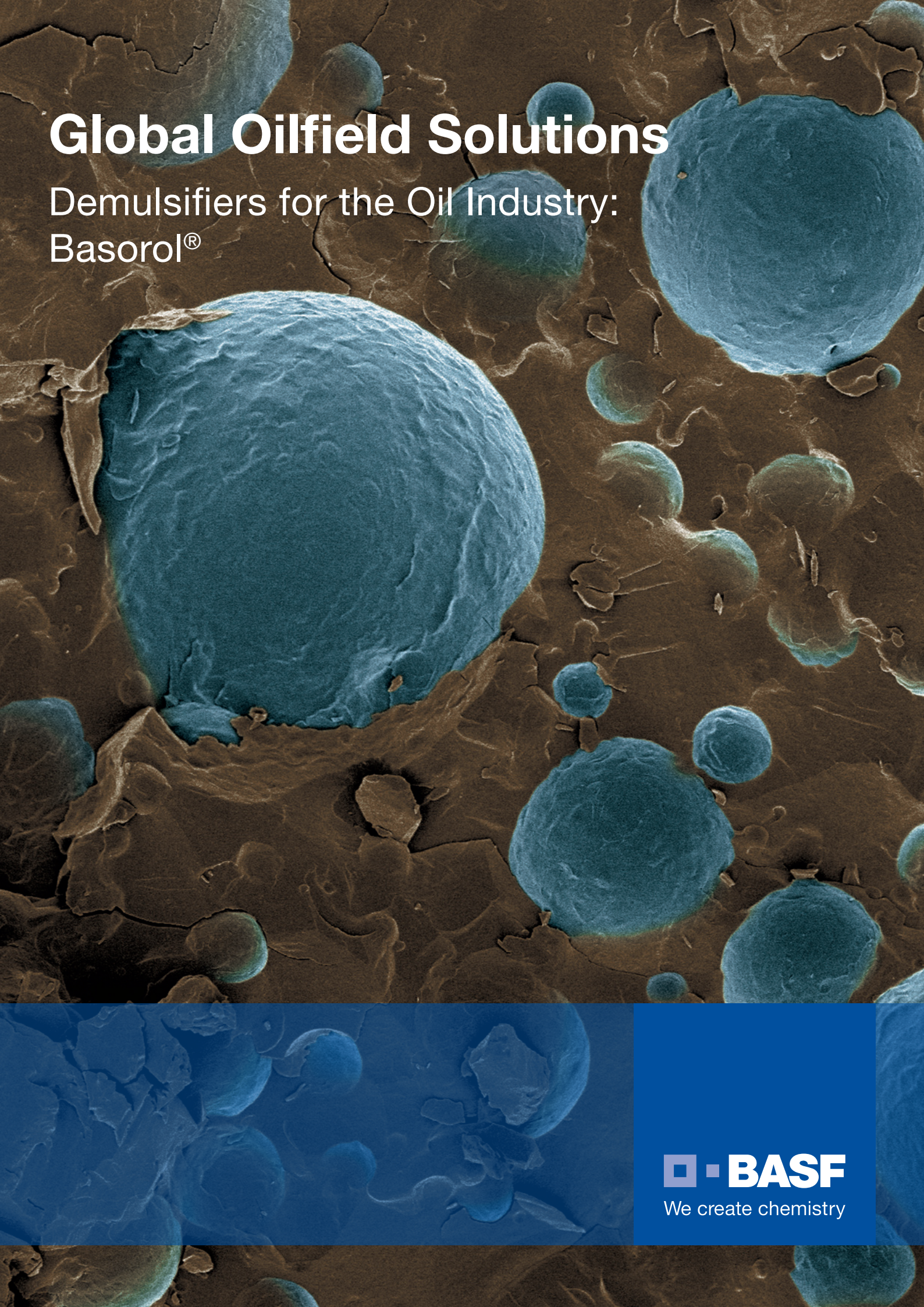
Global Oilfield Solutions

Demulsifiers for the Oil Industry: Basorol®



BASF
We create chemistry

The most important objective of any oil production facility is the separation of water from produced crude. The quick and efficient breaking of these emulsions is essential to meet tight downstream crude oil specifications. In general, crude oil is produced as a water-in-oil emulsion and demulsifiers are necessary for breaking such emulsions. The factors involved in treating emulsions include breaking the film surrounding the small water droplets and coalescing the droplets to produce larger drops. Finally, the water drops settle during or after their coalescence.

