ROKAnol NL SERIES

Ethoxylated C9-C11 alcohols
Non-ionic surfactant series

PCC Exol

ROKAnol NL SERIES

Chemical specificity

ROKAnol NL series are high active non-ionic surfactants. They are ethylene oxide adducts to C9-C11 alcohols. The numerical part of the product name indicates the overall degree of ethoxylation. ROKAnol NL series can be presented by the following structure:

$CH_3(CH_2)n\text{-}O(CH_2CH_2O)n'$ where n - 8 – 10
n' - 3, 5, 6, 8, 9

Applications

ROKAnol NL series are especially effective in the cleaning process. They are consumed as cleaning agents in the I&I industry, but also cope well as a components of laundry detergents or hard surface cleaners. In addition, they have many other applications, such as in the textile industry or the paint and coatings industry.

- INDUSTRIAL AND INSTITUTIONAL CLEANING
- LAUNDRY DETERGENTS
- HARD SURFACE CLEANING
- TEXTILE INDUSTRY
- PAINT AND COATINGS
- OTHERS

Basic physical and chemical properties

ROKAnol	NL3	NL5	NL6W	NL6W/95	NL6	NL8W	NL8	NL9
Appearance at 20-25°C	Liquid	Liquid with a tendency to separation in time	Liquid	Liquid	Liquid with a tendency to separation in time	Liquid	Liquid with a tendency to separation in time	Liquid
Molecular weight [g/mol]	295	380	430	430	430	510	510	560
Hazen colour	Max. 50 (40°C)	Max. 70 (40°C)	Max. 70 (40°C)	Max. 70 (30°C)	Max. 70 (40°C)	Max. 70 (40°C)	Max. 70 (40°C)	Max.100 (40°C)
Hydroxyl number [mg KOH/g]	185-193	144	130	130	130	106	106	98-102
Cloud point [°C]								
Method A 1% in water solution	-	33 - 39	50 – 57	50 – 57	50 – 57	78 - 85	78 – 85	85
Method B 1% solution in 5% NaCl solution	-	25	39	39	39	63	64	69
Method C 1% solution in 10% NaCl solution	-	18	30	28	30	53	53	58
Method D 10% solution in 25% BDG solution	57	72	76	77	76	83	83	83
Method E 16.7% solution in 25% BDG solution	48	68	73	73	73	82	81	82
Approx. Solidification point [°C]	-12	-2	<-20	-5	+ 5	0	+ 15	+ 15
Water content [%, by weight]	max. 0.2	max. 0.5	8.0 – 12.0	max. 6.0	max. 0.5	8.0 - 12.0	max. 0.5	max. 0.5
pH in deionized water, at 20°C	5.5 – 7.5	4.6 – 7.4	5.0 – 7.0	5.0 – 7.0	5.0 – 7.0	5.0 – 7.0	5.0 – 7.0	5.0 – 7.0
Density at 25°C [g/cm^3]	0.95	0.97	1.00	0.99	0.99	1.03	1.03	1.01
Viscosity at 20°C [cP]	Approx. 30	Approx. 40	Approx. 70	Approx. 70	Approx. 50	Approx. 90	Approx. 70	Approx. 130
Average degree of ethoxylation [mol EO]	3	5	6	6	6	8	8	9
Surface tension of 0.1% solution at 25°C [mN/m]	26	26	29	29	28	29	32	31

Additional information

Solubility

The solubility of ROKAnol NL series depends on the degree of ethoxylation. The higher degree of ethoxylation, the better solubility in both water and acetone. Solubility in water and other solvents has been shown in the table below:

Solubility – at 25°C, 10% SOLUTIONS

PRODUCT NAME	DEMINERALIZED WATER	METHANOL	ACETONE
ROKAnol NL3	o	●	o
ROKAnol NL5	●	●	o
ROKAnol NL6W	●	●	●
ROKAnol NL6W/95	●	●	●
ROKAnol NL6	●	●	o
ROKAnol NL8W	●	●	●
ROKAnol NL8	●	●	o
ROKAnol NL9	●	●	●

