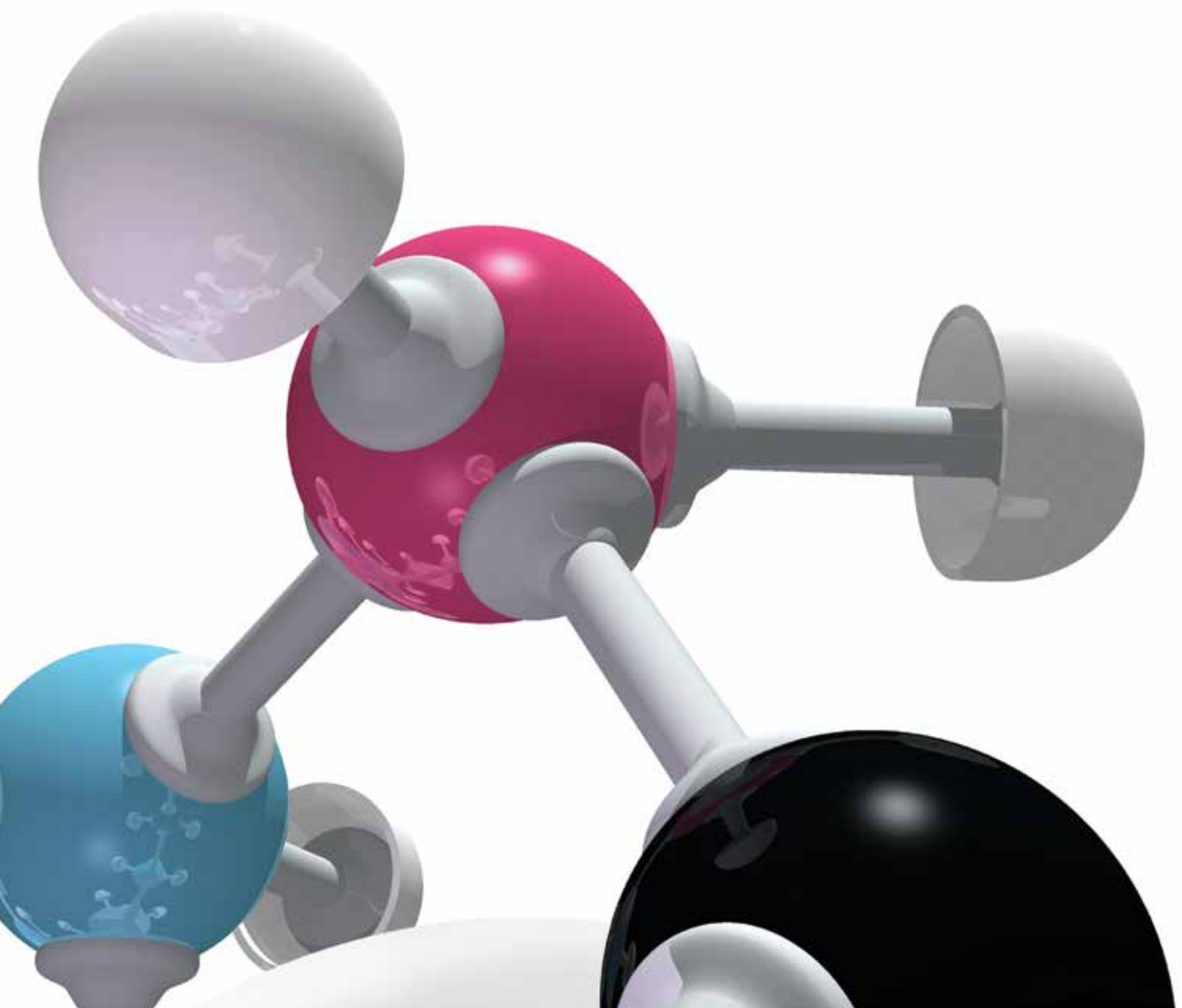


ELEMENTIS

SPECIALTIES

Surfactant chemistry at its best

Specialty Surfactant Products



Elementis Specialties is a specialty chemicals company with a global production network and worldwide distribution, serving products for a wide range of markets and applications. The Elementis Specialties Surfactants division focuses on providing surfactant-based chemical solutions for industrial processes and products involving interfacial surface chemistry. As such, we are active in a broad variety of markets including household and industrial and institutional cleaning, animal feed, agriculture, construction, plastics, textile, pulp and paper, metal working, emulsion polymerisation and alkyd resin emulsification.

Over the years, Elementis Specialties has developed core competencies in manufacturing specialty surfactants. We meet our customers' needs with a unique and versatile product portfolio, a broad expertise in surfactants chemistry and a high degree of flexibility. Through intimate customer relationships and by maximising synergies of customers' application experience and our chemistry knowledge, we continuously strive to offer tailor-made products and system solutions that contribute to your success - after all, we are successful, when you are!

