

EO/PO BLOCK COPOLYMERS

Low foaming surfactant
Rokamer series



EO/PO BLOCK Copolymers

Chemical description

Rokamers products line represents group of non-ionic surfactants of the EO/PO block copolymers. Most of Rokamers are block copolymers in which the central polypropylene glycol group is flanked by two polyethylene glycol groups. Structure of these products can be represented by following formula:



where: n = average number of propylene oxide units

$x+y$ = average number of ethylene oxide units

Rokamer R2800 is a single representative of block copolymer in which the central polyethylene oxide block is flanked by two polypropylene oxide blocks, as shown by the following formula:



where: $x+y$ = average number of propylene oxide units

n = average number of ethylene oxide units

Rokamer G3800 is a single representative of ethoxylated and propoxylated glycerine.

Application

Block copolymers are multipurpose products which are used in variety of applications, where antifoaming, dispersing and wetting properties plays important role, i.e. in detergents, or I&I applications. They can be used in rinse aids, hard surface cleaners (also CIP), metal cleaners and also as a laundry aids. Due to their unique structure block copolymers have good emulsifying properties. Hence they can be used in agriculture, paints and coatings and other applications.

Characteristic property of Rokamers is their defoaming character. They can be used in fermentation processes, textile industry and water treatment where foaming is not require. Summarizing, Rokamer products line can find application in following areas:

- AUTOMATIC DISHWASHING
- DETERGENTS AND RINSE AIDS
- PAINT AND COATINGS
- TEXTILE INDUSTRY
- LAUNDRY DETERGENTS
- WATER TREATMENT
- HARD SURFACE CLEANERS
- FERMENTATION PROCESSES
- AGRICULTURE
- METAL CLEANING
- PULP AND PAPER

Basic physical and chemical properties

ROKAmer	2100	2330	2950	1010	1010/50	2000	2600
Appearance at 25°C	clear liquid	viscous liquid	viscous liquid or semi-liquid paste	wax	viscous liquid	clear or turbid liquid	clear or turbid liquid
Concentration, [%]	approx. 99	approx. 99	approx. 99	approx. 99	approx. 50	approx. 99	approx. 99
Hazen colour at 40°C	max. 125	max. 125	-	-	-	max. 50	max. 50
Cloud point, [°C]							
Method A 1% in water solution	approx. 25	approx. 30	approx. 53	>100	>100	23-27	16-20
Method B 1% solution in 5% NaCl solution	-	approx. 18	approx. 43	approx. 85	approx. 89	-	-
Method C 1% solution in 10% NaCl solution	-	approx. 10	approx. 35	approx. 72	approx. 73	-	-
Method D 10% solution in 25% BDG solution	approx. 47	approx. 56	approx. 68	approx. 95	approx. 95	approx. 40	approx. 38
Method E 16.7% solution in 25% BDG solution	approx. 41	approx. 52	approx. 66	approx. 95	approx. 94	max. 40	33-37
10% water solution	17-20	21-26	54-60				
Average molar mass [g/mol]	2000	2200	2900	8800	8800	1800	2600
Water content [%, by weight]	max. 1	max. 1	max. 1	max. 1	49-51	max. 1	max. 1
Solidification point [°C]	below 0	below 10	below 15	49-52	approx. -5	approx. -20	approx. -22
pH in deionized water, at 20°C	4.6-7.4 10% solution	4.6-7.4 10% solution	4.6-7.4 10% solution	4.6-7.4 2% solution	7.0-9.0	4.6-7.4 1% solution	4.6-7.4 1% solution
Density at 25°C [g/cm ³]	1.02-1.03	approx. 1.03	approx. 1.04	approx. 1.07 ^{20°C}	approx. 1.07	approx. 1.01	approx. 1.02
Viscosity at 20°C [cP]	approx. 500	approx. 700	approx. 1200	approx. 1000 ^{20°C}	approx. 400	approx. 400	approx. 600
Surface tension at 25°C [mN/m]	41	41	42	46	46	33	37

