onto solid surfaces, results from the attraction between the positive charge on the nitrogen atom and the negative charge characteristic of most surfaces. Consequently, substantivity leads to surface modification, softening, corrosion inhibition, adhesion, anti-static properties, lubrication and hydrophobization.

Selection criterias

Solubility

Solubility of surfactants is a primary criterion for their selection. The table below summarizes the solubility behavior of surfactants in water.

Water solubility of amine surfactants is enhanced in the following ways	
alkyl chain	by decrease in chain length (or molecular mass) by increase in unsaturation
nitrogen moiety	by increase in number of functional groups by increase in degree of ethoxylation by formation of salts by quaternization
medium	by decreasing pH

Alkylamines of C_8-C_{22} chain length are insoluble in water at neutral pH. In acidic media, the amine group is protonated and the resulting amine salt is much more soluble. In general, one protonated amino group is sufficiently hydrophilic to solubilize a C_{12} alkyl chain.

Solubilization of a C_{18} alkyl chain requires two protonated amino groups as provided in Duomeen® O surfactant at low pH, for example.

Water solubility is increased by the introduction of neutral hydrophilic groups such as polyoxyethylene groups. Ethoxylation of aliphatic amines yields the Ethomeen® surfactant series.

Solubility of Ethomeen® surfactants are dependent upon the degree of ethoxylation. Example, Ethomeen® C/12 surfactant contains two oxyethylene units per molecule and is insoluble in water, whereas Ethomeen® C/25 surfactant contains fifteen oxyethylene units per molecule and is water soluble.

Hydrophile-lipophile balance

Surfactants are often characterized by their hydrophilic/lipophilic balance or HLB. High HLB values indicate good water, or polar solvent solubility, of the surfactant while low HLB values are indicative of good solubility in nonpolar systems, such as oil. We use Griffin formulas for nonionic surfactants and Davis formulas for ionic surfactants.

The hydrophilic character of a surfactant is determined by the polarity of the head group. Typical head groups found in our surfactant products include amine, quaternary ammonium, ethoxylate and carboxylate. The polarity of the head group may be altered in some cases by adjusting the pH or by changing the degree of ethoxylation. An increase of ethoxylation levels will increase the HLB. Conversely, increasing the size of the fatty tail will decrease the HLB.

Emulsions may be classified as oil-in-water (O/W), in which hydrophobic material is dispersed in water, or as water-in-oil (W/O), in which water is dispersed in hydrophobic material. Formation of O/W emulsions is favored by emulsifiers having a high HLB value like Ethomeen® C/15 and Ethomeen® C/25 surfactants. For W/O emulsions, low HLB surfactants such as Ethomeen® T/12 surfactant are more effective.

Amines / Diamines

$R—NH_2$

$R—NH—CH_2CH_2CH_2—NH_2$

Product	Description	Appearance 20°C	Amine number total mg KOH/g	Iodine number gl/100 g	Water %	Diamine %	Color Gardner	Melting point °C	Viscosity mPa.s at 60°C	Application	Automatic dishwashing	Car wash/rinse/polish	CIP cleaning	Property / Function	Degreaser	Dispersant	Emulsifier
Armeen® C	Cocoamine	Liquid	266-287	8	<0.1	-	max 2	15-20	4			•	•		•		•
Armeen® OL	Oleylamine	Liquid	201-212	min 85	max 0.5	-	max 4	10-20	6			•	•		•		•
Duomeen® C	N-Coco-1,3-diaminopropane	Liquid/Paste	388-443	6	max 1	min 89	max 8	20-30	4		•	•	•		•		•
Duomeen® CD	N-Coco-1,3-diaminopropane	Solid/Paste	388-450	6	max 0.5	min 89	max 3	24-30	4		•	•	•		•		•
Duomeen® O	N-Oleyl-1,3-diaminopropane	Liquid/Paste	313-349	min 65	max 0.5	min 90	max 8	9-20	11		•	•	•		•	•	•
Duomeen® OV	N-Oleyl-1,3-diaminopropane	Liquid/Paste	311-347	75-95	<0.2	min 90	max 8	9-20	11		•	•	•		•	•	•

Polyamines

$R—NH—(CH_2CH_2CH_2NH)_nCH_2CH_2CH_2NH_2$

Triamines: n = 1
Tetramines: n = 2

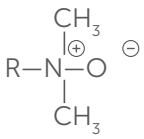
$R—N(CH_2CH_2CH_2NH_2)_2$

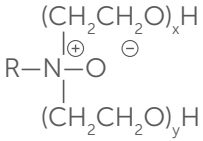
Triameen® YT surfactant

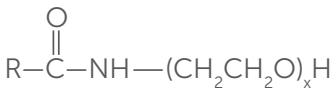
Product	Description	Appearance 20°C	Color Gardner	Iodine number gl/100 g	Water %	Typical data density kg/m³	Melting point °C	Application	Corrosion inhibitor	Industrial metal cleaning	Property / Function	Dispersant	Emulsifier
Triameen® OV	Oleyl (vegetable) di-propylene triamine	Liquid	max 3	min 50	<0.5	855	17		•	•		•	•
Triameen® T	Tallow dipropylene triamine	Solid	max 3	30	<0.5	830	30-45		•	•		•	•
Triameen® YT (a)	Tallow dipropylene triamine	Liquid/Paste	max 12	33	<0.5	845 (b)	15-25		•	•		•	•

(a) not sold within EU
(b) at 60°C

Amine oxides / Amide ethoxylates



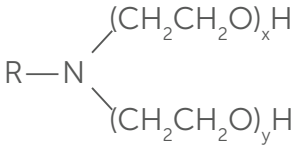




Product	Description	Appearance 20°C	Surface tension mN/m*	Wetting power sec**	Foam height mm*** Immediately	Foam height mm*** After 5 min	Solubility in 5% water	Application	Acid cleaning	Alkaline cleaning	Car wash/rinse/polish	General and household cleaning	Industrial and institutional cleaning	Property / Function	Emulsifier	Foam booster	Thickener
Aromox® 14D-W970	Tetradecyldimethyl-amine oxide	Liquid	30	20	167	163	S			•			•			•	•
Aromox® MCD-W	(Fractionated coco) dimetylamine oxide	Liquid (25°C)	30	20	165	160	S			•	•	•	•			•	•
Aromox® T/12	Tallowbis (2-hydroxyethyl) amine oxide	Paste	30	>300	10	5	S		•	•			•				•
Aromox® T/12 HFP	Tallowbis (2-hydroxyethyl) amine oxide	Paste/slightly cloudy liquid	30	>300	20	15	S			•	•						•

