Technical Information

March 2013

Lutensol® ON types

® = Registered trademark of BASF

Lutensol® ON 30
Lutensol® ON 50
Lutensol® ON 60
Lutensol® ON 70
Lutensol® ON 80
Lutensol® ON 110

Nonionic surfactants for detergents and cleaners, and for the chemical and allied industries

BASF
The Chemical Company

Chemical nature

The Lutensol® ON types are nonionic surfactants. They are alkyl polyethylene glycol ethers made from a saturated synthetic, short-chain fatty alcohol.

They conform to the following formula:

$$RO(CH_2CH_2O)_xH$$

R = saturated, synthetic, short-chain fatty alcohol
x = 3, 5, 6, 7, 8 or 11

The numeric code in the product name usually indicates the degree of ethoxylation.

The Lutensol® ON types are manufactured by causing the fatty alcohol to react with ethylene oxide in stoichiometric proportions. The ethoxylation temperature is kept as low as possible. This, combined with the high purity of the feedstocks, ensures that high-performance products with low toxicity are obtained.

Properties

Lutensol® ON 30, ON 50, ON 60, ON 70 and ON 80 are clear or cloudy, virtually colourless liquids. Lutensol® ON 110 is a soft, colourless paste.

The most important properties of the Lutensol® ON types are shown in the table below. The figures quoted are averages from representative batches of product.

Lutensol®		**ON 30**	**ON 50**	**ON 60**
Physical form (23 °C)		liquid	liquid	liquid
Degree of ethoxylation		approx. 3	approx. 5	approx. 6
Concentration	%	approx. 100	approx. 100	approx. 100
Cloud point (EN 1890)*				
Method A	°C	–	–	approx. 36
Method B	°C	–	–	–
Method C	°C	–	–	–
Method D	°C	approx. 60	approx. 70	approx. 71
Method E	°C	approx. 53	approx. 67	approx. 68
Molar mass (calc. from OH)	g/mol	approx. 290	approx. 380	approx. 430
pH (EN 1262, Solution B)**		approx. 7	approx. 7	approx. 7
Density (DIN 51757, 23 °C)	g/cm^3	approx. 0.95	approx. 0.98	approx. 0.99
Dropping point (DIN 51801)	°C	approx. 5	approx. 10	approx. 12
Congealing point (ISO 2207)	°C	<5	<5	<5
Viscosity (EN 12092, 23 °C, Brookfield, 60 rpm)	mPa·s	approx. 40	approx. 160	approx. 180
Hydroxyl number (DIN 53240)	mg KOH/g	approx. 190	approx. 150	approx. 130
HLB value		approx. 9	approx. 11.5	approx. 12
Wetting (EN 1772, in dist. water, 23 °C, 2 g Soda ash/l)				
0.5 g/l	s	approx. 60	approx. 70	approx. 70
1.0 g/l	s	approx. 40	approx. 20	approx. 20
2.0 g/l	s	approx. 10	approx. 5	approx. 5
Foam formation (EN 12728, 40 °C, 2 g/l in water with a hardness of 1.8 mmol Ca^{2+}-Ions/l, after 30 s)	cm^3	approx. 70	approx. 500	approx. 500
Surface Tension*** (EN 14370, 1 g/l, 23 °C, dist. water)	mN/m	approx. 26	approx. 27	approx. 27

Lutensol®		**ON 70**	**ON 80**	**ON 110**
Physical form (23 °C)		liquid	liquid	paste
Degree of ethoxylation		approx. 7	approx. 8	approx. 11
Concentration	%	approx. 100	approx. 100	approx. 100
Cloud point (EN 1890)*				
Method A	°C	approx. 60	approx. 80	approx. 98
Method B	°C	approx. 47	approx. 62	approx. 78
Method C	°C	approx. 36	approx. 51	approx. 66
Method D	°C	approx. 78	approx. 82	approx. 88
Method E	°C	approx. 76	approx. 81	approx. 88
Molar mass (calc. from OH)	g/mol	approx. 470	approx. 510	approx. 640
pH (EN 1262, Solution B)**		approx. 7	approx. 7	approx. 7
Density (DIN 51757, 23 °C)	g/cm^3	approx. 1.00	approx. 1.02	approx. 1.00 (60 °C)
Dropping point (DIN 51801)	°C	approx. 15	approx. 20	approx. 26
Congealing point (ISO 2207)	°C	<5	approx. 7	approx. 15
Viscosity (EN 12092, 23 °C Brookfield, 60 rpm)	mPa·s	approx. 200	approx. 800	approx. 30 (60 °C)
Hydroxyl number (DIN 53240)	mg KOH/g	approx. 120	approx. 110	approx. 85
HLB value		approx. 13	approx. 14	approx. 15
Wetting (EN 1772, in dist. water, 23 °C, 2 g Soda ash/l)				
0.5 g/l	s	approx. 110	approx. 140	> 300
1.0 g/l	s	approx. 25	approx. 40	approx. 120
2.0 g/l	s	approx. 5	approx. 10	approx. 20
Foam formation (EN 12728, 40 °C, 2 g/l in water with a hardness of 1.8 mmol Ca^{2+}-Ions/l, after 30 s)	cm^3	approx. 600	approx. 650	approx. 650
Surface Tension*** (EN 14370, 1 g/l, 23 °C, dist. water)	mN/m	approx. 27	approx. 30	approx. 34