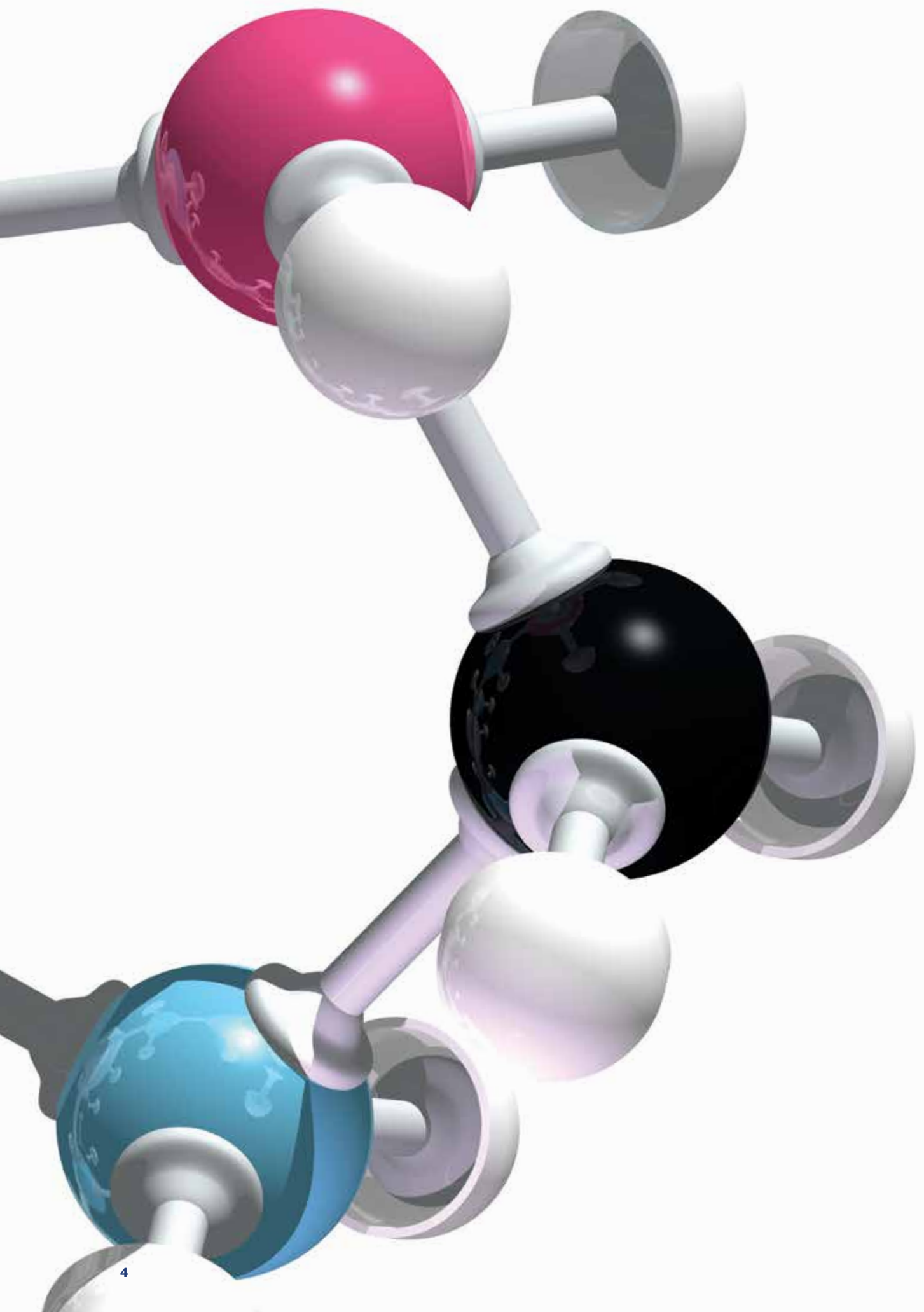




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ABBREVIATIONS

EO = Ethylene oxide
PO = Propylene oxide
TEA = Triethanolamine
IPA = Isopropyl alcohol
HLB = Hydrophilic / Lipophilic balance
% m/m = mass percentage

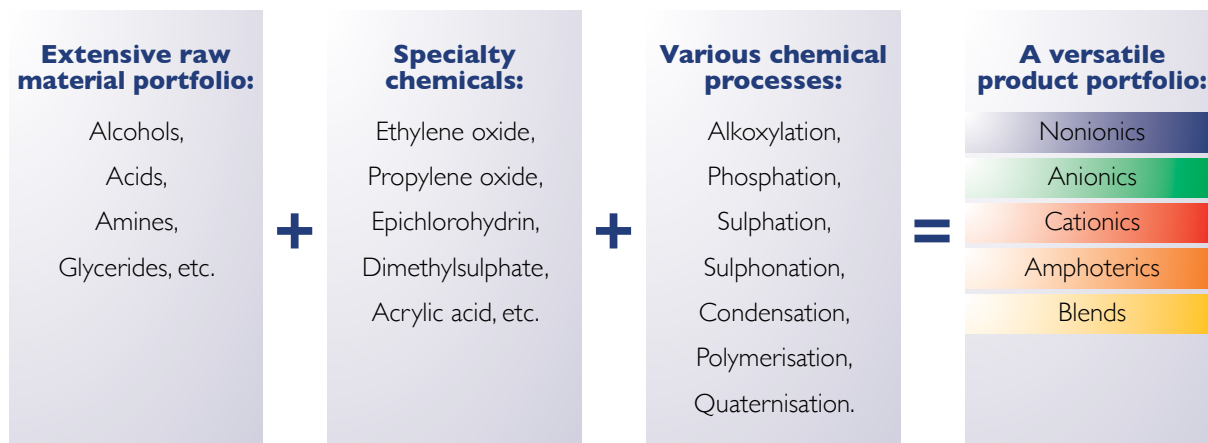


OUR CAPABILITIES AT A GLANCE

Our expertise in manufacturing specialty surfactants is exemplified by the breadth of products presented in our range. We offer nonionic, anionic, cationic and amphoteric surfactants. This brochure lists only part of our product portfolio; its main objective is to demonstrate our capabilities and versatility. We take pride in the high share of new product developments, as new tailor-made surfactants are added to our portfolio continuously.