Cover picture:
Cryo-SEM (Scanning Electron Microscopy) image of a crude oil emulsion (origin: Germany) in false color representation.

PRODUCT RANGE

The Basorol® types are concentrated single products designed for use as components for demulsifier formulations. In order to optimize performance, it may be necessary to blend two or more Basorol® types. Basorol® types are classified into 5 groups:

GROUP 1 These alkoxylated butyl, amyl and nonyl phenol resins have the broadest treating range for crudes. Normally, they are the predominant part of the formulation and they allow emulsions to be treated at lower temperatures.

GROUP 2 These are EO/PO block-co-polymers which are used to treat high-gravity crudes, enhance the interface, clean up and improve water clarity. They are often blended with Basorol® Group 1 products to improve the interface and/or water clarity. High RSN value products wet solids and iron sulfides.

GROUP 3 They act as polishers, brighteners and finishing compounds. They can increase the speed of water drop similar to the alkoxylated polyethyleneimines (Group 5). Combination with phenolic resins (Group 1) is recommended to treat low- to medium-gravity crudes.

GROUP 4 Consists of amine alkoxylates which help to reduce residual water and salt content. They can be blended with Basorol® Group 1 products to improve the interface and/or water clarity. High RSN value products wet solids and iron sulfides.

GROUP 5 These alkoxylated polyethyleneimines (PEI) are often used in combination with Basorol® Group 1, especially in low- to medium-gravity crudes. They often lead to improved water clarity.

INITIAL RECOMMENDATION FOR BOTTLE-TESTING

1. Screen Group 1 and Group 5 as single components.
2. Combine the best out of each class (usually 1:1, 1:2, 2:1 ratios).
3. To achieve the desired performance you can also screen for the blockcopolymers (Group 2 + 4) and polyol alkoxylates (Group 3).
4. The use of DDBSA (dodecylbenzylsulfonic acid) can improve formulation performance if added in small amounts (1–2%).

Remarks

- Dilute all products to be screened to 5–10% in an aromatic solvent (add isopropanol if necessary for solubilization) before addition to the crude oil emulsion.
- Shake vigorously after addition to ensure complete mixing of the demulsifier.
- Do not add more than approx. 300 uL of the diluted demulsifier to avoid solvent effects.

FUNCTION GUIDE

The base components of a demulsifier can generally be characterized by their function in breaking up emulsions. In addition it is also noted that several demulsifier bases can be multipurpose in their function depending on the nature of the emulsion.

DROPPERS The function of these components is to help coalesce water droplets and release free water. The most common types are based on alkoxylated resins.

TREATERS The function of these components is to help flocculate sub-micron water particulates that are dispersed in the crude. They are also referred to as drying agents. Alkoxylated polyethyleneimines (PEI) are one of the most successful treater classes within BASF's portfolio.

DESALTERS Emulsions in a desalter unit usually contain low amounts of water and are less stable due to the removal of emulsifing agents in previous demulsification stages. In addition, a high potential electric field is applied to help coalesce the polar salt water droplets. A desalter demulsifier base will exhibit rapid water separation and be able to handle crudes from various origins.

WETTING AGENTS These components' primary function is to interact with solids, e.g. sands or iron sulfides, contained in the crude. High RSN value products serve to change the wettability of their surfaces.

The majority of the crudes worldwide can be treated with a combination of alkoxylated alkyl phenol resins (Group 1) and alkoxylated polyethyleneimines (Group 5) from BASF. This has been proven in > 20 years of field experience in the Eastern Hemisphere.