* according to du Noüy, 25°C, 0.1% DIN 53914
** according to Draves, 25°C, 0.1%
*** according to Ross-Miles, 50°C, 0.05%
S soluble
D dispersible
suitable for EU Ecolabel

Amine ethoxylates



Product	Description	Appearance 20°C	Active content %	Equivalent mass	Surface tension mN/m*	Wetting power sec**	Solubility in 5% water	Application	Acid cleaning	Industrial and institutional cleaning	Industril metal cleaning	Property / Function	Corrosion inhibitor	Degreaser	Dispersant	Emulsifier	Thickener
Berol® 302	Bis (2-hydroxyethyl) oleyl amine	Liquid	100	344-365	29	>300	D		•		•		•			•	•
Ethomeen® C/12	Bis (2-hydroxyethyl) cocoalkylamine	Liquid	100	275-300	27	100	D		•	•	•		•			•	•
Ethomeen® C/15	Coco alkylamine ethoxylate	Liquid	100	408-440	30	85	S				•		•			•	
Ethomeen® C/22	Coco alkylamine ethoxylate	Liquid	min 96				S				•			•		•	
Ethomeen® C/25	Coco alkylamine ethoxylate	Liquid	100	826-901	41	>600	S				•			•	•	•	
Ethomeen® O/12	Bis (2-hydroxyethyl) oleyl amine	Liquid	100	345-365	28	>300	D		•		•		•			•	•
Ethomeen® OV/17	Oleyl amine ethoxylate	Liquid	100	540-585	31	160	S				•					•	
Ethomeen® T/12	Bis (2-hydroxyethyl) tallow alkylamine	Liquid/Paste	100	340-360	28	>300	D		•		•		•			•	•
Ethomeen® T/15	Tallowalkylamine ethoxylate	Liquid	100	471-506	31	80	S				•		•			•	
Ethomeen® T/25	Tallowalkylamine ethoxylate	Liquid	100	869-952	39	>300	S				•			•		•	

* according to du Noüy, 25°C, 0.1% DIN 53914
** according to Draves, 25°C, 0.1%
S soluble
D dispersible

2.2 Anionic surfactants

Anionic surfactants, designed for applications with extreme requirements

Anionic surfactants are the original workhorse ingredients for the formulator. Familiar benefits such as wetting, foaming, surface tension reduction, detergency, dispersancy and excellent rinseability make our anionic surfactants a cost-effective choice to enhance formulation performance in numerous applications and end markets.

Exceptional acid and base stability, hard water tolerance and high temperature stability enable our anionic surfactants to deliver outstanding results in the harshest environments where other classes of surfactant struggle to perform.

Rinsability/friability

Petro® surfactants are easily removed from surfaces with rinsing. Formulations can dry to a hard brittle residue (solid, crystalline anionic powder) and capture the soil, which can be easily removed during the drying stage of carpet cleaning, or by vacuuming.

Standard high-foaming surfactants leave sticky, gummy residues which can gain redeposition of soil.

Petro® surfactants are used as processing aids for mineral coatings by uniforming the particle size which speeds up filtration. They can also be added to powders as dispersants to reduce/eliminate solidification and improve flow.

Foaming

Medium foam (Petro® AG Special, Petro® BA, Petro® LBA surfactants)

These products are used in many I&I type applications like floor cleaning, hard surface cleaning, metal cleaning, rust removers, carpet cleaning, vehicle cleaning and food processing (fruit & vegetable wash). The recommended use level is 1 to 10% by weight, as anticaking agent 0.4 to 4.5 lb/ton. Petro® LBA surfactant is low color. The optimum medium foam product depends upon formulation specifics.

High foam (Petro® LBAF surfactant)

Petro® LBAF surfactant is well suited for rug and upholstery shampoos based on sodium lauryl sulfate and can improve freeze thaw stability on the formula and give a friable residue that is easily removed from the soft surface. Due to stability in both high and low pH, this product can be used in acid or alkaline cleaners. This includes toilet bowl cleaners (acidic), cement floor cleaners, industrial transportation cleaners, metal cleaners/degreasers and oven cleaners. The recommended use level is 1 to 15% by weight. This is a low color product.

Anionic surfactants improve wetting, detergency, hydrotroping and coupling for many applications including floor, hard surface, metal, carpet and food processing.

Sulfonates surfactants

Energize your detergent formulations with a surfactant portfolio that is completed with some special anionics useful in a range of specific applications.

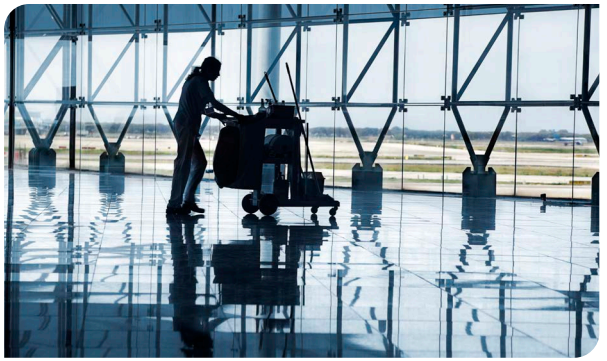
Product	Description	Appearance 25°C	Active content %	Surface tension dynes/ cm*	Wetting power sec**	Foam height mm***	Solubility in 5% water	Application	Acid cleaning	Aircraft/trains/boats/aluminium cleaning	Alkaline cleaning	Automatic dishwashing	Dry cleaners/carpet cleaning	Floor cleaning	Food processing (fruit/vegetable wash)	Hard surface cleaning	Industrial metal cleaning	Liquid detergents	Powdered detergents	Property / Function	Detergency	Dispersant	High foam	Hydrotroping/coupling	Medium foam	Wetting
Petro® AG Special Liquid	Alkylnapthalenesulfonc acid, sodium salts	Clear amber liquid	50	34	20-30	106	S		•	•	•	•	•	•	•	•	•	•			•	•		•	•	•
Petro® AG Special Powder	Alkylnapthalenesulfonc acid, sodium salts	Tan powder	>95	34	20-30	106	S		•	•	•	•	•	•	•	•	•		•		•	•		•	•	•
Petro® BA Powder	Alkylnapthalenesulfonc acid, sodium salts	Tan powder	>95	43	20-30	113	S		•	•	•	•	•	•	•	•	•		•		•	•		•	•	•
Petro® LBA Liquid	Alkylnapthalenesulfonc acid, sodium salts	Clear amber liquid	50	59	103	70	S		•	•	•	•	•	•	•	•	•				•	•		•	•	•
Petro® LBAF Liquid	Alkylnapthalenesulfonc acid, sodium salts	Clear amber liquid	50	37	3	160	S		•	•	•	•	•				•						•			

