

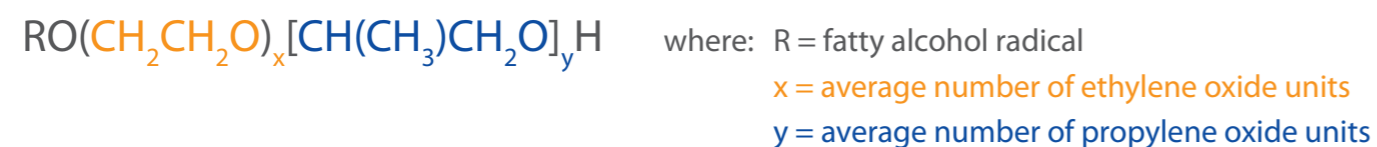
ROKAnol LP Series



ROKANol LP Series

Chemical description








ROKANols with low foaming properties are non-ionic surfactants. They are ethylene and propylene oxides adducts to various types of alcohols and can be represented by follow structure.



Applications

ROKANols with low foaming properties are multipurpose products which are used in variety of applications, where antifoaming, dispersing, wetting properties and detergency plays important role, i.e. in detergents, or I&I applications.

Low foaming surfactant are very useful for low-foam and no-foam applications. They are especially suitable for:

-  Automatic dishwashing detergents
-  Laundry detergents
-  Textile industry
-  Agriculture
-  Paints and coatings
-  Rinse aids
-  Hard surface cleaners
-  Pulp and paper
-  Metal cleaning



Basic physical and chemical properties

| ROKANol | L4P5 | L5P5 | L80/50 | LP2024W/95 | LP2529 | NL8P4 | B2 | RZ4P11 |
|---|---------------------------------|---------------------------------|-------------------------|------------------------|------------------------|---------------------------------|------------------------|------------------------|
| Appearance at 20-25 °C | Clear or slightly turbid liquid | Clear or slightly turbid liquid | Clear liquid | Clear liquid | Clear liquid | Clear or slightly turbid liquid | Turbid liquid | Clear or turbid liquid |
| Concentration [%] | approx. 100 | approx. 100 | approx. 50 | approx. 95 | approx. 100 | approx. 100 | approx. 100 | approx. 100 |
| Hazen colour at 40°C | usually <100 | max. 100 | usually <100 | max. 100 | max. 100 | max. 200 | usually <100 | - |
| Cloud point [°C] | | | | | | | | |
| Method A 1% in water solution | approx. 25 | 27-31 | >100 | approx. 23 | - | 38-48 | 30-39 | - |
| Method B 1% solution in 5% NaCl solution | - | - | approx. 85 | approx. 16 | - | approx. 35 | approx. 26 | - |
| Method C 1% solution in 10% NaCl solution | - | - | approx. 70 | <10 | - | approx. 26 | - | - |
| Method D 10% solution in 25% BDG solution | approx. 48 | approx. 45 | approx. 89 | approx. 49 | approx. 35 | approx. 55 | approx. 46 | - |
| Method E 16.7% solution in 25% BDG solution | approx. 42 | approx. 41 | approx. 88 | approx. 42 | 25-29 | approx. 51 | approx. 43 | 23-27 |
| Average molar mass [g/mol] | 650 | 730 | 3700 | 500 | 500 | 740 | 1000 | 1080 |
| Water content [%; by weight] | max. 0.5 | max. 0.5 | 49-53 | max. 5.0 | max. 0.5 | max. 1.0 | max. 0.5 | max. 1.0 |
| Approx. Solidification point [°C] | approx. -12 | approx. -9 | approx. -1 | approx. -15 | approx. -18 | approx. -10 | approx. 0 | approx. 10 |
| pH in deionized water, at 20°C | 5.5-8.5 1% solution | 5.0-7.0 1% solution | 5.5-8.5 10% solution | 5.0-7.0 1% solution | 5.0-7.0 1% solution | 5.0-7.0 1% solution | 5.5-8.5 1% solution | approx. -10 |
| Density at 25°C [g/cm³] | approx. 0.97 | approx. 0.97 | approx. 1.05 at 50°C | approx. 0.98 | approx. 0.95 | approx. 1.00 | approx. 0.98 | approx. 0.96 |
| Viscosity at 25°C [cP] | approx. 60 | approx. 70 | 230-320 at 50°C | approx. 50 | approx. 60 | approx. 80 | approx. 130 | approx. 130 |

