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Emulan® types

Emulan® A
Emulan® A Special
Emulan® AF
Emulan® AT 9
Emulan® EL
Emulan® EL 40
Emulan® ELH 60
Emulan® HE 50
Emulan® HE 51

Emulan® OC
Emulan® OC Solution
Emulan® OG
Emulan® OP 25
Emulan® P
Emulan® TO 2080
Emulan® TO 3070
Emulan® TO 4070
Emulan® TO 40 Flakes

Nonionic emulsifiers for the chemical and allied industries

Chemical nature

Emulan® A	Oleic acid ethoxylate
Emulan® A Special	Oleic acid ethoxylate
Emulan® AF	Fatty alcohol ethoxylate
Emulan® AT 9	Fatty alcohol ethoxylate
Emulan® EL	Castor oil ethoxylate
Emulan® EL 40	Castor oil ethoxylate
Emulan® ELH 60	Castor oil ethoxylate
Emulan® HE 50	Alcohol ethoxylate
Emulan® HE 51	Alcohol ethoxylate
Emulan® OC	Fatty alcohol ethoxylate
Emulan® OC Solution	Fatty alcohol ethoxylate
Emulan® OG	Fatty alcohol ethoxylate
Emulan® OP 25	Alkylphenol ethoxylate
Emulan® P	Fatty alcohol ethoxylate
Emulan® TO 2080	Fatty alcohol ethoxylate
Emulan® TO 3070	Fatty alcohol ethoxylate
Emulan® TO 4070	Fatty alcohol ethoxylate
Emulan® TO 40 Flakes	Fatty alcohol ethoxylate

PRD-Nos.*

30043876	Emulan® A
30044181	Emulan® A Special
30043889	Emulan® AF
30043862	Emulan® AT 9
30043883	Emulan® EL
30058290	Emulan® EL 40
30206333	Emulan® ELH 60
30082035	Emulan® HE 50
30230334	Emulan® HE 51
30043858	Emulan® OC
30043874	Emulan® OC Solution
30043868	Emulan® OG
30043900	Emulan® OP 25
30043898	Emulan® P
30043905	Emulan® TO 2080
30043928	Emulan® TO 3070
30043912	Emulan® TO 4070
30278194	Emulan® TO 40 Flakes

* BASF's commercial product numbers.

Properties

Emulan® P, Emulan® OC Solution, Emulan® TO 2080, Emulan® TO 3070 and Emulan® TO 4070 are clear, colourless liquids.

Emulan® A and Emulan® A Special are clear, yellowish or yellow liquids.

Emulan® EL, Emulan® EL 40 and Emulan® ELH 60 are cloudy, yellow liquids.

Emulan® AF, Emulan® AT 9, Emulan® OC and Emulan® OP 25 are colourless, waxy substances.

Emulan® OG is supplied in the form of colourless, waxy micronized beads.

Emulan® TO 40 Flakes are supplied in the form of white or yellowish flakes.

Emulan® HE 50 and Emulan® HE 51 are clear, colourless liquids.

The most important properties of the Emulan® types are listed in the tables below.