* according to du Noüy, 25°C, 0.1% DIN 53914
** according to Draves, 25°C, 0.1%
*** according to Ross-Miles, 25°C, 0.25% (active)
S soluble

Phosphate esters

Product	Description	Appearance 20°C	Active content %	Surface tension mN/m*	Wetting power sec**	Solubility in 5% water	Application	Alkaline cleaning	Industrial and institutional cleaning	Industrial metal cleaning	Property / Function	Corrosion inhibitor	Co-surfactant/hydrotrope	Emulsifier	High foam	Low to medium foam
Phospholan® PE169	Isotridecyl alcohol ethoxylate phosphate ester	Liquid	100	28	23	D		•	•	•		•				•
Phospholan® PE65	Alcohol ethoxylate phosphate ester	Liquid	100		>300	D		•	•	•		•		•	•	
Phospholan® PHB14	Phenol ethoxylate phosphate ester	Liquid	100	55	23	D		•	•				•			

* according to du Noüy, 25°C, 0.1% DIN 53914
** according to Draves, 25°C, 0.1%
D dispersible



2.3 Cationic surfactants

Effective thickening benefits

Cationic surfactants deliver many unique properties to formulations. Due to the positive charge on the head group, this class of surfactants offers many unique functions such as softening, anti stat, surface modification and dispersancy. The cationic head group of cationic surfactants adheres to negatively charged surfaces, as most surfaces are, such as fabric, pigments, clays and other solids.

Cleaning formulations are thickened to increase the contact time on inclined or vertical surfaces like toilet bowls and tiled walls.

A longer adherence time results in an improved removal of soil and limescale as well as extended perfume release for better air-freshening.

Effective thickening systems for specific applications can be obtained with blends of cationic surfactants.

The higher viscosity generated by these products allows an improved control of dosage and increases the safety of your formulations by avoiding splashes and leaking.

The guiding principle in understanding the function of cationic surfactants as thickening agents is the model of rod micelle formation.

Viscosity increase is due to chaotic rod-like arrangement of the surfactant molecules in solution. The viscosity level that can be achieved gets higher as the alkyl chain length of the surfactant hydrophobe gets longer.

The rheology profile of the final formulation can be controlled with small amounts of additives. This also decreases the amount of cationic surfactant needed to achieve the desired viscosity level.

Organic salts such as SXS, SCS, soaps, as well as electrolytes (NaOH, NaCl) act as desolubilizers which promote rod-like micelle formation and consequently an increase in viscosity.

The desired viscosity is achieved by optimizing the ratio of the components and the concentration of the blend. Formulations with cationic surfactant blends exhibit thixotropic behavior (shear thinning formulations).

Provide effective thickening across the whole pH range for enhanced product performance as well as stability in chlorine and hydrogen peroxide bleach.

The cleaning product becomes thinner when it is squeezed out of the bottle, making it easy to dispense, but becomes thicker when it hits the surface allowing it to cling and prevent run off.

This portfolio of cationic surfactants offer a broad range of applications including fabric softening, anti-stats and rinse aids.

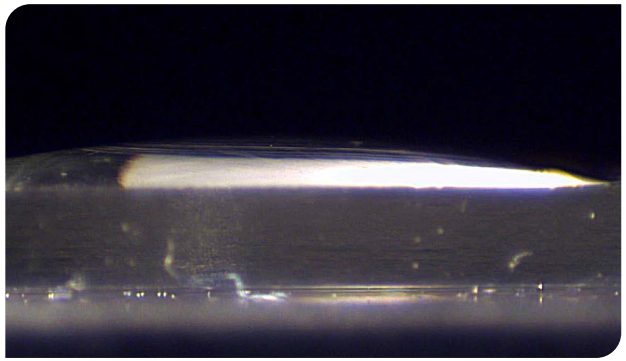
Nonionic ethoxylated alcohols, e.g. Berol® 175 surfactant, have a solubilization effect which helps to avoid the viscoelastic region where the formulation does not flow and has no practical use.

The desired viscosity is achieved by optimizing the ratio of the components and the concentration of the blend. Formulations with cationic surfactant blends exhibit thixotropic behavior (shear thinning formulations). The cleaning product becomes thinner when it is squeezed out of the bottle, making it easy to dispense, but becomes thicker when it hits the surface allowing it to cling and prevent run off.

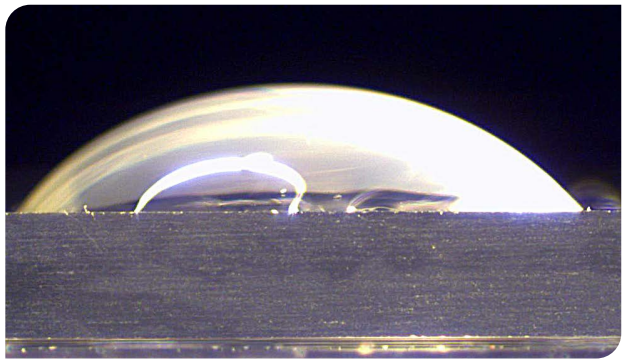
Ethomeen® T/12 and Arquad® T-50 surfactant blends provide an efficient thickening system at low and high hydrochloric acid concentration.