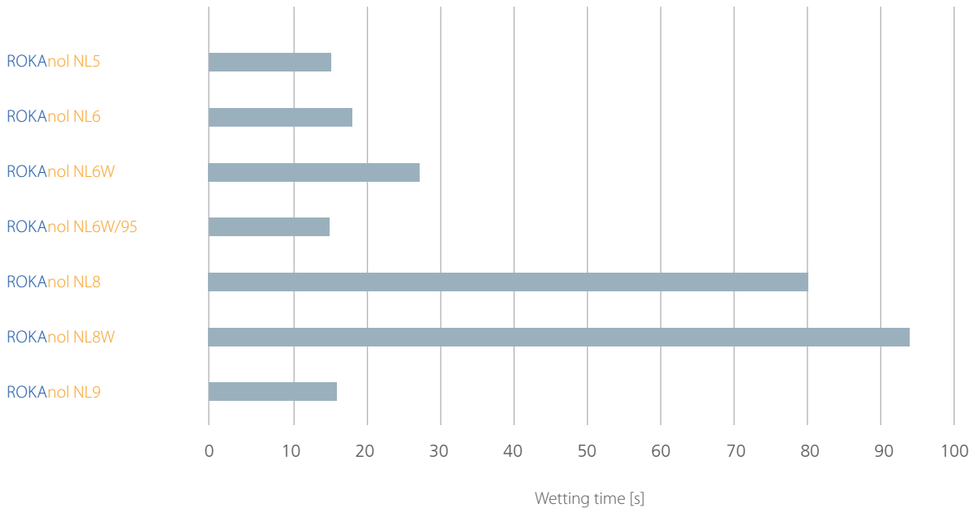
o macroscopic phase separation
● homogeneous, cloudy solution
● clear, homogeneous solution
● homogeneous, opalescent solution

Wetting capability

Surfactants reduce the surface tension of liquids in which they are dissolved. Thanks to them, any liquid (usually water) has greater wetting capability, which increases its ability to get as close as possible to the solid. This is very important for many surfactant applications, especially in cleaning processes.

The capability of wetting cotton fabric was determined in accordance to **PN-EN 1772:2001** Standard.

Concentration of 1.0 g/l; demineralized water; temperature 20°C

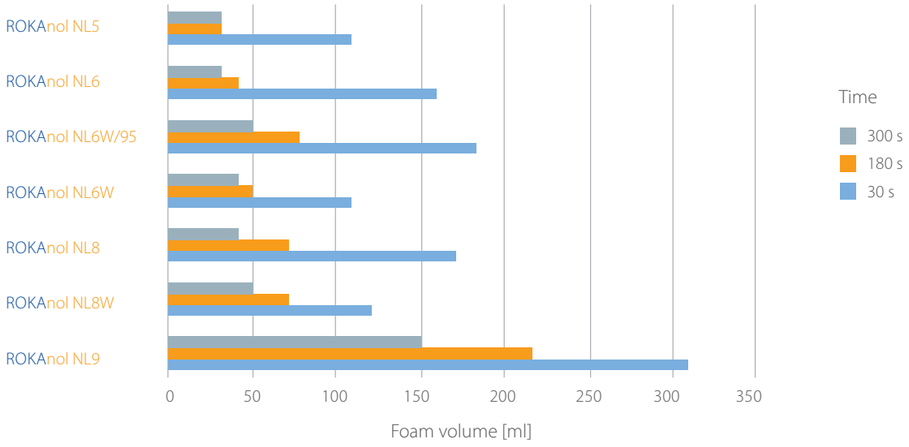


* The data presented in the charts were developed on the basis of tests carried out at PCC EXOL SA