Basic physical and chemical properties

| ROKANol | LP100 | LP180 | LP200 | LP220 | LP400 | LP700 | LP911 | LP3034 |
|---|--------------------|-------------------------------|------------------------|--------------------|------------------------|--------------------|--------------------|--------------------|
| Appearance at 20-25 °C | Liquid | Colorless to yellowish liquid | Clear or turbid liquid | Liquid | Clear or cloudy liquid | Liquid | Liquid | Clear liquid |
| Concentration [%] | approx. 95 | approx. 100 | approx. 100 | approx. 97 | approx. 100 | approx. 100 | approx. 100 | approx. 100 |
| Hazen colour at 40°C | max. 100 | approx. 140 | max. 100 | max.50 | max. 100 | max. 100 | max. 100 | max. 100 |
| Cloud point [°C] | | | | | | | | |
| Method A 1% in water solution | 72-76 | approx. 17 | approx. 21 | 36-40 | 39-42 | 20-24 | 9-11 | 18,5 |
| Method B 1% solution in 5% NaCl solution | approx. 57 | - | approx. 14 | approx. 27 | approx. 30 | approx. 13 | - | <10 |
| Method C 1% solution in 10% NaCl solution | approx. 47 | - | - | approx. 19 | approx. 21 | - | - | <10 |
| Method D 10% solution in 25% BDG solution | approx. 71 | approx. 38 | approx. 43 | approx. 54 | approx. 53 | approx. 56 | approx. 33 | 36,8 |
| Method E 16.7% solution in 25% BDG solution | approx. 69 | 32-35 | 37-41 | approx. 49 | 39-42 | 20-24 | approx. 28 | 30-34 |
| Average molar mass [g/mol] | 1100 | 1870 | 680 | 790 | 640 | 540 | 920 | 740 |
| Water content [%, by weight] | max. 5 | max. 0.5 | max. 0.5 | max. 3.0 | max. 0.5 | max. 0.5 | max. 0.5 | max. 1.0 |
| Approx. Solidification point [°C] | approx. 10 | <-20 | < -15 | approx. -12 | <-5 | <-5 | <-20 | >-20 |
| pH in deionized water, at 20°C | 5-7 1% solution | 5-8 5% solution | 5-7 1% solution | 5-8 5% solution | 5-7 1% solution | 5-7 1% solution | 5-7 1% solution | 5-7 1% solution |
| Density at 25°C [g/cm ³] | approx. 1.04 | approx. 1.01 | approx. 0.99 | approx. 1.01 | approx. 1.00 | approx. 0.98 | approx. 0.99 | approx. 0.97 |
| Viscosity at 25°C [cP] | approx. 245 | approx. 240 | approx. 80 | Max.200 | approx. 90 | approx. 70 | approx. 100 | max.100 |