Dialkyl quaternary ammonium compounds are commonly used for surface modification. Armosoft® DEVQ fabric softener is a high performing rinse cycle, fabric softening active. It can be formulated in a wide range of activities, up to 24%. Armosoft® DEVQ fabric softener is readily biodegradable. Arquad® 2C-75 surfactant is used to formulate high performing car rinse aids, for enhanced drying and minimal streaking.

Quaternary ammonium compounds are stable across the entire pH range. Combinations of Arquad® T-50 with Ethomeen® T/12 surfactants provide efficient thickening for hydrochloric acid solutions up to 15%. Arquad® T-50 surfactant is used as a mold release agent for polyvinyl alcohol films. Quaternary ammonium compounds are stable in the presence of chlorine and hydrogen peroxide bleaches.



Untreated glass surface (control)
Water sprayed on the untreated glass surface
Contact angle: untreated glass 19.5°



Treated glass surface with car rinse aid
Water sprayed after glass surface was rinsed with the premium solvent base car rinse
Contact angle: treated glass 43.9°

Quaternary ammonium compounds (QAC)

Product	Description	Appearance 20°C	Active content %	Free amine+ amine HCl %	Color Gardner	pH 5% in 50/50 2-propanol/ water	Solubility in 5% water	Application	Acid cleaning	Alkaline cleaning	Car wash/rinse/polish	Fabric softeners	General and household cleaning	Property / Function	Antistatic	Thickener
Armosoft® DEVQ (a)	Diester quaternary ammonium salt	Liquid	78-82	max 2	max 3.5		S					•				
Arquad® 2C-75	Dicocoldimethyl ammonium chloride, 2-propanol	Liquid	74-77	max 2	max 5	6-9	D				•	•			•	
Arquad® 2HT-75	Di(hydrogenated tallow) dimethyl ammonium chloride, 2-propanol	Liquid	74-76	max 2	max 4	6-9	D					•			•	
Arquad® T-50	Tallowtrimethyl ammonium chloride, 2-propanol	Paste	49-52	max 2	max 5	6-9	S		•	•			•			•
Arquad® T-50 HFP	Tallowtrimethyl ammonium chloride, 2-propanol	Liquid	49-52	max 2	max 6	6-9 (b)	S		•	•			•			•

(a) not sold within EU
(b) 1% in water
S soluble
D dispersible

2.4 Amphoterics

Excellent surfactants for solubilization

Amphoteric surfactants are unusual in that they have both anionic and cationic character within the same molecule. This means that the properties of the surfactant can be highly dependent upon the pH of the formulation, which determines whether the surfactant is predominantly anionic or cationic in character.

Given that the headgroup of this class of surfactants has two polar groups, typically these molecules have relatively very high water-affinity and solubility. This property is extremely helpful in solubilization of some of the more difficult to solubilize nonionic surfactants, allowing development of high cloud-point and visually attractive cleaning solutions.

The amphoteric surfactants help drive the formation of mixed micelle systems that are stable and optically attractive – a property referred to as hydrotroping. In cleaning applications, this is one of the standout properties of amphoteric surfactants.

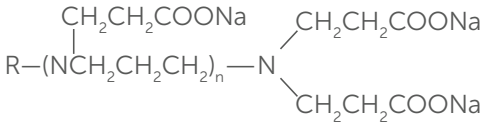
Another important trait of amphoteric surfactants is their mildness. With high water solubility, they interact less strongly with biological cell membranes of organisms that other surfactant types, and are known to be mild. Some of these ingredients have no hazard labels as sold, and can be used as an excellent base for more sustainable formulary. Due to the relatively limited surface interactivity, these surfactants leave little residue once a surface is treated and rinsed.

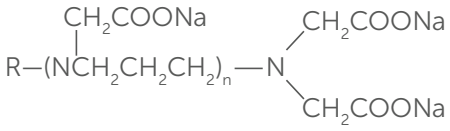
Further advantage with amphoteric surfactants is their ability to remain soluble in high levels of electrolyte. For example, high alkalinity solution with >20% NaOH can be formed. Such surfactants are also compatible with high levels of liquid chelating agents, such as Dissolvine® GL Premium. Many other surfactant groups precipitate in the presence of such high electrolyte cleaning ingredients, unless heavily diluted.

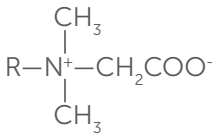
Amphoteric surfactants can also be uses as foam boosters, although Ampholak® YJH-40 is unusual in imparting low foam when used.

Amphoteric surfactants are unusual in that they have both anionic and cationic character within the same molecule.

Amphoterics







Product	Description	Appearance 20°C	Solids %	Surface tension mN/m*	Wetting power sec**	Foam height mm*** Imme-diately	Foam height mm*** After 5 min	Color Hazen	Pour point °C	pH 20% in water	Sodium chloride %	Solubility in 5% water
Ampholak® 7TX	Sodium tallowampho-polycarboxyglycinate	Liquid	39-41	40	>300	130	120	max 100	-20	8.5-9.5	9.8-10.8	S
Ampholak® XCE	Coco iminodiglycinate	Liquid	39-41	36	150	150	150	max 500	-17	8-10		S
Ampholak® YCE	Sodium cocopropylene-diaminepropionate	Liquid	29-30	39	300	125	120	max 250	0	6-7	Salt free	S
Ampholak® YJH-40	Sodium caprylimino-dipropionate	Liquid	38-42	64	>300	15	0	max 500	-8	8.5-9.5	Salt free	S

Application	Alkaline cleaning	Car wash/rinse/polish	CIP cleaning	Industrial and institutional cleaning	Laundry liquids/manual dishwash
	•	•		•	
	•	•		•	
	•	•		•	
	•	•	•	•	

Property / Function	Corrosion inhibitor	Co-surfactant/hydrotrope	Dispersant	Foam booster	Low foam	Mildness to skin
		•		•		•
		•	•	•		
	•	•		•		
		•			•	

* according to du Noüy, 25°C, 0.1% DIN 53914
** according to Draves, 25°C, 0.1%
*** according to Ross-Miles, 50°C, 0.05%
S soluble
suitable for EU Ecolabel

2.5 Surfactant systems

High performance cleaning solutions

In addition to formulating your own degreasers with our cutting-edge components, we provide optimized, highly effective and cost-efficient surfactant systems for specific applications. They are well known in the market for being easy to formulate and able to achieve the best performance in challenging soils. Our nonionic surfactant systems are particularly stable in harsh environments.