Emulan®		A	A Special	AF	AT 9	EL	EL 40
Physical form (23 °C)		Liquid	Liquid	Paste	Paste	Liquid	Liquid
Concentration	%	approx. 100	approx. 100	approx. 100	approx. 100	approx. 97	approx. 100
Water content (EN 13267)	%	–	–	–	–	approx. 3	–
Cloud point (EN 1890)*							
Method A	°C	–	–	–	approx. 68	–	>100
Method B	°C	–	–	–	–	approx. 71	approx. 67
Method C	°C	–	–	–	–	approx. 61	approx. 57
Method D	°C	approx. 58	approx. 65	approx. 69	approx. 86	approx. 77	approx. 72
Method E	°C	approx. 52	approx. 59	approx. 65	approx. 88	approx. 79	approx. 72
pH** (EN 1262, Solution B)		approx. 7	approx. 7	approx. 7	approx. 7	approx. 7	approx. 7
Density (DIN 51757, Method 1)	g/cm ³						
(23 °C)		approx. 0.98	approx. 1.0			approx. 1.07	approx. 1.04
(60 °C)			–	approx. 0.90	approx. 0.95	approx. 0.97	
Bulk density (ISO 697)	g/l	–	–	–	–	–	–
Dropping point (DIN 51801)	°C	<5	<5	approx. 43	approx. 33	approx. 16	approx. 20
Congeaing point (ISO 2207)	°C	<5	<5	approx. 38	approx. 31	approx. 8	approx. 5
Pour point (ISO 3016)	°C	approx. -20	approx. -8	–	–	–	approx. 2
Melting point	°C	–	–	approx. 44	approx. 33	–	–
Viscosity (EN 12092, Brookfield LVT)	mPa·s						
23 °C		approx. 70	approx. 100			approx. 1500	approx. 600
60 °C			–	approx. 15	approx. 20		
Acid value (ISO 2114)	mg KOH/g	approx. 0	approx. 0	approx. 0	approx. 0	approx. 1	approx. 0.5
Saponification value (ISO 3681)	mg KOH/g	approx. 110	approx. 95	approx. 0	approx. 0	approx. 60	approx. 68
Surface tension*** (EN 14370, 1 g/l surfactant in distilled water, 23 °C)	mN/m	approx. 33	approx. 33	approx. 39	approx. 35	approx. 40	approx. 41
Hydrophilic-lipophilic balance (W.C. Griffin)		approx. 9	approx. 11	approx. 11	approx. 13	approx. 14	approx. 13

Emulan®		ELH 60	HE 50	HE 51	OC	OC Solution	OG
Physical form (23 °C)		Liquid	Liquid	Liquid	Paste	Liquid	Powder
Concentration	%	approx. 90	approx. 100	approx. 100	approx. 100	approx. 30	approx. 100
Water content (EN 13267)	%	approx. 10	–	–	–	approx. 70	–
Cloud point (EN 1890)*							
Method A	°C	>100	>100	>100	–	–	–
Method B	°C	approx. 85	approx. 72	approx. 67	approx. 90	approx. 90	approx. 92
Method C	°C	approx. 71	approx. 49	approx. 49	approx. 76	approx. 76	approx. 80
Method D	°C	approx. 83	approx. 86	approx. 86	approx. 93	approx. 93	approx. 97
Method E	°C	approx. 86	approx. 82	approx. 82	approx. 96	approx. 96	–
pH** (EN 1262, Solution B)		approx. 7	approx. 7	approx. 7	approx. 7	approx. 7	approx. 7
Density (DIN 51757, Method 1)	g/cm ³						
(23 °C)		approx. 1.07	approx. 1.00	approx. 1.00	–	approx. 1.00	–
(60 °C)		–	–	–	approx. 1.02	–	–
Bulk density (ISO 697)	g/l	–	–	–	–	–	approx. 600
Dropping point (DIN 51801)	°C	approx. 22	<5	<5	approx. 50	<5	approx. 52
Congeaing point (ISO 2207)	°C	approx. 8	<5	<5	approx. 35	<5	approx. 34
Pour point (ISO 3016)	°C	approx. 11	approx. 25	approx. 23	–	approx. 0	–
Melting point	°C	–	–	–	approx. 52	–	approx. 50
Viscosity (EN 12092, Brookfield LVT)	mPa·s						
23 °C		approx. 8000	approx. 20	approx. 20	–	approx. 200	–
60 °C		–	<20	<20	approx. 60	–	approx. 80
Acid value (ISO 2114)	mg KOH/g	approx. 0.5	approx. 0.7	approx. 0.7	approx. 0	approx. 0	approx. 0
Saponification value (ISO 3681)	mg KOH/g	approx. 43	approx. 3	approx. 1	approx. 0	approx. 0	approx. 0
Surface tension*** (EN 14370, 1 g/l surfactant in distilled water, 23 °C)	mN/m	approx. 43	approx. 52	approx. 48	approx. 39	approx. 39	approx. 40
Hydrophilic-lipophilic balance (W.C. Griffin)		approx. 15	–	–	approx. 17	approx. 17	approx. 17