Basic physical and chemical properties

ROKAmer	G3800	R2800	3150
Appearance at 25°C	clear liquid	clear liquid	clear to opalescent liquid
Concentration, [%]	approx. 100	approx. 100	approx. 100
Hazen colour at 40°C	-	-	-
Cloud point, [°C]			
Method A 1% in water solution	approx. 21	approx. 21	approx. 14
Method B 1% solution in 5% NaCl solution	-	-	-
Method C 1% solution in 10% NaCl solution	-	-	-
Method D 10% solution in 25% BDG solution	25-28	28-31	approx. 34
Method E 16.7% solution in 25% BDG solution	approx. 22	approx. 25	approx. 29
Average molar mass [g/mol]	3800	2800	approx. 3150
Water content [%, by weight]	max. 0.5	max. 0.5	max. 0.5
Solidification point [°C]	below -20	below -20	below -20
pH in deionized water, at 20°C	4-7 1% solution	4-7 1% solution	6.0-7.5 (2g/20ml methanol: water 7:3)
Density at 25°C [g/cm ³]	approx. 1.02	approx. 1.01	approx. 1.015 (20°C)
Viscosity at 20°C [cP]	approx. 870	approx. 550	550-800 (25°C)
Surface tension at 25°C [mN/m]	42	36	34

Additional information

Solubility

Solubility of Rokamer series in water depends on EO/PO ratio. Solubility of these products increases with increasing ethoxylation degree and decreases with increasing propoxylation degree. Characteristic property of these products is their better solubility in cold water than in hot water. Solubility in water and other solvents has been shown in Table 2.

SOLUBILITY - at 25°C, 10% SOLUTIONS

PRODUCT	DEMINERALIZED WATER	METHANOL	ISOPROPANOL	ETHYLENE GLYCOL	HEXANE	XYLENE
ROKAmer 2100	•	•	•	○	○	○
ROKAmer 2330	•	•	•	○	○	○
ROKAmer 2950	•	•	○	○	○	○
ROKAmer 1010	•	•	•	○	○	○
ROKAmer 1010/50	•	•	•	○	○	○
ROKAmer 2000	•	•	•	○	•	○
ROKAmer 2600	○	•	•	○	•	○
ROKAmer G3800	○	•	•	○	○	○
ROKAmer R2800	○	•	•	○	•	•
ROKAmer 3150	○	•	•	○	•	•