Our product portfolio includes several types of co-surfactants which can be used in different conditions (very alkaline, high to low salinity, low and high foaming, etc.).

Both Berol® R648 NG and Berol® R648 PO surfactants are multifunctional hydrotropes. Both have excellent solubilization power and in combination with nonionic surfactants deliver outstanding degreasing performance even at very low concentrations. The unique chemistry enables superior cleaning performance of your formulations, ranging from household cleaners to the most demanding industrial degreasers.

A co-surfactant is often added to the formulation of a cleaning product to increase the solubilization power of the surfactant system and boost its cleaning performance.

Berol® SurfBoost AD15 surfactant is a nonclassified co-surfactant which has the primary benefit to be readily aerobically and anaerobically biodegradable. It is a moderate foaming alkylamide ethoxylate designed particularly for environmentally friendly household products.

Berol® SurfBoost AD2M surfactant is an alkyl N,N-dimethylamide with excellent solubilizing properties designed to boost cleaning performance.

The smart chemistry of Berol® ENV226 Plus surfactant provides the best solution for industrial and household degreasing applications. It is an industry-leading readily biodegradable and powerful surfactant system delivering highly efficient cleaning. A versatile product, Berol® ENV226 Plus surfactant is the heart of high performance cleaning formulations.

Berol® DGR 81 and Berol® LFG 61 surfactants are easy to formulate in very alkaline conditions. Berol® DGR 81 surfactant is a strong degreaser with medium foam and Berol® LFG 61 surfactant is a very low foam nonionic surfactant blend.

Berol® LS surfactant combines degreasing and lowstreaking into one product. This novel technology also provides easy-clean benefits to a cleaning formulation.

Specialty surfactants

Product	Description	Appearance 20°C	Active content %	Surface tension mN/m*	Wetting power sec**	Solubility in 5% water	Application	Aircraft/trains/boats/aluminium cleaning	Alkaline cleaning	Automatic dishwashing	Car wash/rinse/polish	CIP cleaning	Dry cleaners/carpet cleaning	General and household cleaning	High pressure cleaning	Industrial and institutional cleaning	Industrial metal cleaning	Laundry liquids/manual dishwash	Property / Function	Degreaser	Emulsifier	Low foam	Wetting
Berol® 226 (a)	Alcohol ethoxylates and co-surfactants	Liquid	100	27	17	S		•	•		•			•	•	•	•	•		•	•		•
Berol® DGR 81	Alcohol ethoxylates and co-surfactants	Liquid	95	27	20	S (b)		•	•		•			•	•	•	•	•		•	•		•
Berol® EcoClean	Alcohol ethoxylates and co-surfactants	Liquid	83	27	23	S		•	•		•			•	•	•	•	•		•	•		•
Berol® ENV226 Plus	Alcohol ethoxylates and co-surfactants	Liquid	55	27	17	S		•	•		•			•	•	•	•	•		•	•		•
Berol® EZ-1	Alcohol ethoxylates and co-surfactants	Liquid	72	23		S		•	•		•			•	•	•				•	•		•
Berol® LFG 61	Alcohol ethoxylates and co-surfactants	Liquid	95	31		S			•	•		•		•	•							•	
Berol® LS	Alcohol ethoxylates, co-surfactants and nano silicas	Liquid	35	30		S			•				•	•						•			•
Berol® XS (a)	Alcohol ethoxylates and co-surfactants	Liquid	75	28	24	S		•	•		•			•	•	•	•	•		•	•		•
Berosol™ EC	Alcohol ethoxylates, co-surfactants and nano silicas	Liquid	47	30	95	S			•		•			•		•				•			

* according to du Noüy, 25°C, 0.1% DIN 53914
** according to Draves, 25°C, 0.1%
(a) not sold within EU
S soluble
(b) less than 5% Berol® DGR 81 surfactant is dispersible in water
suitable for EU Ecolabel

Co-surfactants

Product	Description	Appearance 20°C	Active content %	Surface tension mN/m*	Wetting power sec**	Solubility in 5% water	Application	Acid cleaning	Alkaline cleaning	Car wash/rinse/polish	General and household cleaning	Industrial and institutional cleaning	Laundry liquids/manual dishwash	Property / Function	Co-surfactant/hydrotrope
Berol® EP 25	C_8 alcohol ethoxylate	Liquid	70	50	>600	S		•	•	•	•	•	•		•
Berol® Nexxt	C_{12}-C_{14} alkyl methyl amine oxide ethoxylate	Liquid	65	25	>600	S		•	•	•	•	•			•
Berol® R648 NG	Quaternary C_{12}-C_{14} alkyl methyl amine ethoxylate methyl chloride	Liquid	60	36	>300	S		•	•	•	•	•			•
Berol® R648 PO (a)	Quaternary C_{12}-C_{14} alkyl methyl amine ethoxylate methyl chloride	Liquid	60	36	>300	S		•	•	•	•	•			•
Berol® SurfBoost AD15 (a)	Alkyl amide ethoxylate	Liquid	65	32	>300	S		•	•	•	•	•	•		•
Berol® SurfBoost AD2M	N,N-Dimethyldecan amide	Liquid	100	26	7-8	I		•	•	•	•	•	•		•
Berol® SurfBoost RA	Poly-quaternary amine	Liquid	55	-	-	S		•	•	•	•	•	•		•
OMA™ 4	Ethoxylated oleyl monoethanolamide	Liquid	99	30	95	S			•	•	•	•			•

* according to du Noüy, 25°C, 0.1% DIN 53914
** according to Draves, 25°C, 0.1%
(a) certified RSPO source
S soluble
I insoluble
suitable for EU Ecolabel

3. Performance polymers

Provide formulation flexibility

We are a global leader in the synthesis of water soluble polymers designed to meet the unique requirements of our customers. We have developed a diverse portfolio of specialty additives to provide cost-effective solutions to suit individual customer needs.