Emulan®		OP 25	P	TO 2080	TO 3070	TO 4070	TO 40 Flakes
Physical form (23 °C)		Paste	Liquid	Liquid	Liquid	Liquid	Flakes
Concentration	%	approx. 100	approx. 100	approx. 80	approx. 70	approx. 70	approx. 100
Water content (EN 13267)	%	–	–	approx. 20	approx. 30	approx. 30	–
Cloud point (EN 1890)*							
Method A	°C	–	–	–	–	–	–
Method B	°C	approx. 88	–	approx. 93	approx. 92	approx. 92	approx. 92
Method C	°C	approx. 74	–	approx. 78	approx. 78	approx. 78	approx. 78
Method D	°C	approx. 92	approx. 58	approx. 93	approx. 93	approx. 94	approx. 94
Method E	°C	approx. 93	approx. 52	approx. 93	approx. 93	approx. 94	approx. 94
pH** (EN 1262, Solution B)		approx. 7	approx. 7	approx. 7	approx. 7	approx. 7	approx. 7
Density (DIN 51757, Method 1)	g/cm ³						
(23 °C)		–	approx. 0.92	approx. 1.07	approx. 1.08	approx. 1.09	–
(60 °C)		approx. 1.06	–	–	–	–	approx. 1.06
Bulk density (ISO 697)	g/l	–	–	–	–	–	approx. 500
Dropping point (DIN 51801)	°C	approx. 37	approx. 5	approx. 12	approx. 12	approx. 15	approx. 48
Congeaing point (ISO 2207)	°C	approx. 26	<5	<5	<5	approx. 7	approx. 34
Pour point (ISO 3016)	°C	–	approx. 6	approx. 3	approx. 0	approx. 2	–
Melting point	°C	approx. 37	–	–	–	–	approx. 44
Viscosity (EN 12092, Brookfield LVT)	mPa·s						
23 °C		–	approx. 30	approx. 400	approx. 1500	approx. 1400	–
60 °C		approx. 100	–	–	–	–	approx. 120
Acid value (ISO 2114)	mg KOH/g	approx. 0	approx. 0	approx. 0	approx. 0	approx. 0	approx. 0
Saponification value (ISO 3681)	mg KOH/g	approx. 0	approx. 0	approx. 0	approx. 0	approx. 0	approx. 0
Surface tension*** (EN 14370, 1 g/l surfactant in distilled water, 23 °C)	mN/m	approx. 39	approx. 28	approx. 35	approx. 39	approx. 41	approx. 44
Hydrophilic-lipophilic balance (W.C. Griffin)		approx. 17	approx. 7	approx. 16	approx. 17	approx. 18	approx. 18

The above figures reflect the situation at the time of going to press and do not necessarily form part of the product specification.

The specified test characteristics are set out in the relevant product specification, which can be requested from the local BASF representative.

* *Cloud point according to EN 1890:*

Method A: 1 g of surfactant + 100 g of distilled water

Method B: 1 g of surfactant + 100 g of NaCl solution (c = 50 g/l)

Method C: 1 g of surfactant + 100 g of NaCl solution (c = 100 g/l)

Method D: 5 g of surfactant + 45 g of diethylene glycol monobutyl ether solution (c = 250 g/l)

Method E: 5 g of surfactant + 25 g of diethylene glycol monobutyl ether solution (c = 250 g/l)

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

*** *Applying Harkins-Jordan correction.*

Solubility of 10% solutions of Emulan® types at 23 °C

Emulan®	A	A Special	AF	AT 9	EL	EL 40	ELH 60	HE 50	HE 51
Distilled water	-	-	-	-	+	+	+	+	+
Potable water	-	-	-	-	+	+	+	+	+
Caustic soda, 5%	-	-	-	-	+	-	+	+	+
Hydrochloric acid, 5%	-	-	-	-	+	+	+	+	+
Sodium chloride, 5%	-	-	-	-	+	+	+	+	+
Mineral oil	+	•	•	-	-/•	-	-	+	+
Ethanol	+	+	+	+	+	+	+	+	+
Aromatic hydrocarbons	+	+	+	+	•	+	-	+	+

Emulan®	OC	OC Solution	OG	OP 25	P	TO 2080	TO 3070	TO 4070	TO 40 Flakes
Distilled water	+	+	+	+	-	+	+	+	+
Potable water	+	+	+	+	-	+	+	+	+
Caustic soda, 5%	+	+	+	+	-	+	+	+	+
Hydrochloric acid, 5%	+	+	+	+	-	+	+	+	+
Sodium chloride, 5%	+	+	+	+	-	+	+	+	+
Mineral oil	-	-	-	-/•	+	-	-	-	-
Ethanol	•	•	-	+	+	+	+	+	+
Aromatic hydrocarbons	+	+	+	+	•	-	-	-	-

The above table shows the solubility of 10% solutions of the various Emulan® types at 23 °C.