Basic physical and chemical properties

| ROKANol | LP3135 | LP3943 | LP60 | LP64 | LP66 | LP550 | LP1319 | LP2023 | LP2227 | LP2500 | LP2855 |
|---|--------------------|----------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|-------------------------------|
| Appearance at 20-25 °C | Turbid liquid | Clear liquid | Clear liquid | Liquid | Liquid | Clear liquid | Clear liquid | Clear liquid | Clear liquid | Clear liquid | Clear/ slightly turbid liquid |
| Concentration [%] | approx. 95 | approx. 100 | approx. 100 | approx. 100 | approx. 97 | approx. 100 | approx. 100 | approx. 100 | approx. 100 | approx. 100 | approx. 100 |
| Hazen colour at 40°C | max. 100 | - | Max. 200 | Max. 70 | Max. 70 | Max. 50 | Max.150 | max. 100 | Approx.30 | max. 40 | max. 100 |
| Cloud point [°C] | | | | | | | | | | | |
| Method A 1% in water solution | 31-35 | - | - | <10 | approx. 15 | <10 | - | - | 22-27 | 31-35 | 27-31 |
| Method B 1% solution in 5% NaCl solution | approx. 24 | - | - | <10 | <10 | <10 | - | - | approx. 15 | approx. 24 | - |
| Method C 1% solution in 10% NaCl solution | approx. 15 | - | - | <10 | <10 | <10 | - | - | approx. 12 | approx. 15 | - |
| Method D 10% solution in 25% BDG solution | approx. 48 | approx. 50 | 14-18 | 60-62 | approx. 69 | 26-30 | approx. 20 | approx. 27 | approx. 48 | approx. 48 | - |
| Method E 16.7% solution in 25% BDG solution | approx. 44 | 39-43 | <10 | approx. 55 | 64-68 | 23-25 | 13-19 | 20-23 | approx. 43 | approx. 45 | - |
| Average molar mass [g/mol] | 620 | 550 | 770 | 770 | 1000 | 1550 | 1530 | 1060 | | 670 | 630 |
| Water content [%, by weight] | max. 5.0 | max. 0.5 | max. 1.0 | max. 0.5 | max. 3.0 | max. 0.3 | max. 0.5 | max. 0.5 | max. 0.5 | max. 0.5 | max. 0.5 |
| Approx. Solidification point [°C] | < -20 | < -20 | <-20 | Approx. 8 | Approx. 4 | Approx. -14 | <-20 | approx. -10 | approx. -4 | approx. -9 | ~-10 |
| pH in deionized water, at 20°C | 5-7 1% solution | 5-7 2.5% solution | 6-8 1% solution | 5-7 1% solution | 5-7 1% solution | 5-7 1% solution | 4-7 1% solution | 5-7 1% solution | 5-7 1% solution | 6-8 1% solution | 5-7 1% solution |
| Density at 25°C [g/cm ³] | approx. 1.00 | approx. 0.95 | approx. 0.96 | approx. 0.96 | approx. 0.98 | approx. 1.00 | approx. 0.98 | approx. 0.97 | approx. 1.00 | approx. 0.98 | approx. 0.97 |
| Viscosity at 25°C [cP] | approx. 100 | approx. 55 | approx. 100 | approx. 115 | approx. 160 | Max.300 | Approx.200 | approx. 140 | approx. 300 | approx. 80 | approx. 50 |

Additional information

Solubility

Solubility in water and other solvents has been shown in the table below.

Solubility – at 25°C, 10% SOLUTIONS

| ROKANOL SERIES | DEMINERALIZED WATER | METHANOL | ETHYL ETHER | ACETONE |
|----------------|---------------------|----------|-------------|---------|
| L4P5 | ● | ● | ○ | ● |
| L5P5 | ● | ● | ○ | ● |
| L80/50 | ● | ● | ○ | ● |
| LP2024W/95 | ● | ● | ○ | ● |
| LP2529 | ○ | ● | ○ | ● |
| NL8P4 | ● | ● | ○ | ○ |
| B2 | ● | ● | ○ | ○ |
| RZ4P11 | ○ | ● | ○ | ○ |
| LP100 | ● | ● | ○ | ● |
| LP180 | ○ | ● | ○ | ● |
| LP200 | ○ | ● | ○ | ● |
| LP220 | ● | ● | ○ | ● |
| LP400 | ● | ● | ● | ● |
| LP700 | ○ | ● | ○ | ● |
| LP911 | ○ | ● | ● | ● |
| LP3034 | ○ | ● | ● | ● |
| LP3135 | ● | ● | ○ | ● |
| LP3943 | ○ | ● | ● | ● |
| LP60 | ○ | ● | ○ | ○ |
| LP64 | ○ | ○ | ○ | ● |
| LP66 | ○ | ● | ● | ● |
| LP550 | ○ | ● | ● | ● |
| LP1319 | ○ | ● | ● | ● |
| LP2023 | ○ | ● | ● | ● |
| LP2227 | ● | ● | ○ | ● |
| LP2500 | ● | ● | ○ | ● |
| LP2855 | ● | ● | ○ | ● |

- macroscopic phase separation
- clear, homogeneous solution
- homogeneous, opalescent solution

Wetting capability

The capability of effective wetting is a necessary and required property of surfactants in a large number of applications. Some of ROKAnols with low foaming properties are effective wetting agents. Other products with antifoaming profile exhibit poor wetting properties. The capability of wetting cotton fabric was determined according to EN 1772:2001.