We maintain and enhance our image as a premier specialty surfactant supplier through the following features:

- Our specialty surfactant plant is equipped with both continuous and multi-purpose batch reactors for various chemical processes, including polymerisation and condensation reactions, ethoxylation, propoxylation, phosphation, sulphation, sulphonation and quaternisation. All operations on the production site of Elementis Specialties in Delden are conducted and conform to the management system standards NEN-EN-ISO 9001:2008 and NEN-EN-ISO 14001:2004
- We are specialised in multi-step reactions. The technical layout of our reactors is such that several different chemical processes can be carried through sequentially in a highly efficient manner. Through various blending facilities, special mixtures can be produced at your request
- Dedicated reactors are in place for GMP regulated and Kosher specialties
- We handle over 300 different raw materials, including broad varieties of alcohols, acids and amines, and are fully equipped to handle specialty chemicals such as ethylene oxide, propylene oxide, epichlorhydrin, formaldehyde, dimethylsulphate, acrylonitrile and acrylic acid
- We offer R&D support and pilot-plant scale-up facilities (200-1000 kgs) for new product developments and the commercialisation of specialty surfactants
- Products can be supplied in various packaging, ranging from 25 litre pails through drums and containers to bulk material



The following chapters highlight our capabilities within the different classes of surfactants. Each chapter lists an illustrative selection of commercially available products and depicts a scheme with general structures depicting red coloured functionalities that can be altered at your request to meet your application requirements. Both tables and schemes serve to demonstrate our flexibility and breadth of product portfolio.

NONIONIC SURFACTANTS

Elementis Specialties offers a broad range of nonionic surfactants. Alcohols, oils, fatty acids, amines and alkanol amides can be coupled with ethylene oxide and/or propylene oxide, enabling the production of ethoxylates, propoxylates, and random and block co-polymers.

Nonionics are applied in a wide variety of applications and their function is strongly dependent on the chemical composition. The choice of nonionic for a specific application is primarily determined by the hydrophilic/lipophilic balance (HLB). The HLB value dictates properties such as emulsification power, detergency, foaming, solubilisation and others. The table provides indicative values of required HLB's for the most common applications.

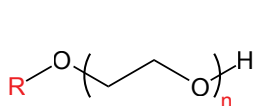
HLB value	Surfactant properties
0 – 3	anti-foaming agent
4 – 6	W/O (water in oil) emulsifier
7 – 9	wetting agent
8 – 18	O/W (oil in water) emulsifier
13 – 15	detergents
> 15	solubiliser or hydrotrope

Elementis Specialties has the capabilities to offer designed chemical solutions for specific applications. The HLB value of the nonionic surfactants can be tuned by the length of the alkyl chain and the amount, ratio and order of EO and PO units. Nonionics can be tailor-made with high precision with regard to the average number of EO and/or PO units. Additionally, specific requirements for nonionic surfactants - such as biodegradability, mildness, ionic character, etc. - can be met by choosing a particular starting material, i.e. a fatty alcohol, acid or amine.

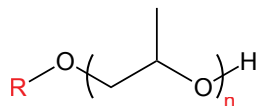


ALKYL POLYGLYCOL ETHERS

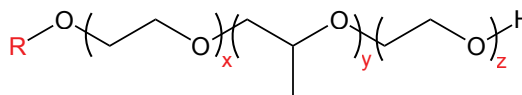
Alkyl polyglycol ethers are stable in acidic and alkaline media and can be combined with anionic and cationic surfactants for synergistic effects.



Ethoxylates



Propoxylates



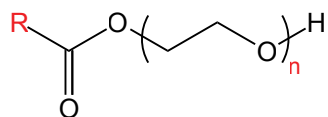
Random & block copolymers

Product name	Description	HLB	Appearance (20 °C)
ETHOXYLATES			
SERDOX® NLO 20	glycerine + 20 EO	20	liquid
SERDOX ZLY 4	phenol + 4 EO	13	liquid
SERDOX NBS 6.6/90	oxo C9-C11 alcohol + 6.6 EO	13	liquid
SERDOX NES 3	linear C12-C15 alcohol + 3 EO	8	liquid
SERDOX NKL 6	linear C16-C18 alcohol + 6 EO	10	solid
SERDOX NHL 4.7	oleyl alcohol + 4.7 EO	9	liquid
SERDOX NOL 15	oleyl alcohol + 15 EO	15	wax
SERDOX NSL 30	stearyl alcohol + 30 EO	17	solid
SERDOX NSP 14	tristyrylphenol + 14 EO	13	liquid
SALT FREE			
SERDOX NRL 7E	branched C13 alcohol + 7 EO	12	liquid
SERDOX NCSQ 10/3.5E	branched C13 alcohol + 10 EO/3.5 PO	11	liquid
EO/PO AND PO/EO BLOCK			
SERDOX NBSQ 5/5	oxo C9-C11 alcohol + 5 EO/5 PO		liquid
SERDOX NKLP 35/2	linear C16-C18 alcohol + 35 PO/2 EO		liquid

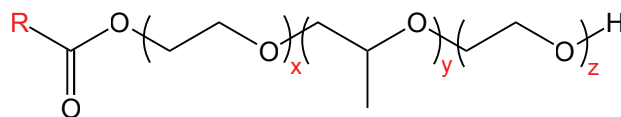
The complete overview of the actual product portfolio and details of tailor-made solutions are available on request

OIL / ACID POLYGLYCOL ESTERS

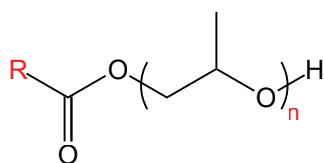
Elementis Specialties offers alkoxyated oils and fatty acids, as well as alkyl polyglycol esters. These products are generally mild for the skin and eyes and have good emulsifying, softening, lubricating and antistatic properties, making them useful as emulsifiers for essential oils, cosmetics, textile, leather, paper and agricultural products.