+ = Clear solution
 • = Cloudy solution
 - = Insoluble

For transportation and storage of the Emulan® types, it is important to know how their viscosity changes with temperature. The tables below show this relationship.

Viscosity (mPa·s) as a function of temperature

Emulan® A	A Special	AF	AT 9	EL	EL 40	ELH 60	HE 50	HE 51	
0 °C	approx. 290	approx. 350	>10 ⁵	>10 ⁵	>10 ⁵	>10 ⁵	Solid	approx. 60	approx. 60
10 °C	approx. 160	approx. 180	>10 ⁵	>10 ⁵	>10 ⁵	10 ⁵	>10 ⁵	approx. 40	approx. 40
20 °C	approx. 100	approx. 110	>10 ⁵	>10 ⁵	approx. 5000	approx. 7300	>10 ⁵	approx. 25	approx. 25
30 °C	approx. 50	approx. 65	>10 ⁵	approx. 3500	approx. 1000	approx. 660	approx. 1400	<20	<20
40 °C	approx. 30	approx. 45	approx. 3600	approx. 90	approx. 600	approx. 360	approx. 750	<20	<20
50 °C	approx. 25	approx. 30	approx. 20	approx. 40	approx. 200	approx. 190	approx. 430	<20	<20
60 °C	approx. 15	approx. 20	approx. 15	approx. 20	approx. 150	approx. 120	approx. 280	<20	<20

Emulan® OC	OC Solution	OG	OP 25	P	TO 2080	TO 3070	TO 4070	TO 40 Flakes
0 °C	>10 ⁵	approx. 170	>10 ⁵	>10 ⁵	>10 ⁵	>10 ⁵	>10 ⁵	Solid
10 °C	>10 ⁵	approx. 100	>10 ⁵	>10 ⁵	approx. 140	approx. 8000	approx. 12000	approx. 23000 Solid
20 °C	>10 ⁵	approx. 60	>10 ⁵	>10 ⁵	approx. 40	approx. 1100	approx. 3000	approx. 10000 Solid
30 °C	>10 ⁵	approx. 40	>10 ⁵	>10 ⁵	approx. 25	approx. 240	approx. 1000	approx. 1000 Solid
40 °C	approx. 800	approx. 30	>10 ⁵	approx. 300	approx. 20	approx. 130	approx. 500	approx. 600 Solid
50 °C	approx. 100	approx. 20	approx. 110	approx. 150	approx. 15	approx. 70	approx. 200	approx. 200 approx. 200
60 °C	approx. 60	<10	approx. 80	approx. 100	approx. 10	approx. 50	approx. 100	approx. 100 approx. 120

The rate at which the Emulan® types dissolve can be increased by adding alcohols, glycols and other solubilizers.

Emulan® types may form a gel when they are diluted with water, as can be seen from the following table.

Viscosity (mPa·s) at 23 °C after the addition of water

Emulan®	A	A Special	AF	AT 9	EL	EL 40	ELH 60	OC
Water content								
0%	approx. 70	approx. 100	>10 ⁵	>10 ⁵	approx. 1500	approx. 600	approx. 8000	>10 ⁵
10%	approx. 110	approx. 200	>10 ⁵	>10 ⁵	approx. 1500	approx. 1200	approx. 10000	>10 ⁵
20%	approx. 230	approx. 310	>10 ⁵	>10 ⁵	approx. 2100	approx. 1700	approx. 17000	>10 ⁵
30%	approx. 360	approx. 8000	>10 ⁵	>10 ⁵	approx. 12000	approx. 2800	>10 ⁵	>10 ⁵
40%	approx. 500	>10 ⁵	>10 ⁵	>10 ⁵	approx. 23000	>10 ⁵	>10 ⁵	>10 ⁵
50%	approx. 850	approx. 50000	>10 ⁵	>10 ⁵	approx. 74000	approx. 14000	>10 ⁵	>10 ⁵
60%	approx. 1900	approx. 1800	>10 ⁵	>10 ⁵	approx. 12000	approx. 550	approx. 400	approx. 1000
70%	approx. 200	approx. 2100	approx. 9000	>10 ⁵	approx. 130	approx. 40	approx. 50	approx. 200
80%	approx. 35	approx. 2300	approx. 4000	approx. 1000	approx. 15	approx. 10	approx. 20	approx. 60
90%	approx. 20	approx. 900	approx. 1000	<10	<10	<10	<10	approx. 25