BASOROL® DEMULSIFIERS

General information

Group	Product name	Product form	Active content (%)
1	Basorol® P DB-9429	Viscous liquid	75–90
	Basorol® P DB-9934*	Viscous liquid	75–90
	Basorol® P DB-9935	Viscous liquid	50–90
	Basorol® P DB-9945*	Viscous liquid	50–90
	Basorol® P DB-9946	Viscous liquid	85–95
	Basorol® P DB-9947	Viscous liquid	> 80
	Basorol® P DB-9954	Viscous liquid	45–65
	Basorol® P DB-9954 A	Viscous liquid	60–75
	Basorol® P DB-9955	Viscous liquid	55–70
	Basorol® P DB-9958	Viscous liquid	80–95
2	Basorol® L 81	Liquid	100
	Basorol® L 101	Liquid	100
	Basorol® PE 9200*	Liquid	100
	Basorol® PE 10100	Liquid	100
	Basorol® 17 R 4*	Liquid	100
3	Basorol® G 3218	Liquid	100
	Basorol® K 3800	Viscous liquid	100
	Basorol® C 1000*	Liquid	60–100
4	Basorol® P DB-9904	Liquid	100
	Basorol® 904	Paste	100
	Basorol® P DB-5951	Liquid	100
5	Basorol® P DB-9390	Liquid	75–90
	Basorol® P DB-9392	Liquid	80–100
	Basorol® P DB-9360	Liquid	76–91
	Basorol® P DB-9393	Viscous liquid	80–100

Demulsifier kits are available upon request from your local sales representative.

* Product is available, but sample not provided in the current kit. Please check with a BASF representative.

		Solubility (10% product)				Function		
Viscosity (cPs) @ 20 °C	RSN	Isopropanol	Water	Kerosene	Aromatic	Water Dropper	Treater/ Dryer	Desalter
1,200–1,600	12	Soluble	Insoluble	Insoluble	Soluble	■		■
8,000–12,000	14–16	Dispersible	Insoluble	Insoluble	Dispersible	■		■
4,000–8,500	17–20	Soluble	Dispersible	Insoluble	Soluble	■		■
6,000–12,000	8–10	Soluble	Insoluble	Insoluble	Soluble	■		■
2,000–5,000	10–12	Dispersible	Insoluble	Insoluble	Soluble	■		■
1,000–3,000	12–14	Dispersible	Dispersible	Insoluble	Soluble	■		■
100–300	11–13	Soluble	Insoluble	Insoluble	Soluble	■		■
700–3,000	10–12	Soluble	Insoluble	Insoluble	Soluble	■		■
1,500	13.5–15.5	Soluble	Dispersible	Insoluble	Soluble	■		■
750–1,250	14–16	Soluble	Insoluble	Insoluble	Soluble	■		■
475 (@ 25 °C)	23.4	Soluble	Insoluble	Insoluble	Soluble		■	
800	9.6	Soluble	Insoluble	Insoluble	Soluble		■	
approx. 900 (@ 23 °C)	18.6	Soluble	Dispersable	Insoluble	Soluble		■	
800	9.7	Soluble	Dispersible	Insoluble	Soluble		■	
600 (@ 25 °C)	29.4	Soluble	Insoluble	Insoluble	Soluble	■	■	
600	13.9	Soluble	Dispersible	Insoluble	Soluble	■	■	
1,370	9.4	Soluble	Insoluble	Insoluble	Soluble	■	■	
99.9	14.5	Soluble	Insoluble	Soluble	Soluble	■	■	
900 (@ 25 °C)	19.2	Soluble	Insoluble	Soluble	Soluble		■	
320 (@ 60 °C)	33.8	Dispersible	Soluble	Insoluble	Dispersible		■	
1,100–1,300	11.0	Soluble	Insoluble	Insoluble	Soluble		■	
740 (@ 50 °C)	13.4	Soluble	Insoluble	Insoluble	Soluble		■	
2,050 (@ 50 °C)	8.3	Soluble	Insoluble	Insoluble	Soluble		■	
5,700	7.0	Dispersible	Insoluble	Insoluble	Dispersible		■	
500–2,000	5–7	Soluble	Insoluble	Insoluble	Soluble		■	

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