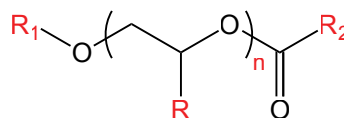
Ethoxylates



Random & block copolymers



Propoxylates



Esterified alkoxyates

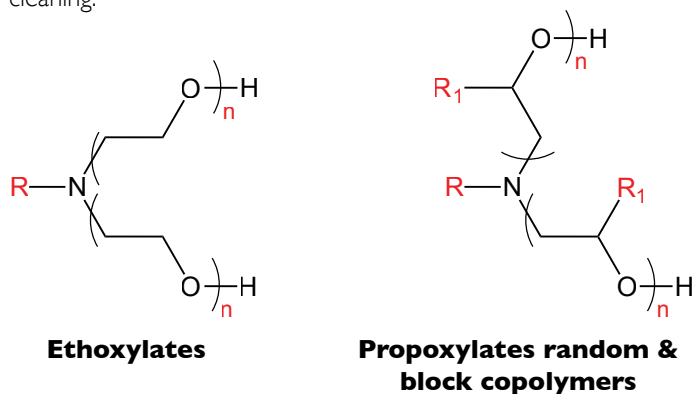
Product name	Description	HLB	Appearance (20 °C)
SERDOX® NOG 440	oleic acid + 10 EO	12	liquid
SERDOX NSG 200	stearic acid + 4.5 EO	8	solid
SERMUL EN 24	castor oil + 17 EO	9	liquid
SERDOX NAD 20	soya oil + 20 EO	10	liquid
SERDOX NOK 700	rape seed fatty acid + 12 PO		liquid
SERDAS XEN 8708	tall oil fatty acid + PO/EO		liquid
SALT FREE			
SERVIROX OEG 59E	castor oil + 31 EO	12	liquid
ESTERIFIED ALKOXYLATE			
SERVOXYL® VSLE 12/100	2-ethylhexanol + 12 EO, 2-ethylhexanoic ester	13	liquid

The complete overview of the actual product portfolio and details of tailor-made solutions are available on request

AMINE POLYGLYCOL ETHERS

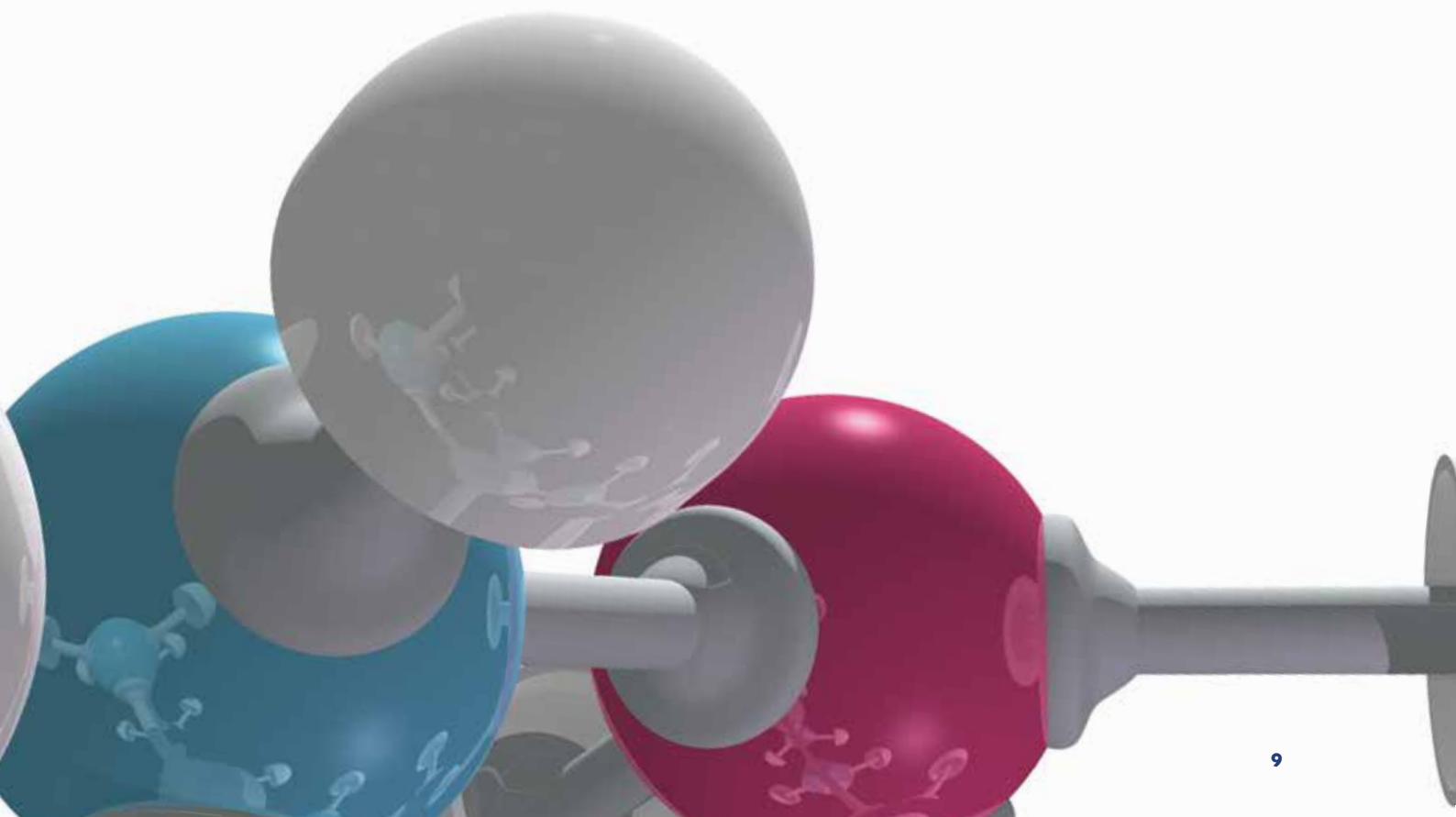
Amine polyglycol ethers are nonionic surfactants which exhibit a cationic character under acidic conditions. This cationic property can be tuned by the length of the hydrophilic polyglycol ether chain (amount of EO) and offer valuable means for solving various industrial challenges.