Our product line offers a broad array of polymers that provide benefits in the formulation, production and performance of cleaning and care products around the globe. Our scientists are continually seeking new ways to improve the performance and cost structure of laundry, dish wash and hard surface cleaning formulations in consumer and in industrial and institutional environments.

Alcosperse® polymers find application in liquid and powdered dishwasher detergents, laundry detergents and hard surface cleaners. The polymers act as co-builders in helping the detergents work more effectively by removing water hardness ions. They also serve as antiredeposition agents, compatibility and process aids in the manufacturing of powdered laundry formulations.

Alcoguard® polymers offer extreme scale control in zero phosphate formulations. These products prevent film from forming on hard as well as soft surfaces. Other applications include opacifiers and fabric stiffening aids.

A new platform of hybrid polymers based on poly-saccharides has been developed for a more sustainable option.

Our hybrid polymers offer an environmentally conscious choice without compromising on performance. They help in achieving:

- Less dependency on synthetic polymers
- Avoidance of fluctuations in the petroleum chemical feedstock
- Greater sustainability thanks to natural, renewable feedstocks
- Favorable environmental impact (high biodegradability profile and 500 kgs reduction of CO_2 for each ton of synthetic polymer replaced)
- High cleaning performance similar to traditional synthetic polymers and easy to formulate

Novel hybrid polymers are being used in several formulations in laundry, automatic dishwashing and also in hard surface cleaning.

Polymers

Product	Description	Appearance 25°C	Solids %	Molecular weight	pH 20% in water	Solubility in 5% water	Application	Automatic dishwashing	General and household cleaning	Industrial and institutional cleaning	Laundry liquids/manual dishwash	Laundry powder	Property / Function	Antistatic	Corrosion inhibitor	Co-surfactant/hydrotope	Dispersant	Low foam
Alcoguard® 4160	Sulfonated multipolymer	Liquid	39-41	3,500	4-5	S		•	•		•			•			•	
Alcosperse® 408	Acrylic/maleic copolymer	Liquid	42-44	3,000	5-6	S					•			•			•	
Alcosperse® 412	Acrylic/maleic copolymer	Liquid	40-42	2,500	10-11	S						•		•			•	
Alcosperse® 602N	Sodium polyacrylate	Liquid	44-46	5,000	7-8	S			•						•			
Alcosperse® 747	Acrylic/styrene copolymer	Liquid	39-41	3,000	8-10	S			•	•	•			•	•	•		•
Aquatreat® AR-257B	Sodium polyacrylate	Liquid	53-55	2,500	5.3-5.7 (10%)	S		•	•	•				•			•	

Hybrid bio-polymer

Alcoguard® H 5941	Hybrid bio-polymer	Liquid	39-41	-	4-6	S		•	•		•			•			•	
Alcoguard® H 5941D	Hybrid bio-polymer	Solid	100	-	4-6	S		•	•		•			•			•	

S soluble
suitable for EU Ecolabel

4. Biocides

Microbial control

We are one of the leading producers of biocides based on fatty amines and derivatives. A number of these products, especially quaternary ammonium compounds (QAC) and dodecyldipropylene triamine, are widely used in formulations for control of bacteria, fungi, viruses and algae in disinfection or preservation applications.

Quaternary ammonium compounds have been presented from a chemical point of view in the corresponding chapter of this brochure. Our trade name for the QACs is Arquad® surfactant.

Dodecyldipropylene triamine does not have an ionic charge like the QACs. Depending on the pH value there can be a partial positive charge at the nitrogen atoms of the amine groups. Our trade name of the dodecyldipropylene triamine is Triameen® Y12D antimicrobial.

Triameen® Y12D antimicrobial structure:

In the EU, biocidal products are specifically regulated by the Biocidal Products Regulation (BPR). In force since September 1, 2013. It replaces the Biocidal Products Directive (BPD) from 2000.

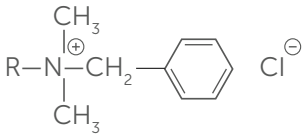
Due to the registration process of active ingredients not all actives on the market before the BPR was established will be finally registered. The following active substances have been selected for registration according to the following product types:

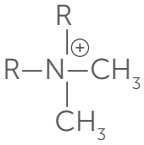
- BKC = benzalkonium chloride (CAS 68424-85-1) for PT 1,2,3,4,8,10,11,12:
  - Arquad® MCB-50, Arquad® MCB-50 PO, Arquad® MCB-80
- DDAC = didecyldimethylammonium chloride (CAS 7173-51-5) for PT 1,2,3,4,8,10,11,12:
  - Arquad® 2.10-50, Arquad® 2.10-70 HFP, Arquad® 2.10-80
- TMAC = trimethylalkylammonium chloride (CAS 61789-18-2) for PT 8:
  - Arquad® C-35
- Dodecyldipropylene triamine (CAS 2372-82-9) for PT 2,3,4,6,11,12, 13:
  - Triameen® Y12D, Triameen® Y12D-30

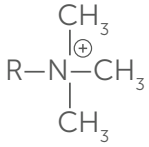
Information on the status of each substance in the BPR registration process as well as more details on the product types can be found in our Fact Sheet which is regularly updated and available on request.

In addition to these strong biocides there are substances which also have some weak biocidal/biostatic effect but are not in the BPR registration process. Often these substances are used for non-biocidal applications. Outside of Europe it depends on the national legislation if they may be used as biocides or not. These products are listed in a separate table. Please note that the biocidal/biostatic effect of these products is mainly known from literature. We do not have data supporting these claims.