• Soluble ○ Insoluble

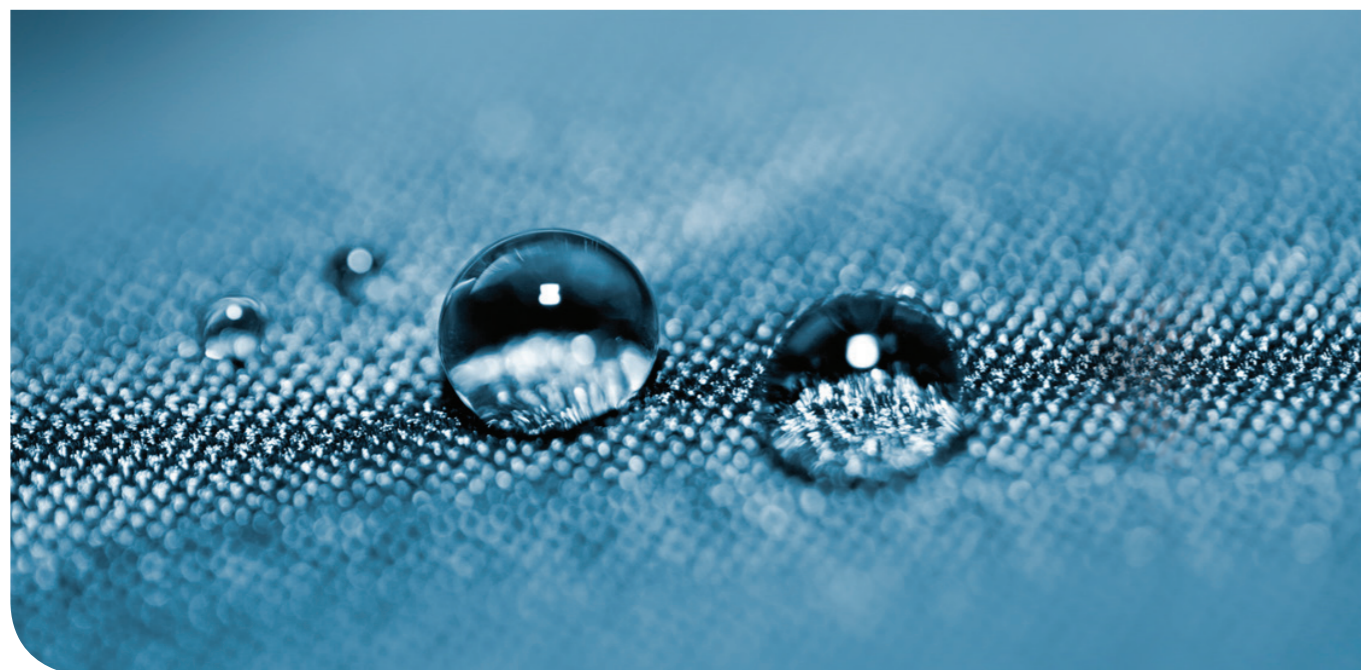


Wetting capability

The capability to effective wetting is a necessary and required property of surfactants in a large number of applications. Rokamer series exhibits good wetting properties at higher concentrations. The capability of wetting cotton fabric was determined according to **EN 1772:2001** with the use of block copolymers solutions with a concentration in the range between 1 and 10 g/l in deionised water.

In the analyses the "Cotton fabric for wetting" according to **ISO 8022:490** was used. The measurement temperature was 20°C.

PRODUCT	WETTING TIME (s)				DESCRIPTION	
	1 g/l	2 g/l	5 g/l	10 g/l		
ROKamer 2100	poor	poor	moderate	excellent	<20	excellent
ROKamer 2330	poor	poor	moderate	good	20-50	good
ROKamer 2950	poor	poor	poor	moderate	50-100	moderate
ROKamer 1010	poor	poor	poor	poor	100-300	low
ROKamer 1010/50	poor	poor	poor	poor	>300	poor
ROKamer 2000	poor	poor	moderate	excellent		
ROKamer 2600	low	moderate	excellent	excellent		
ROKamer G3800	low	moderate	excellent	excellent		
ROKamer R2800	poor	low	excellent	excellent		
ROKamer 3150	moderate	good	excellent	excellent		



Foaming capability

Determination of the foaming capability was performed according to **PN-ISO 696:1994** (the modified Ross-Miles method) for solution with a concentration of 1.0 g/l in deionised water at a temperature of 25°C.

Products from Rokamer series display no foaming capability or very poor foaming. Products with polyethylene glycol content below 30% exhibits also antifoaming properties and can be used as defoaming agents.

PRODUCT	Foam volume [ml]			FOAM VALUE (ml)	DESCRIPTION
	30 s	180 s	300 s		
ROKamer 2100	none	none	none	< 100	low
ROKamer 2330	none	none	none	0	none
ROKamer 2950	none	none	none		
ROKamer 1010	low	none	none		
ROKamer 1010/50	low	low	low		
ROKamer 2000	none	none	none		
ROKamer 2600	none	none	none		
ROKamer G3800	none	none	none		
ROKamer R2800	none	none	none		
ROKamer 3150	none	none	none		



Kosher Certification

Kosher certification plays a very important role in food industry.