Amine polyglycol ethers provide adhesion, antistatic, corrosion inhibiting and leveling properties, and are therefore highly suitable to use in auxiliary products for various industries such as agro, textile, oil-drilling, metal and industrial cleaning.



Product name	Description	Appearance (20 °C)
SERDOX® NLAP 3	triethanolamine + 3 PO	liquid
SERDOX NCA 15 G	cocoamine + 15 EO	liquid
SERDOX NJAD 2	tallowamine + 2 EO	liquid
SERDOX NJAD 10 S	tallowamine + 10 EO	liquid
SERDOX NJAT 12/8	tallowamine + 12PO/7EO	liquid

The complete overview of the actual product portfolio and details of tailor-made solutions are available on request

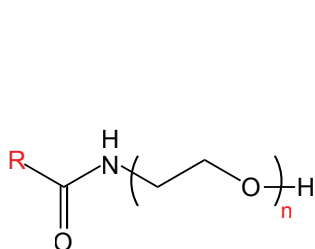


ALKANOLAMIDES (ETHOXYLATED)

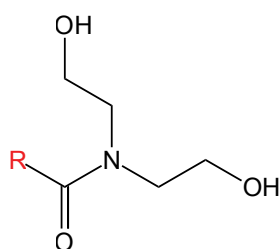
Elementis Specialties offers (ethoxylated) alkanolamides based on various fatty acids and monoethanolamine or diethanolamine. The products based on diethanolamine can be subdivided into two groups:

- Super-amides based on a 1:1 molar ratio of amine to fatty acid.
- Kritchevsky amides based on a 2:1 molar ratio of amine to fatty acid. This type is better soluble in water.

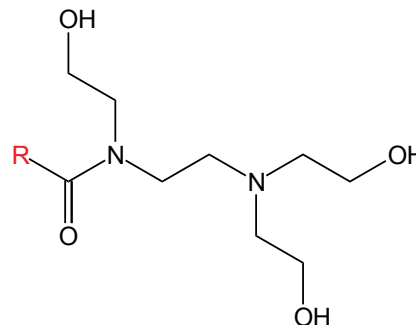
Alkanolamides can be used as anti-static agents for plastics and as emulsifiers for detergents, mineral oils and cosmetic formulations.



**Monoethanol amides
(alkoxylated)**



Diethanol amides



Kritchevsky amides

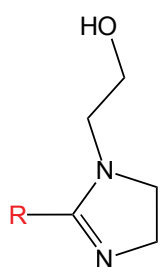
Product name	Description	Appearance (20 °C)
SERDOLAMIDE PPF 67	coconut oil diethanol amide (Super-amide)	liquid
SERDOLAMIDE POF 61	oleic acid diethanol amide (Kritchevsky)	liquid
SERDOLAMIDE PQJ 48	soya oil diethanol amide in TEA/water (Super-amide)	liquid
SERDOX® NXC 3	oleic acid monoethanol amide + 3 EO	liquid
SERDOX NXC 6	oleic acid monoethanol amide + 6 EO	liquid
SERDOX NXC 14	oleic acid monoethanol amide + 14 EO	liquid

The complete overview of the actual product portfolio and details of tailor-made solutions are available on request

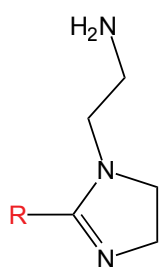
IMIDAZOLINES

Imidazolines are thermally stable and easy to handle liquids. The un-neutralised imidazoline is soluble in non-polar solvents and mineral oil, but only dispersible in aqueous systems. Due to the ability of imidazolines to form cations, they strongly absorb onto negatively charged surfaces such as metals, fibres, glass and minerals and thereby convert the hydrophilic surfaces to hydrophobic ones.

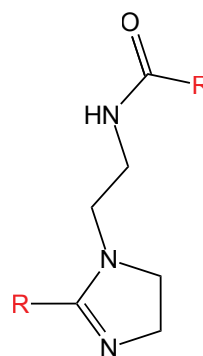
Imidazolines find application in adhesion agents for bitumen (heat stability) and corrosion inhibitor formulations.



**Hydroxyethyl
imidazolines**



**Aminoethyl
imidazolines**



**Amidoethyl
imidazolines**

Product name	Description	Appearance (20 °C)
SERVAMINE KOO 330	oleic acid + diethylenetriamine	liquid
SERVAMINE KOO 360	oleic acid + aminoethylethanolamine	liquid

The complete overview of the actual product portfolio and details of tailor-made solutions are available on request



ANIONIC SURFACTANTS

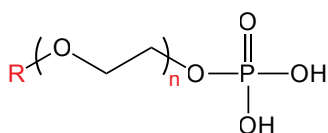
PHOSPHATE ESTERS

Phosphate esters are anionic surfactants which are produced by phosphorylation of (ethoxylated) aliphatic or aromatic alcohols. By use of special production processes, mono phosphate esters, di-esters or mixtures of mono-and di-esters can be produced. Optionally, the acidic phosphate esters can be neutralised using organic or inorganic bases.