Biocides*



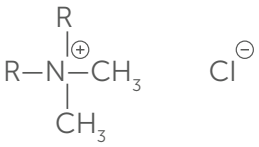


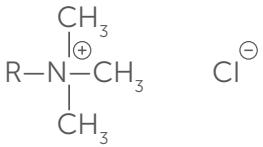


Product	Description	Appearance 20°C	Active content %	Solvent	Color Gardner	pH 10% in water	Flash point °C	BPR supported (c)	Application	Disinfectants	Preservatives	Property / Function	Algicide	Bactericide	Fungicide	Selective virucide	Tuberculocide
Arquad® 2.10-50	Didecyldimethyl ammonium chloride	Liquid	49-51	Water/ 2-propanol	max 2	6-9	28	Yes		•	•		•	•	•	•	
Arquad® 2.10-70 HFP	Didecyldimethyl ammonium chloride	Liquid	69-71	Water/ ethylene glycol	max 3	6-9 (a)	>100	Yes		•	•		•	•	•	•	
Arquad® 2.10-80	Didecyldimethyl ammonium chloride	Liquid	79-81	Water/ 2-propanol	max 3	6-9	28	Yes		•	•		•	•	•	•	
Arquad® C-35	Cocotrimethyl ammonium chloride	Liquid	33-37	Water	max 2	6-9	>100	Yes		•	•		•	•	•	•	
Arquad® MCB-50	C_{12}-C_{16} alkylbenzyl dimethyl ammonium chloride	Liquid	49-52	Water	max 1	6-9	>100	Yes		•	•		•	•	•	•	
Arquad® MCB-50 PO (d)	C_{12}-C_{16} alkylbenzyl dimethyl ammonium chloride	Liquid	49-52	Water	max 1	6-9	>100	Yes		•	•		•	•	•	•	
Arquad® MCB-80	C_{12}-C_{16} alkylbenzyl dimethyl ammonium chloride	Liquid	80-81	Water/ ethylene glycol	max 4	6-9	>100	Yes		•	•		•	•	•	•	
Triameen® Y12D	Dodecyl dipropylene triamine	Liquid	98-100	(b)	max 2	11.6	>100	Yes		•	•		•	•	•	•	•
Triameen® Y12D-30	Dodecyl dipropylene triamine	Liquid	29-31	Water	max 1	11.5	>100	Yes		•	•		•	•	•	•	•

* supported according to BPR (see page 41 for more details)
(a) 5% in 50/50 2-propanol/water
(b) residual water max 2%
(c) for details see text
(d) certified RSPO source

Fatty amine based products with some biocidal properties*





Product	Description	Appearance 20°C	Active content %	Color Gardner	BPR approved	Application	Acid cleaning	Car wash/rinse/polish	Chain lubricants	Disinfectants/preservatives	Fabric softening	General and household cleaning	Industrial and institutional cleaning	Industrial metal cleaning	Property / Function	Antistatic	Biocidal/biostatic	Corrosion inhibitor	Emulsifier	Thickener
Armeen® CD	Cocoamine	Liquid	min 98	max 2	No				•	•							•	•		
Arquad® 16-29	Hexadecyltrimethyl ammonium chloride	Liquid	28-30	max 2	No		•			•		•					•			•
Arquad® 16-50	Hexadecyltrimethyl ammonium chloride, 2-propanol	Liquid	49-52	max 4	No		•			•		•					•			•
Arquad® 2C-75	Dicocoldimethyl ammonium chloride, 2-propanol	Liquid	74-77	max 5	No			•		•	•					•	•		•	
Duomeen® C	N-coco-1,3-diaminopropane	Liquid/Paste	min 89	max 8	No				•	•			•	•			•	•	•	
Duomeen® CD	N-coco-1,3-diaminopropane	Solid/Paste	min 89	max 3	No				•	•			•	•			•	•	•	

* not supported according to BPR (see page 41 for more details)

5. Carboxymethyl cellulose (CMC)

Finnfix® CMC in powder detergents

Powder detergents have their own special requirements in terms of performance, shelf-life stability, delivery system and environmental friendliness. With our experience in biodegradable, nature-based, water-soluble polymers, we can help meet your needs with the best active aids and new technology developments.

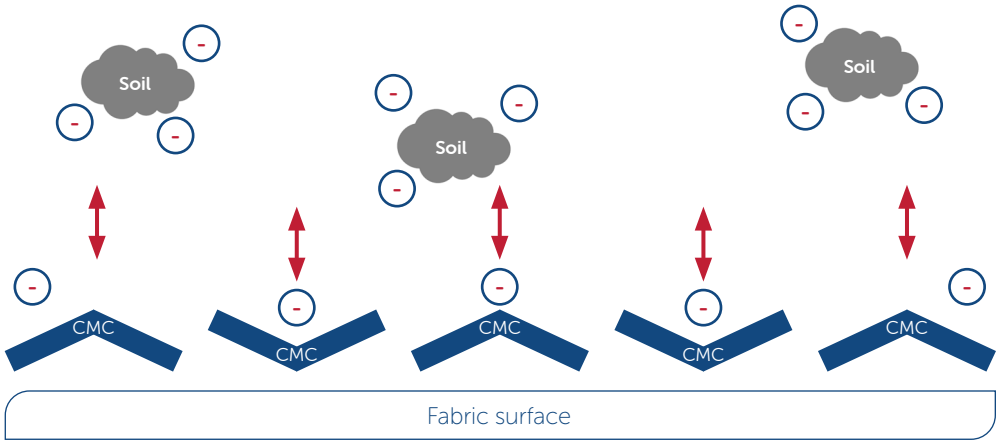
Carboxymethyl cellulose (CMC) is widely used in household detergent powder production. It is one of the oldest and most well-known applications of CMC.

Finnfix® CMC is a proven anti-redeposition aid that prevents dirt from reattaching to freshly washed fabric surfaces. With their cellulosic backbone and negative charge, Finnfix® CMC molecules adhere to fabric fibers through hydrogen bonding. Electrostatic and/or steric repulsion prevents the negatively charged soil particles in the wash water from re-depositing onto fibers.

Just a small amount of Finnfix® CMC can greatly improve the quality of soap, allowing it to be pliable and flexible with its emulsifying and protecting properties. In addition, the pH of the wash water and the presence of other surfactants do not affect the adsorption of Finnfix® CMC. During the rinse cycle, Finnfix® CMC releases cleanly from the fabric surface, for whiter whites.

Finnfix® CMC is a proven anti-redeposition aid that prevents dirt from reattaching to freshly washed fabric surfaces.

Question: How does CMC work as anti-redeposition agents?
Answer: CMC adsorbs on cotton surface and prevents the dirt to come back on the fabrics.