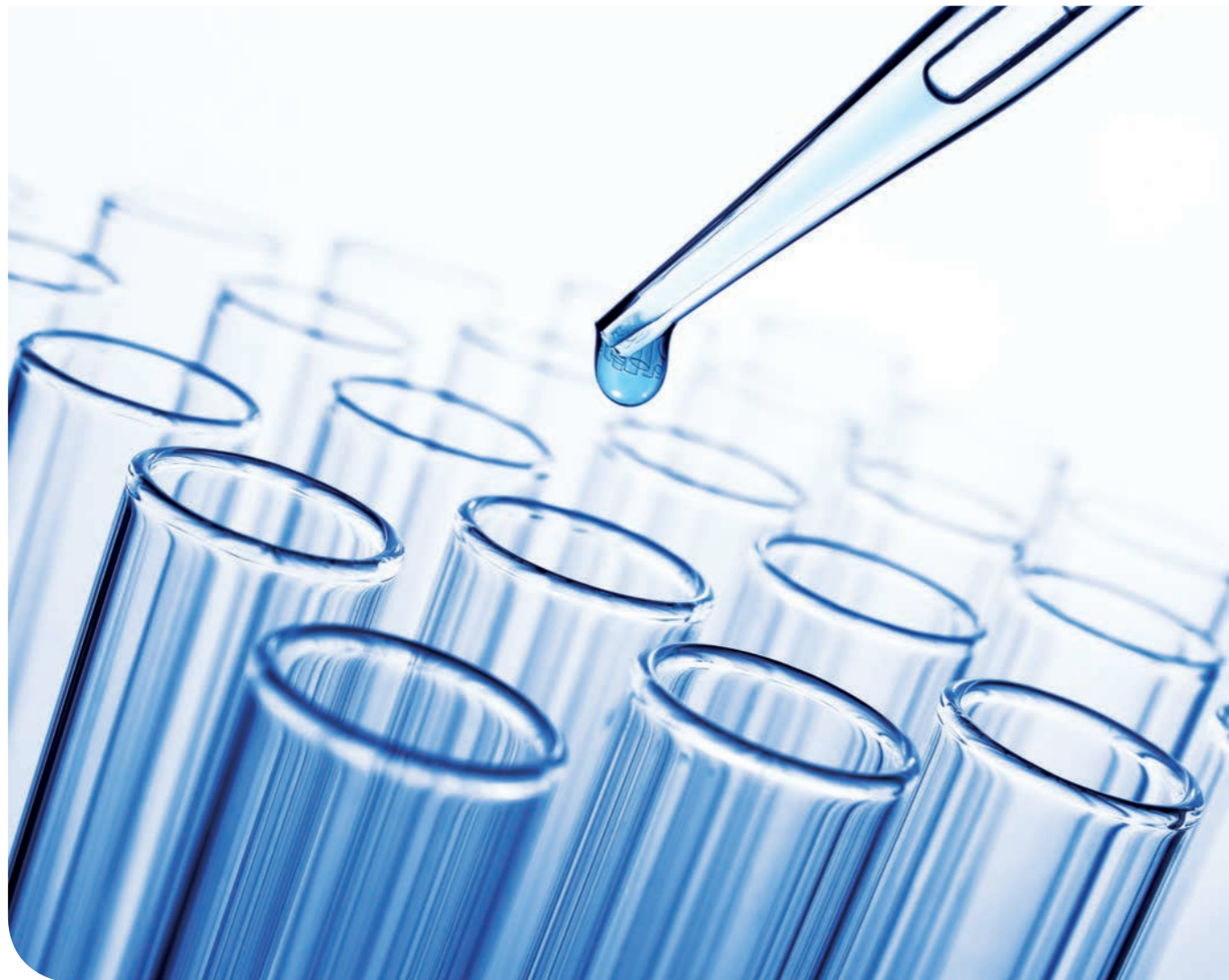
“Kosher” is a Hebrew word that literally means “fit” or “proper.” When used in relation to food products, “kosher” means that the item in question meets the dietary requirements of Jewish law.

Because of the myriad changes in the food market, it has become an absolute necessity for food production facilities wishing to serve the kosher consumer to obtain certification from a reliable certifying agency.

To be certified Kosher, all ingredients in every product - and the process of preparing the product, package - must be certified for kosher-compliance too.

The role of kosher supervision is to check the source of all ingredients, provide for the kosher status of any equipment used to process the product, and to set up a system by which the integrity of both ingredients and equipment is maintained.