Wetting time (time in seconds necessary for wetting the textile material) was measured at ROKAnols solution with a concentration of 1.0 g/l in deionized water at a temperature of 25°C.

| ROKANOL SERIES | DEMINERALIZED WATER |
|----------------|---------------------|
| L4P5 | excellent |
| L5P5 | good |
| L80/50 | poor |
| LP2024W/95 | excellent |
| LP2529 | low |
| NL8P4 | good |
| B2 | low |
| RZ4P11 | low |
| LP100 | low |
| LP180 | poor |
| LP200 | good |
| LP220 | good |
| LP400 | excellent |
| LP700 | excellent |
| LP911 | good |
| LP3034 | excellent |
| LP3135 | good |
| LP3943 | low |
| LP60 | low |
| LP64 | low |
| LP66 | low |
| LP550 | good |
| LP1319 | poor |
| LP2023 | low |
| LP2227 | good |
| LP2500 | excellent |
| LP2855 | excellent |

| TIME (s) | DESCRIPTION |
|----------|-------------|
| <20 | excellent |
| 20-50 | good |
| 50-100 | moderate |
| 100-300 | low |
| >300 | poor |

Foaming capability

ROKANols from low foaming range exhibit desired properties like good detergency, efficient wettability, degreasing abilities. Difference between ROKANols and standard non-ionic surfactants is in their low foaming capability. Due to that, these products can be used in many application where foam is problematic.

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 and hard water at a temperature of 25°C.

| ROKANol SERIES | DEMINERALIZED WATER | HARD WATER |
|----------------|---------------------|------------|
| L4P5 | low | poor |
| L5P5 | poor | poor |
| L80/50 | low | poor |
| LP2024W/95 | poor | poor |
| LP2529 | poor | non |
| NL8P4 | poor | non |
| B2 | moderate | low |
| RZ4P11 | non | non |
| LP100 | moderate | moderate |
| LP180 | non | non |
| LP200 | non | non |
| LP220 | non | non |
| LP400 | poor | poor |
| LP700 | moderate | moderate |
| LP911 | non | non |
| LP3034 | non | non |
| LP3135 | non | non |
| LP3943 | non | non |
| LP60 | non | non |
| LP64 | non | non |
| LP66 | poor | poor |
| LP550 | non | non |
| LP1319 | non | non |
| LP2023 | non | non |
| LP2227 | non | non |
| LP2500 | poor | poor |
| LP2855 | poor | poor |

| FOAM VALUE [ML] | DESCRIPTION |
|-----------------|-------------|
| 100-200 | moderate |
| 70-100 | low |
| 20-70 | poor |
| 0-20 | non |

Alkali and acid resistance

The analysis of this stability for low foaming surfactants has been performed in accordance with the PN-EN 14712:2005 Standard.