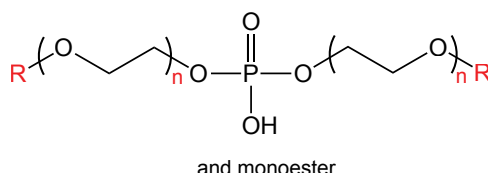
The properties of phosphate esters can be adjusted by the following factors:

- the type of alcohol used as raw material
- the degree of ethoxylation of the alcohol
- the mono / di-ester ratio
- the type of neutralising agent

Compared to other anionic surfactants, phosphate esters offer specific advantages, including stability over a broad pH range, good solubility and corrosion inhibiting properties. Phosphate esters are highly suitable to use as emulsifying agents, wetting agents, anti-statics, corrosion inhibitors and hydrotropes in cleaning formulations.

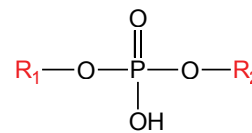


Phosphate monoesters

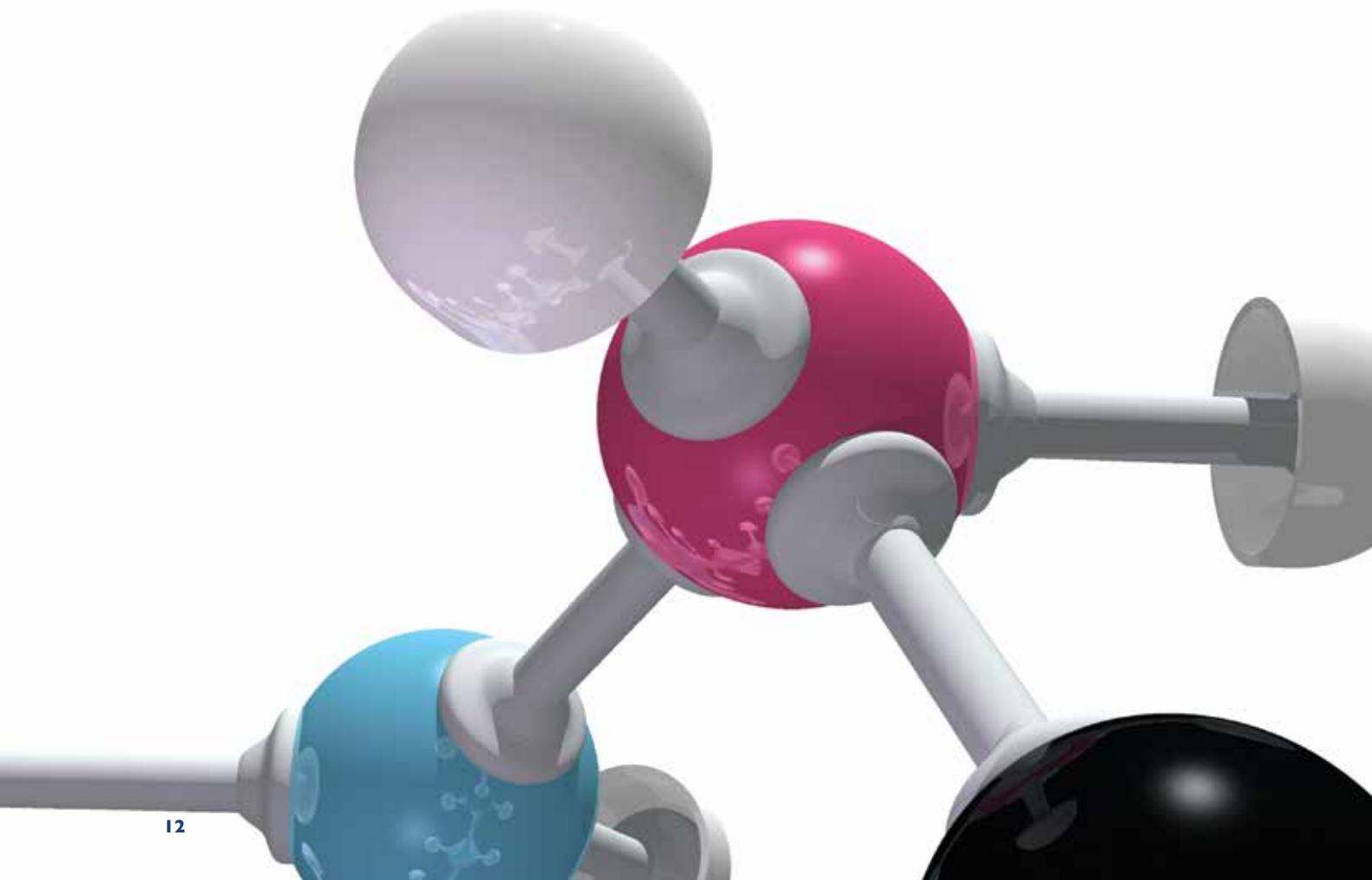


and monoester

**Phosphate esters
(P₂O₅ based)**



(mixed) Phosphate diesters



Product name	Alcohol base	Appearance (20 °C)
MONO PHOSPHATE ESTERS		
SERVOXYL® VMUZ 100	methanol	liquid
SERVOXYL VMNZ 9/100	nonylphenol + 9 EO	liquid
MONO/DI PHOSPHATE ESTERS		
SERVOXYL VPUZ 100	methanol	liquid
SERVOXYL VPGZ 6/100	phenol + 6 EO	liquid
SERVOXYL VPT 3/85 (sodium salt)	2-ethylhexanol + 3 EO	liquid
SERVOXYL VQHZ 100	hexanol	liquid
SERVOXYL VPXZ 100	iso-nonanol	liquid
SERVOXYL VPAZ 100	linear C12-C14 alcohol	solid
SERVOXYL VPBZ 5/100	linear C12-C18 alcohol + 5 EO	liquid
SERVOXYL VPDZ 100	branched C13 alcohol	liquid
SERVOXYL VPDZ 20/100	branched C13 alcohol + 20 EO	liquid
SERVOXYL VPDP 20/35 (potassium salt)	branched C13 alcohol + 20 EO	liquid
SERVOXYL VPNZ 9/100	nonylphenol + 9 EO	liquid
SERVOXYL VPFZ 7/100	oleylalcohol + 7 EO	liquid
SERVOXYL VPQZ 14/100	tristyrylphenol + 14 EO	liquid
MIXED PHOSPHATE DI-ESTERS		
SERVOXYL VDYZ 100	mixed ethyl + octyl/decyl alcohol	liquid