PCC EXOL SA has in portfolio **Rokamer R2800** and **Rokamer G3800** which are strictly kosher for Passover and pareve. A Certificate of Kashrut for this products is available upon request.



PRODUCT FDA and BfR QUALIFICATIONS

Product 21 CFR (FDA) Qualifications

Rokamers are approved for CFR (Code of Federal Regulations) applications. According to FDA's CFR regulations the listed substances in 21 CFR title, section 174-178 are permitted to use as indirect food additives.

The table details FDA's CFR status and applicable codes for Rokamers. The information detailed in this list is only for reference. Customers should verify the CFR clearances for their own application.

PRODUCT	175.105	176.180	176.200	176.210	177.1200	177.1210
ROKamer 1010	•	•	•	•	•	
ROKamer 2100	•	•	•	•	•	
ROKamer 2330	•	•	•	•	•	
ROKamer 2950	•	•	•	•	•	•
ROKamer 2000				•		
ROKamer 2600	•	•	•	•	•	
ROKamer G3800*	•	•	•	•	•	
ROKamer R2800*	•	•	•	•	•	•
ROKamer 3150*	•	•	•	•	•	

• the product is, according to 21 CFR, listed in this FDA section

21 CFR SECTION	TITLE
175: INDIRECT FOOD ADDITIVES: ADHESIVES AND COMPONENTS OF COATINGS	
175.105	Adhesives
176: INDIRECT FOOD ADDITIVES: PAPER AND PAPERBOARD COMPONENTS	
176.180	Components of paper and paperboard in contact with dry food
176.200	Defoaming agents used in coatings
176.210	Defoaming agents used in the manufacture of paper and paperboard
177: INDIRECT FOOD ADDITIVES: POLYMERS	
177.1200	Cellophane
177.1210	Closures with sealing gaskets for food containers

Product BfR Qualifications

The BfR (Bundesinstitut für Risikobewertung) database contains recommendations for food contact materials manufacturers and includes the listings of substances which can be used with some limitations during the production processes.

All Rokamers are listed in German BfR Recommendation XIV (Plastics Dispersion).

The information detailed in this material is only for reference. Customers should verify the Database BfR Recommendations with all data about the product usage limitations for the given application/material.



PCC EXOL SA

Sustainable technologies for new generations



PCC Exol SA is a combination of the latest technology with experience in production and distribution of surfactants.

PCC Exol SA is a combination of the latest technology with experience in production and distribution of surfactants. The company has its headquarters in Brzeg Dolny, Poland, where the manufacturing units of anionic, nonionic and amphoteric surfactants are located. Flexibility of production enables us to offer a wide range of surfactants adjusted to the current customer needs. As one of the leading chemical products manufacturers, we continue to undertake investment activities based on the principle of sustainable development. Our products have numerous industrial applications. Our surfactants are used as raw materials for various markets including:

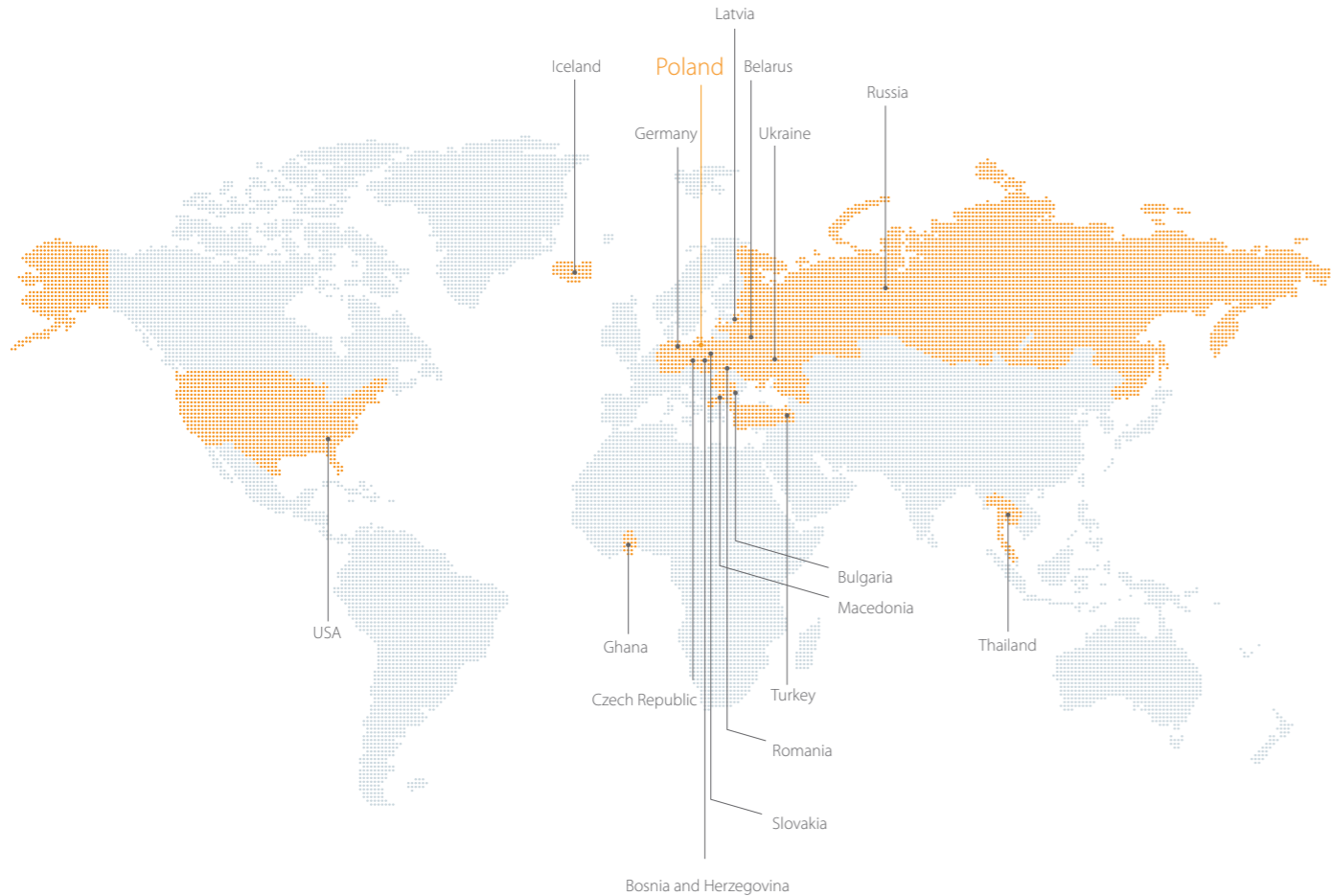
household chemicals, textile, agrochemicals, metalworking, oilfield industries, construction industry, paints & coatings, pulp and paper, and many others. Over the years, PCC Exol SA has developed core expertise in manufacturing specialty surfactants. We meet our customers' needs with a unique and versatile product portfolio, a broad expertise in surfactants chemistry and a high degree of flexibility. Through close customer relationships and by maximizing the synergy of customers' application experience combined with our knowledge of chemistry, we continuously strive to offer tailor-made products and system solutions that contribute to your success.

We are continuously expanding our product range with new surfactants, focusing on safe chemistry and being friendly to people and environment. Our operations are conducted in full compliance with legal and other requirements, including environmental requirements. The design, production and sale of large volumes of specialist, often unique, chemical products for further processing requires the coordinated cooperation of many services at the Company's disposal. A certified quality management system and environmental management system has proven to be very useful. Those two integrated systems help our employees to be aware of their

roles in reaching quality and environmental goals.

Our specialists know that in the end, by carrying out their tasks in accordance with procedures applicable to their positions and other internal regulations, we provide our clients with exactly what they expect from us, acting within conditions of reasonable and legal usage with regard to the environment. Our strategic investor is the German company PCC SE, which operates internationally as three divisions: Chemical, Energy and Logistics.

PCC Group in the world



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