Alkali resistance (Sodium Hydroxide); concentration of 1%; temperature 20°C

| ROKANol SERIES \ NaOH conc. [g/l] | 10 | 20 | 30 | 40 | 60 | 70 | 300 | 360 |
|-----------------------------------|----|----|----|----|----|----|-----|-----|
| L4P5 | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| L5P5 | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| L80/50 | ● | ● | ● | ● | ● | ○ | ○ | ○ |
| LP2024W/95 | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| LP2529 | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| NL8P4 | ● | ● | ● | ○ | ○ | ○ | ○ | ○ |
| B2 | ● | ● | ○ | ○ | ○ | ○ | ○ | ○ |
| RZ4P11 | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| LP100 | ● | ● | ● | ● | ○ | ○ | ○ | ○ |
| LP180 | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| LP200 | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| LP220 | ● | ● | ● | ○ | ○ | ○ | ○ | ○ |
| LP400 | ● | ● | ○ | ○ | ○ | ○ | ○ | ○ |
| LP700 | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| LP911 | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| LP3034 | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| LP3135 | ● | ● | ○ | ○ | ○ | ○ | ○ | ○ |
| LP3943 | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| LP60 | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| LP64 | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| LP66 | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| LP550 | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| LP1319 | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| LP2023 | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| LP2227 | ● | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| LP2500 | ● | ● | ○ | ○ | ○ | ○ | ○ | ○ |
| LP2855 | ● | ○ | ○ | ○ | ○ | ○ | ○ | ○ |

- macroscopic phase separation
- homogeneous, cloudy solution
- clear, homogeneous solution
- homogeneous, opalescent solution

Acid resistance (Sulphuric Acid); concentration of 1%; temperature 20°C

| H ₂ SO ₄ conc. [g/l] | 1 | 10 | 20 | 60 | 120 | 140 | 225 |
|--|---|----|----|----|-----|-----|-----|
| L4P5 | ● | ● | ● | ● | ● | ● | ● |
| L5P5 | ● | ● | ● | ● | ● | ● | ● |
| L80/50 | ● | ● | ● | ● | ● | ● | ● |
| LP2024W/95 | ● | ● | ○ | ○ | ○ | ○ | ● |
| LP2529 | ○ | ○ | ○ | ○ | ○ | ● | ● |
| NL8P4 | ● | ● | ● | ● | ● | ● | ● |
| B2 | ● | ● | ● | ● | ● | ● | ● |
| RZ4P11 | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| LP100 | ● | ● | ● | ● | ● | ● | ● |
| LP180 | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| LP200 | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| LP220 | ● | ● | ● | ● | ● | ● | ● |
| LP400 | ● | ● | ● | ● | ● | ● | ● |
| LP700 | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| LP911 | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| LP3034 | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| LP3135 | ● | ● | ● | ● | ● | ● | ● |
| LP3943 | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| LP60 | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| LP64 | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| LP66 | ○ | ○ | ○ | ○ | ○ | ○ | ● |
| LP550 | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| LP1319 | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| LP2023 | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| LP2227 | ● | ● | ● | ● | ● | ● | ● |
| LP2500 | ● | ● | ● | ● | ● | ● | ● |
| LP2855 | ● | ● | ● | ● | ● | ● | ● |

- macroscopic phase separation
- homogeneous, cloudy solution
- clear, homogeneous solution
- homogeneous, opalescent solution



PCC EXOL SA

Sustainable technologies for new generations



PCC EXOL SA combines innovative technologies with experience in designing, producing and selling surfactants and chemical formulations

PCC EXOL S.A. is a company that combines cutting-edge technologies with rich experience in production of surfactants (surface active agents). The company is located in Brzeg Dolny (Poland), where anionic, nonionic and amphoteric surfactant production plants have been launched. Due to the flexible production processes, the company offers a wide spectrum of surfactants and industrial formulations, which are often suited for the individual customers operating in plenty of various industry sectors. As one of the leading surfactant manufacturers, PCC EXOL S.A. carries out new investment projects and implements innovative technologies based on the global sustainability trends.