* *Cloud point EN 1890 :*
Method A: 1 g surfactant + 100 g distilled water
Method B: 1 g surfactant + 100 g NaCl solution (c = 50 g/l)
Method C: 1 g surfactant + 100 g NaCl solution (c = 100 g/l)
Method D: 5 g surfactant + 45 g of diethylene glycol monobutyl ether solution (c = 250 g/l)
Method E: 5 g surfactant + 25 g of diethylene glycol monobutyl ether solution (c = 250 g/l)

** *The pH of the Lutensol® ON types can decrease during storage but this does not have any effect on their performance.*

*** *Applying Harkins-Jordan correction.*

The stability of 10% solutions of Lutensol® ON at 23 °C

	Distilled water	Potable water (approx. 2.7 mmol Ca^{2+}-ions/l)	Caustic soda (5%)	Hydro-chloric acid (5%)	Mineral oil	Ethanol	Aromatic Hydro-carbons
Lutensol® ON 30	–	–	–	O	+	+	+
Lutensol® ON 50	+	+	O	+	O	+	+
Lutensol® ON 60	+	+	O	+	O	+	+
Lutensol® ON 70	+	+	–	+	O	+	+
Lutensol® ON 80	+	+	+	+	–	+	+
Lutensol® ON 110	+	+	+	+	–	+	+

\+ = *clear solution*
O = *cloudy solution*
– = *insoluble*

We recommend preparing 10 – 25% stock solutions of Lutensol® ON types if they are to be used in the form of very dilute solutions, or if they are to be added to other solutions. This makes it very much easier to dilute them later.

The rates at which the Lutensol® ON types dissolve can be increased by adding alcohols, glycols and other solubilizers.

Viscosity

The relationship between viscosity and temperature is always an important point to consider when Lutensol® ON types are being stored or transported. This is shown in the following table.

Viscosity at (°C)	0	10	20	23	30	40	50	60
Lutensol® ON 30	500	200	70	40	30	20	15	10
Lutensol® ON 50	60000	1000	200	160	60	30	20	10
Lutensol® ON 60	$>10^5$	2000	250	180	60	30	20	10
Lutensol® ON 70	$>10^5$	$>10^5$	300	200	80	40	30	20
Lutensol® ON 80	$>10^5$	$>10^5$	30000	800	200	40	30	20
Lutensol® ON 110	$>10^5$	$>10^5$	$>10^5$	$>10^5$	500	80	50	30

The Lutensol® ON types can form fairly stiff gels at certain concentrations when water is added. The figures below were measured with a Brookfield viscometer at 23 °C and 60 rpm.

The viscosity of Lutensol® ON types (mPa·s) as a function of concentration

Water content (%)	Lutensol® ON 30	Lutensol® ON 50	Lutensol® ON 60	Lutensol® ON 70	Lutensol® ON 80	Lutensol® ON 110
0	40	160	180	200	800	–
10	50	60	60	80	110	150
20	60	160	80	90	130	160
30	100	5000	900	140	140	180
40	10000	4000	2000	140	170	230
50	3000	400	110	170	160	180
60	10000	70	60	110	100	100
70	6000	40	40	50	30	40
80	1000	20	30	20	10	20
90	300	10	10	10	10	10

Storage

a) The Lutensol® ON types should be stored indoors in their original packaging, which should be kept tightly sealed.

b) They are hygroscopic and readily soluble in water, with the result that they absorb moisture very quickly. Drums must be resealed each time they are opened.

c) The storage temperature should not be allowed to fall substantially below 20 °C, and storerooms must not be overheated.

d) The Lutensol® ON types can become slightly cloudy if they are stored at low temperatures, but this has no effect on their performance.

This cloudiness can be dissipated by heating them to 30 – 40 °C, or 50 °C in the case of Lutensol® ON 110.

e) Liquid that has solidified or that shows signs of precipitation should be heated to around 40 °C (Lutensol® ON 110 : 50 °C) and rehomogenized before it is processed.

f) Drums that have solidified or that have begun to precipitate should be reconstituted by gentle heating, preferably in a heating cabinet. The temperature must not be allowed to exceed 70 °C. This also applies if drums are heated by external electrical elements.

Internal electrical elements should not be used because of the localized anomalies in temperature that they cause.

g) The Lutensol® ON types must be blanketed with nitrogen if they are stored in heated tanks (at 50 – 60 °C) to prevent them from coming into contact with air. Constant gentle stirring helps to prevent them being discoloured as a result of prolonged contact with electrical elements or external heating coils.

Materials

The following materials can be used for tanks and drums:

a) AISI 304 stainless steel (X6CrNiTi1810)
b) AISI 316 stainless steel (X6CrNiMoTi17122)

Shelf life

Provided they are stored properly and drums are kept tightly sealed, the Lutensol® ON types have a shelf life of at least two years in their original packaging.

Safety

We know of no ill effects that could have resulted from using the Lutensol® ON types for the purpose for which they are intended and from processing them in accordance with current practice.

According to the experience we have gained over many years and other information at our disposal, the Lutensol® ON types do not exert any harmful effects on health, provided that they are used properly, due attention is given to the precautions necessary for handling chemicals, and the information and advice given in our safety data sheets are observed.

Labelling

Please refer to the latest safety data sheets for detailed, up-to-date information on classification, labelling and product safety.

PRD-Nos.*

30043995 Lutensol® ON 110
30043997 Lutensol® ON 30
30043998 Lutensol® ON 50
30043999 Lutensol® ON 60
30043985 Lutensol® ON 70
30043987 Lutensol® ON 80

* BASF's commercial product numbers.

Note

March 2013