The complete overview of the actual product portfolio and details of tailor-made solutions are available on request

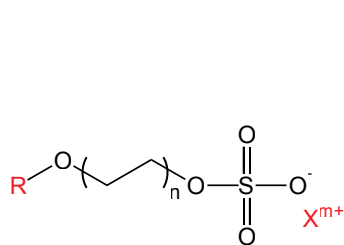
SULPHATES / SULPHONATES

Elementis Specialties offers a variety of sulphates and sulphonates based on natural or synthetic alcohols and alkyl (phenol) polyglycol ethers.

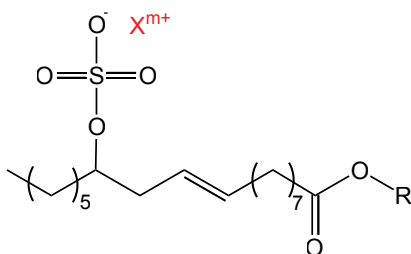
Sulphates are often used because of their excellent emulsifying, wetting, lime soap dispersing, and foaming properties, and their high electrolyte tolerance. The alkylethersulphates show improved water solubility and water hardness resistance over the alkylsulphates which show good solubilisation properties. Both alkylsulphates and alkylethersulphates can be used in emulsion polymerisation, cosmetic formulations, detergents and textile industry.

Sulphonated (sulphated) castor oil, also known as Turkey Red oil, is completely dispersible in water and an excellent dispersant/emulsifier for many applications. The performance of the sulphonated castor oil can be tuned by the degree of sulphonation and/or the degree of saponification of the castor oil, as well as the choice of neutralising agent. Sulphonated castor oil can be used in formulating lubricants, pigment dispersions, cosmetics and detergents.

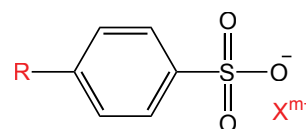
Salts of dodecylbenzene sulphonic acids have excellent emulsifying properties in many applications. In particular, calcium soaps - available in a wide variety of solvents - are widely used in crop protection formulations.



**Sulphated (alkoxylated)
alcohols**



Sulphated castor oil



Sulphonates



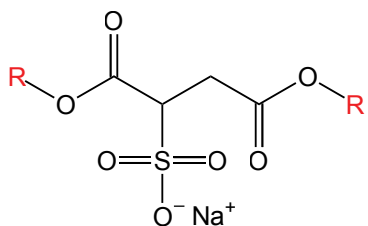
Product name	Description	Salt	Appearance (20 °C)	Active content (% m/m)
ALKYLSULPHATES				
SERDET DSK 40	2-ethylhexyl sulphate	sodium	liquid	40
SERDET DFK 30	linear C12-C14 alcohol sulphate	sodium	liquid	30
ALKYLETHERSULPHATES				
SERDET DLK 9/30	branched C13 alcohol (9 EO) sulphate	sodium	liquid	30
SERMUL EA 266	branched C13 alcohol (15 EO) sulphate	sodium	liquid	26
SERMUL EA 146	nonylphenol (15 EO) sulphate	sodium	liquid	35
SERMUL EA 170	nonylphenol (5.5 EO) sulphate	ammonium	liquid	35
SULPHATED / SULPHONATED OILS				
SERVO® BRILLANT OIL BAZ 75	castor oil sulphonate	sodium	liquid	77
SULPHONATES				
SERMUL EA 27	branched dodecylbenzene sulphonate	calcium	liquid	65
SERMUL EA 88	dodecylbenzene sulphonate	calcium	liquid	65

The complete overview of the actual product portfolio and details of tailor-made solutions are available on request

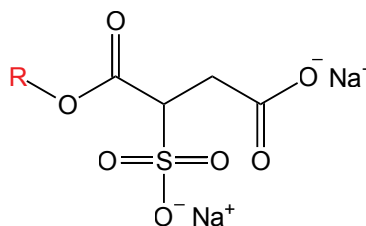
SULPHOSUCCINATES

Elementis Specialties offers a range of sulphosuccinates. The properties of sulphosuccinates can be adjusted by varying the alkyl group, the way of sulphonation and the variance in sulphosuccinate mono- and di-esters. By use of different solvents, for example VOC-free sulphosuccinates are made. Production of sulphosuccinates belongs to the possibilities.

Sulphosuccinic di-esters are highly effective wetting agents which are used in many branches of industry. Both sulphosuccinates, mono- and di-esters are applied as emulsifying agents in polymerisation processes.