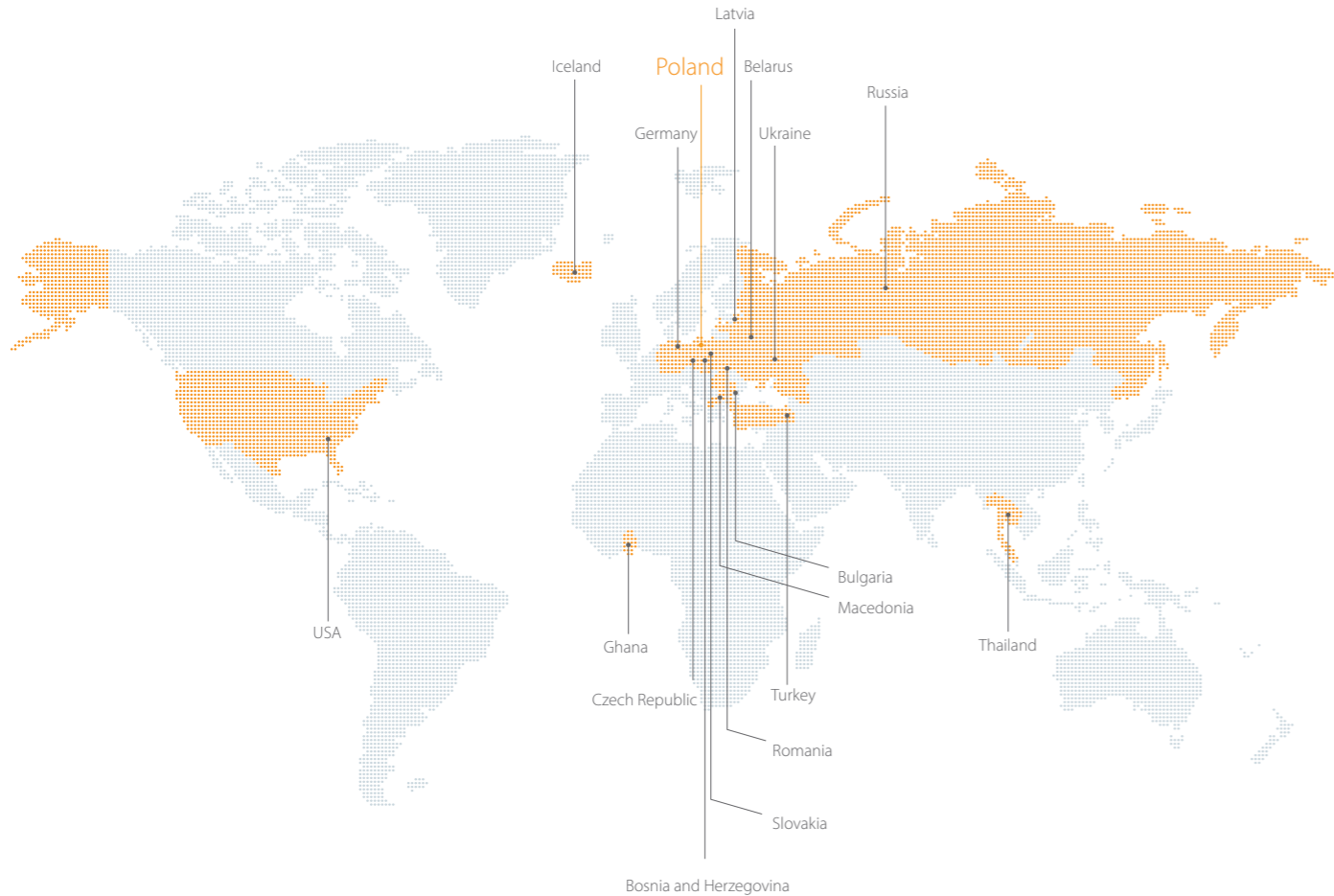
PCC EXOL S.A. portfolio includes surfactants with a broad range of applications. Besides of the mass production for personal care and detergents industry, the substances produced by PCC EXOL S.A. also include specialized products used in various branches, such as textile, agrochemical, metal cleaning, oil drilling, building & construction, paints & coatings, paper industry, extraction & drilling, and many others. The company comprehensive portfolio is continuously enriched with new innovative products, which meet even the strictest market requirements and adapt to the individual needs of customers. This is possible due to the dynamic development of the research facilities,

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PCC EXOL S.A. has the key competence necessary for a worldwide production of surfactants. The ongoing projects will soon bring the new opportunities for the company's further development and expansion into new markets. The company offers not only a wide portfolio and professional servicing but most of all flexible production and comprehensive system solutions that meet individual customer demands. The strategic PCC EXOL S.A. investor is PCC SE, operating on international markets of the chemical raw materials, transport, energy, coal,

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