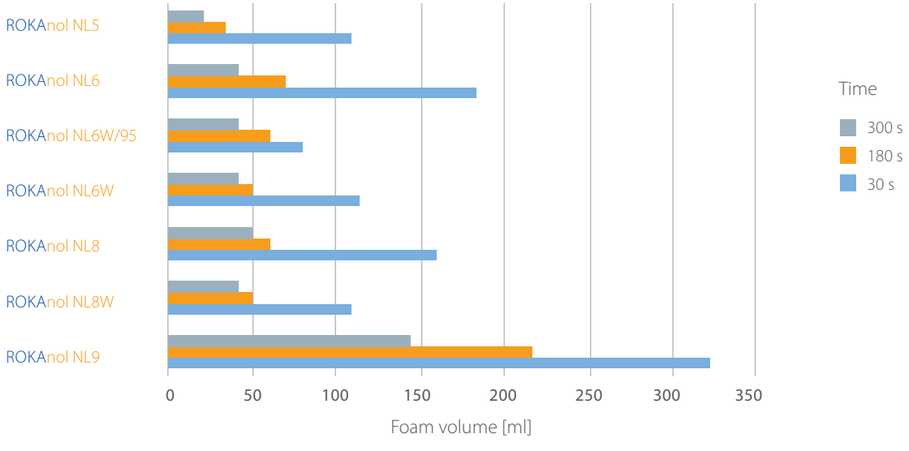
Foaming capability

Foam is a heterogeneous system in which the liquid is the continuous phase and the dispersed phase is a gas. Foams, as well as emulsions, are thermodynamically unstable systems, so surfactant molecules on the interface are required to stabilize them. The ability to foam a substance is important in many industrial applications including the detergents, where it prevents re-dirt in the washing or cleaning processes. The determination of the foaming capability was performed according to **PN-ISO 696: 1994** Standard (the modified Ross-Miles method) at a temperature of 25°C, for a surfactant concentration of 1 g/l, in both hard (17°d) and demineralized water.

Concentration of 1.0 g/l; demineralized water; temperature 25°C



Concentration of 1.0 g/l; hard water; temperature 25°C



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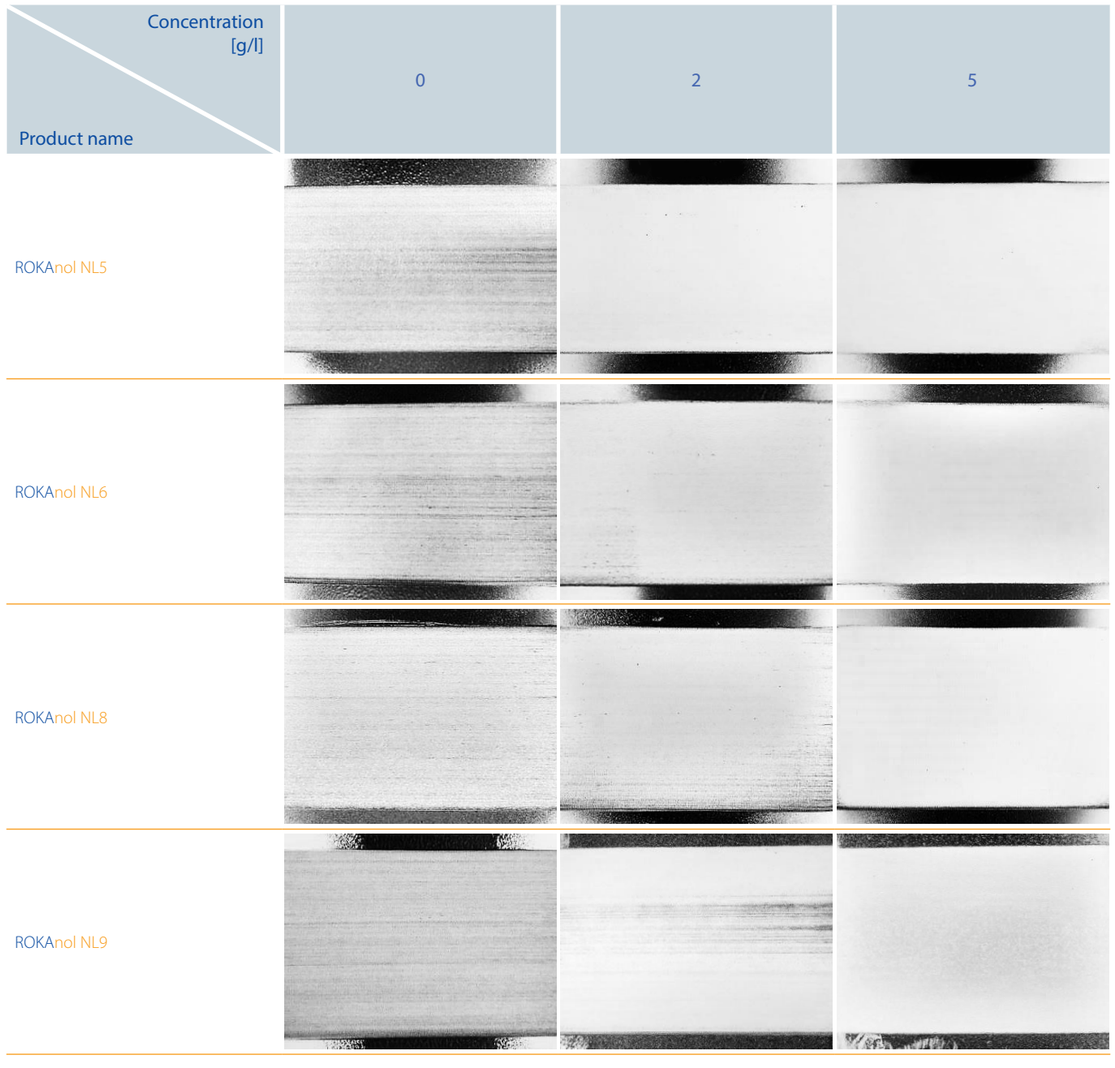
Detergency on hard surfaces