Emulan®	OC Solution	OG	OP 25	P	TO 2080	TO 3070	TO 4070	TO 40
Water content								
0%	approx. 200	>10 ⁵	solid	approx. 30	approx. 400	approx. 1500	approx. 1400	solid
10%	approx. 60	>10 ⁵	approx. 30	approx. 50	>10 ⁵	>10 ⁵	approx. 2300	>10 ⁵
20%	approx. 25	>10 ⁵	approx. 400	approx. 200	>10 ⁵	>10 ⁵	approx. 1800	approx. 100
30%	<10	approx. 15000	approx. 500	>10 ⁵	>10 ⁵	>10 ⁵	approx. 1500	approx. 2200
40%	<10	approx. 13000	approx. 900	>10 ⁵	>10 ⁵	>10 ⁵	approx. 800	>10 ⁵
50%	<10	approx. 2000	>10 ⁵	>10 ⁵	>10 ⁵	>10 ⁵	approx. 400	>10 ⁵
60%	<10	approx. 250	>10 ⁵	>10 ⁵	>10 ⁵	approx. 160	approx. 150	>10 ⁵
70%	<10	approx. 50	approx. 100	>10 ⁵	approx. 70	approx. 80	approx. 50	>10 ⁵
80%	<10	approx. 35	<10	approx. 3000	approx. 20	approx. 20	approx. 20	approx. 50
90%	<10	approx. 10	<10	approx. 60	approx. 10	approx. 10	<10	<20

Storage

- a) The Emulan® types should be stored in their original packaging, which should be kept tightly sealed, in a dry place. Storerooms must not be overheated.
- b) Avoid a humid environment, because the products are hygroscopic and, being readily soluble in water, absorb moisture immediately. For this reason, it is advisable to reseal drums tightly without delay each time material is taken from them.
- c) The congealing points of the Emulan® types must be taken into consideration when determining the storage temperature.
- d) The Emulan® types can become slightly cloudy if they are stored at low temperatures, but this has no effect on the product properties. The cloudiness can be reversed at 50 – 60 °C.
- e) Product that has solidified or that shows signs of precipitation should be heated to 50 – 70 °C and homogenized before use.
- f) Product in drums that has solidified or that shows signs of precipitation should be melted or heated gently in a heating cabinet or heated chamber; the temperature should not exceed 50 – 70 °C, depending on the particular congealing or melting point. This also applies if electric drum heaters are used. Internal electrical elements are unsuitable for heating owing to the high heat load in some places.
- g) If the Emulan® types are stored in heated tanks at 50 – 70 °C (depending on the particular congealing or melting point), care must be taken to ensure that they do not come into contact with air (blanket with nitrogen). Constant gentle stirring prevents them from overheating or becoming discoloured as a result of prolonged contact with the heating elements or external heating jacket.
- h) Emulan® OG and TO 40 Flakes should be stored in a dry place at a temperature not exceeding 25 – 30 °C.

Materials

Tanks made of the following materials are suitable for the storage of Emulan® types:

- a) V2A stainless steel (1.4541 or X6 CrNiTi 1810)
- b) V4A stainless steel (1.4571 or X6 CrNiMoTi 17122)

Shelf life

The Emulan® types have a shelf-life of at least 24 months, provided they are stored in their original packaging and kept tightly sealed.

Safety

We know of no ill effects that could have resulted from using Emulan® 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, Emulan® 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 consult the current Safety Data Sheets for information on the classification and labelling of our products and other information relevant to safety.

Note

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