Sulphosuccinate diesters



Sulphosuccinate monoesters

Product name	Description (sodium salt of)	Appearance (20 °C)	Active content (% m/m)
DI-SULPHOSUCCINATES			
SERWET WH 170	2-ethylhexyl sulphosuccinate in ethanol/water	liquid	65
SERWET WH 175	2-ethylhexyl sulphosuccinate in nonionic/water	liquid	65
MONO-SULPHOSUCCINATES			
SERMUL EA 176	nonylphenol (10 EO) sulphosuccinate	liquid	23

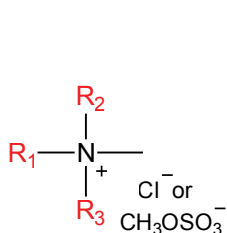
The complete overview of the actual product portfolio and details of tailor-made solutions are available on request



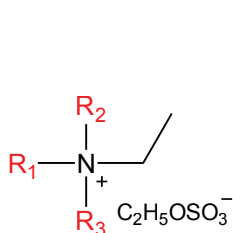
CATIONIC SURFACTANTS

Elementis Specialties' range of cationic surfactants comprises quaternary ammonium compounds which can be based on dimethylsulphate, diethylsulphate, methylchloride, benzylchloride or epichlorohydrin; all of which are available in water and various organic solvents.

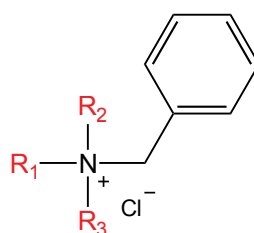
Cationic surfactants show surfactant properties over the whole pH range. Many applications of cationic surfactants are based on their tendency to absorb onto negatively charged surfaces. Typically, quaternary ammonium compounds are used as hydrophobic agent, hydrotropes, antistatic and softening agent (fabrics). The range of ester- and amide based quaternary ammonium compounds comply with the European Detergent Regulations.



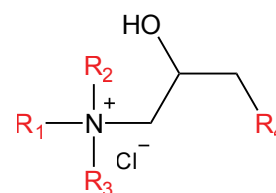
**Methylquats,
chloride or
methosulphate**



**Ethylquats,
ethosulphate**



**Benzylquats,
chloride**



**Epichlorohydrin
quats**

Product name	Description	Appearance (20 °C)	Active content (% m/m)
SERVAMINE KAC 458	coco alkyl trimethyl ammonium methosulphate	liquid	45
SERVO® Q 8010	lauryl amido propyl trimethyl ammonium methosulphate	liquid	60
SERVO Q 8040	undecyl amido propyl trimethyl ammonium methosulphate	liquid	40
SERVAMINE KW 100	polyglycolether (15 EO) cocoammonium methosulphate	liquid	> 99
SERVAMINE KZB 402	poly quat	liquid	60
SERVOSOFT XW 445 PP	TEA esterquat	dispersion	45
SERVOSOFT XW 690	TEA esterquat	liquid	90
SERVOSOFT XW 275 PG	Imidazoline quat	liquid	75

The complete overview of the actual product portfolio and details of tailor-made solutions are available on request

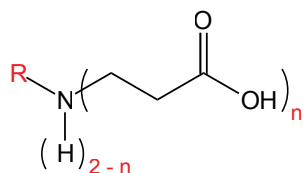


AMPHOTERIC SURFACTANTS

Amphoteric surfactants exhibit cationic behavior near or below their isoelectric points and anionic behavior at higher pH. They are compatible with all other classes of surfactants.

Benefits of amphoteric surfactants are their stability in the presence of high concentrations of electrolytes, acids and alkalis and very good hydrotrope performance.

Amphoteric surfactants can be used to formulate mild, biodegradable and high performing alkaline and acidic cleaning products for household, I&I and personal care markets.



Imino propionates

Product name	Description	Appearance (20 °C)	Active content (% m/m)
SERVO® AM 1010	coco amino propionate	liquid	50
SERVO AM 1020	lauryl imino dipropionate, sodium salt	liquid	30
SERVO AM 2020	octyl imino dipropionate, sodium salt	liquid	40
SERVO AM 1015	coco imino mono/dipropionate, sodium salt	liquid	38

The complete overview of the actual product portfolio and details of tailor-made solutions are available on request

OTHER SPECIALTY PRODUCTS

Elementis Specialties offers a very broad range of custom-made products. This comprises blends of several components in order to meet specific requirements in any application. Several commonly applied specialty products are listed in the table below. Virtually any blend of Elementis Specialties products can be made on request.

Product name	Description	Application
SERVON XGF	glycerol formal	solvent for e.g. pharmaceutical and veterinary products
SERPOL QPA 150	polyacrylate, ammonium salt	dispersing agent
SERPOL QPA 160	polyacrylate, sodium salt	dispersing agent
SERFAX AK 330	cationic blend	emulsifier for bitumen
SERFAX AK 500	cationic blend	emulsifier for bitumen
SERVO® XB 90	cationic/nonionic blend	cleaning agent for hard surfaces
SERVO XB 102	cationic/nonionic blend	car rinse off agent
SERDOX NXK 1000	nonionic blend	antifog agent

The complete overview of the actual product portfolio and details of tailor-made solutions are available on request

DEFOAMERS

Numerous high quality defoamers can be manufactured that facilitate defoaming performance in a broad area, while meeting typical requirements concerning the environment, pH-resistance or food approval. Elementis Specialties provides defoamers to various industries, including pulp and paper, metalworking, textile, coating, agro and cleaning.

The defoamers generally show both surface defoaming and deairation properties. By proper design and selection of defoamers, special emphasis can be put on either deairation or defoaming.

Product name	Description	Appearance (20 °C)	Active content (% m/m)
SERDAS GON PD 51	paraffinic oil/wax based mixture	dispersion	100
SERDAS XEN 1274	polyalkoxylate based mixture	liquid	100
SERDAS GBR	mixture of aluminium soap and additives	dispersion	100

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ELEMENTIS

SPECIALTIES

Surfactant chemistry at its best

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