Detergency is the ability of the surfactant to remove greasy soil from the surface of the masonite tile in the cleaning process. Non-polar structural fragments of surfactants form a micelle which interact with a particle of dirt.

Subsequently, an emulsion is formed, that can be removed mechanically with a sponge. The cleaning process was carried out on a BYK Gardner scrub abrasion tester according to our own method.

Comparison of masonite tiles, before and after the detergency tests



* The pictures present the results of tests carried out at PCC EXOL SA

Detergency on hard surface results in dL units

Product name	Demi water	ROKAnol NL9		ROKAnol NL8		ROKAnol NL6		ROKAnol NL5	
Concentration	-	2 g/L	5 g/L	2 g/L	5 g/L	2 g/L	5 g/L	2 g/L	5 g/L
The aritmetic average of all measurements [dL units]	41	35	31	33	32	33	32	31	31

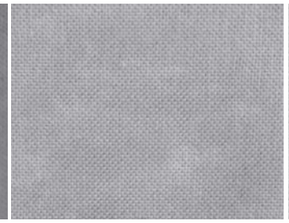
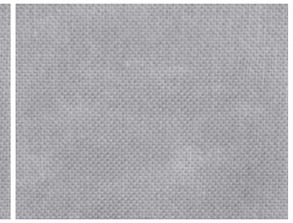
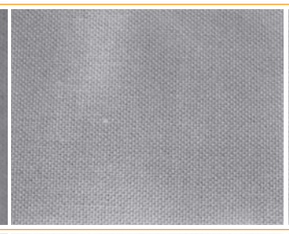
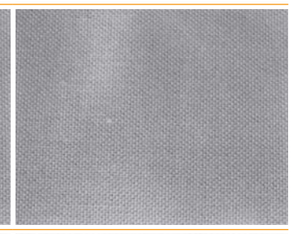
The cleaning process is described by the dL parameter according to the CIE LAB method. This parameter determines the change in the brightness (luminescence) between the tested sample and the standard which is a white plate. Detergency tests on hard surfaces were carried out in 3 replicates for each concentration of each product. The dL parameter is described by the following formula:
dL = LT – LS,

where:
T – tested sample (plate after cleaning process)
S – standard to which the tested sample is compared (white plate)

Detergency on a cotton fabric

Determination of detergency on a cotton fabric is tantamount to assessing the effectiveness of washing with the use of surfactants. Detergency tests were performed according to PCC EXOL SA own method, using EMPA 125 fabric (cotton), soiled with a mixture of oils and pigments that were washed in ROKAnol NL series solutions.

Comparison of the EMPA 125 fabric, before and after the detergency tests

Product name \ Concentration [g/l]	0	2	5
ROKAnol NL9			
ROKAnol NL8			
ROKAnol NL6			
ROKAnol NL5			

* The pictures present the results of tests carried out at PCC EXOL SA

Cotton fabric detergency results in dL units

Product name	ROKAnol NL9		ROKAnol NL8		ROKAnol NL6		ROKAnol NL5	
Concentration	2 g/L	5 g/L	2 g/L	5 g/L	2 g/L	5 g/L	2 g/L	5 g/L
The aritmetic average of all measurements [dL units]	13	13	12	12	21	21	18	21

As with the detergency on hard surface method, the cleaning process is described by the dL parameter in accordance with the CIE LAB method. The difference is that the standard in this case is the soiled fabric, so the higher the value of the dL parameter, the better the tested fabric is cleaned.

Alkali and acid resistance

Surfactants used in industrial cleaning have to be resistant to strong acids or alkalis. Acidic cleaning agents are mainly used to remove mineral deposits from acid-resistant surfaces, while alkaline agents are known primarily for their remarkable degreasing ability.

The analysis of this stability for ROKAnol NL series has been performed in accordance with the **PN-EN 14712:2005** Standard.