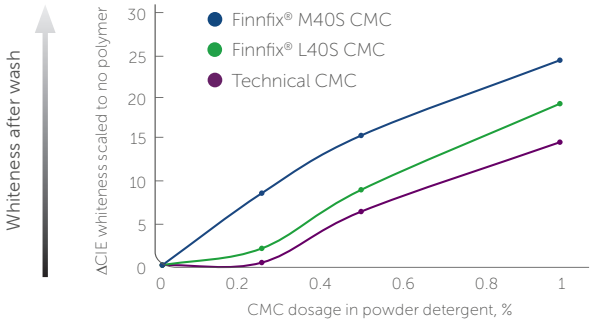


Technical Carboxymethyl cellulose (CMC) grade for laundry powders

Product	Description	Viscosity mPa.s	Solution conc %	Purity %	Specific properties
Finnfix® L40S	Carboxymethyl cellulose	100-700	4	>55	Technical grade sodium carboxymethyl cellulose
Finnfix® M40S	Carboxymethyl cellulose	100-700	4	>70	Technical grade sodium carboxymethyl cellulose

suitable for EU Ecolabel

Dose response curve



Reference, no CMC | Technical CMC | Finnfix® M40S CMC

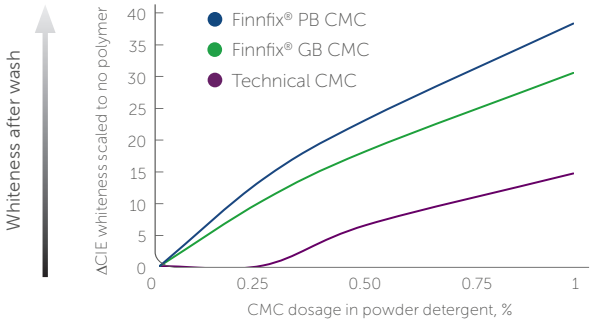
- Clear anti-redeposition (ARD) benefit in ΔCIE whiteness is seen with CMC vs. no polymer
- Finnfix® CMC keeps the soil from depositing on fabrics much more efficiently than traditional CMC

New sustainable Carboxymethyl cellulose (CMC) designed for laundry powder

Product	Description	Purity %	Specific properties
Finnfix® GB	Carboxymethyl cellulose	98	Optimized surface activity for powder laundry
Finnfix® PB	Carboxymethyl cellulose	65	Optimized surface activity for powder laundry

suitable for EU Ecolabel

Dose response curve



Reference, no CMC | Technical CMC | Finnfix® GB CMC | Finnfix® PB CMC

- Finnfix® GB and Finnfix® PB CMC keep the soil from depositing on fabrics much more efficiently than traditional CMC
- Achieve same performance at much lower polymer levels
- Improved cellulose compatibility

5. Sustainability

Our approach to sustainability

Sustainability is a cornerstone of our overall strategy to achieve long term success. We have long been an industry leader in sustainability and our commitment to sustainability remains unchanged going forward. We take pride in improving our environmental impact and maximizing our positive societal impact.

On a daily basis we strive to do more with less, reducing carbon emissions through a combination of improved energy efficiency, increased use of renewable energy, and higher use of bio-based raw materials in production. Downstream, we focus on expanding our portfolio of eco-premium products, which have a significant sustainability benefit over common alternatives.

We see sustainability not just as the right thing to do, but as a true business opportunity that delivers value to everyone involved.

Sustainable actions may not always be obvious to the customer. Some specific examples of actions we are taking in the market today:

- Offering a broad portfolio of ingredients that conform to higher standards of chemical sustainability i.e. suitable for EU Ecolabel and Nordic Ecolabel (Svanen)
- Membership of the Roundtable on Sustainable Palm Oil (RSPO)
- Choosing to use natural, renewable and preferably vegetable-based raw materials (including RSPO MB) in our finished products whenever possible
- Providing high activity products to customers to minimize packaging and transportation impacts
- Developing low toxicity, and preferably non-label products that allow our customers to develop mild formulations for use
- Innovation of higher performance products i.e. with our nonionic, narrow range ethoxylate technology, where less surfactant is needed for the same performance versus standard ethoxylates

We understand that the needs of the market are dynamic and changing. Our innovation team and supply chain continue to work to maintain and enhance our offerings into the future.

We are always ready to listen to and empower our partners to make our industry more sustainable in all dimensions. If you have any questions or comments regarding our sustainability philosophy or have unmet sustainability needs that we might be able to help address, please contact your Nouryon sales representative.

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Sustainable chemistry without performance compromise

We enable you to create sustainable, high-performing cleaning solutions

- Dishwashing
- Laundry
- Hard surface cleaning
- Industrial & institutional cleaning

Contact us directly for detailed product information and sample request
website | nouryon.com/markets/cleaning
email | cleaning@nouryon.com

Nouryon

Nouryon is a global, specialty chemicals leader. Markets and consumers worldwide rely on our essential solutions to manufacture everyday products, such as personal care, cleaning goods, paints and coatings, agriculture and food, pharmaceuticals, and building products. Furthermore, the dedication of approximately 8,300 employees with a shared commitment to our customers, business growth, safety, sustainability and innovation has resulted in a consistently strong financial performance. We operate in over 80 countries around the world with a portfolio of industry-leading brands. Visit our website and follow us @Nouryon and on LinkedIn.

All information concerning our products and/or all suggestions for handling and use contained herein (including formulation and toxicity information) are offered in good faith and are believed to be reliable. However, Nouryon makes no warranty express or implied (i) as to the accuracy or sufficiency of such information and/or suggestions, (ii) as to any product's merchantability or fitness for a particular use or (iii) that any suggested use (including use in any formulation) will not infringe any patent. Nothing contained herein shall be construed as granting or extending any license under any patent. The user must determine for itself by preliminary tests or otherwise the suitability of any product and of any information contained herein (including but not limited to formulation and toxicity information) for the user's purpose. The safety of any formulations described herein has not been established. The suitability and safety of a formulation should be confirmed in all respects by the user prior to use. The information contained herein supersedes all previously issued bulletins on the subject matter covered.

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March 2024

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