ALKALI RESISTANCE (SODIUM HYDROXIDE); concentration of 1%; temperature 20°C

NaOH conc. [g/l] / Product name	10	20	30	40	50	60	70	80	90	100
ROKAnol NL3	o									
ROKAnol NL5	●	●	o							
ROKAnol NL6	●	●	●	●	o					
ROKAnol NL6W/95	●	●	●	●	●	o				
ROKAnol NL6W	●	●	●	●	●	o				
ROKAnol NL8	●	●	●	●	●	●	●	o		
ROKAnol NL8W	●	●	●	●	●	●	●	o		
ROKAnol NL9	●	●	●	●	●	●	●	●	●	o

o macroscopic phase separation
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● clear, homogeneous solution
● homogeneous, opalescent solution

ACID RESISTANCE (SULPHURIC ACID); concentration of 1%; temperature 20°C

Product name \ H_2SO_4 conc. [g/l]	1	10	40	60	120	140	225
ROKAnol NL3	o	o	o	o	o	o	●
ROKAnol NL5	●	●	●	●	●	●	●
ROKAnol NL6	●	●	●	●	●	●	●
ROKAnol NL6W/95	●	●	●	●	●	●	●
ROKAnol NL6W	●	●	●	●	●	●	●
ROKAnol NL8	●	●	●	●	●	●	●
ROKAnol NL8W	●	●	●	●	●	●	●
ROKAnol NL9	●	●	●	●	●	●	●

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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. 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 and 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.

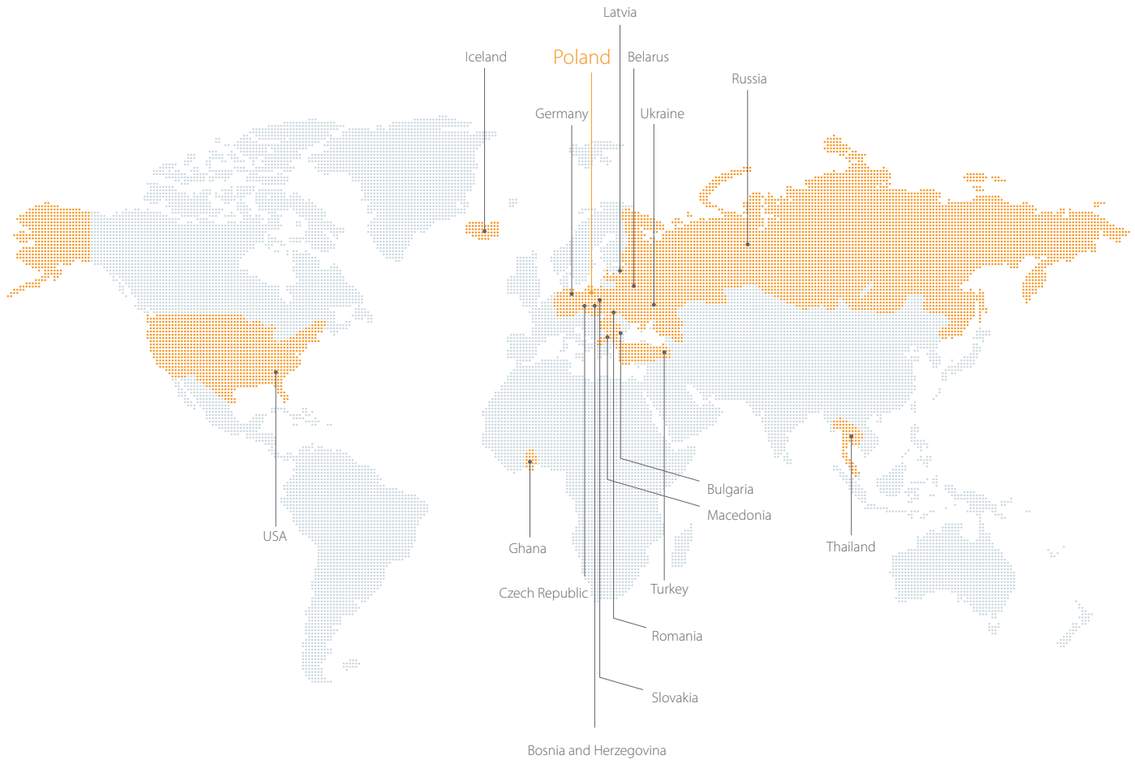
Through close customer relationships and by maximizing the synergy of customers' application experience combined with our knowledge of chemistry, we continuously strive to offer tailor-made products and system solutions that contribute to your success.

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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