Berol® DGR 81 & Berol® LFG 61

Ingredients for highly alkaline and/or highly concentrated liquid cleaning products

For certain cleaning applications a high amount of caustic is required for effective cleaning. Berol LFG 61 and Berol DGR 81 help formulators develop high performance, liquid alkaline cleaners with high electrolytes for low and medium foam cleaning respectively.

Performance advantages of Berol DGR 81 and Berol LFG 61

- Soluble and stable in >40% NaOH
- Good wetting and cleaning properties
- Soluble in high electrolytes
- Soluble in weak and strong acids
- Require no further surfactant be added for effective high-alkali cleaning

Berol DGR 81 and Berol LFG 61 are both readily biodegradable blends.

Wetting

The surface tension of a NaOH solution is high, so in a high alkaline cleaner it is important to get a surfactant in a solution with good wetting properties. Berol DGR 81 has very good wetting at low concentration while Berol LFG 61 needs a higher concentration as the CMC is higher.

Wetting according to Draves test

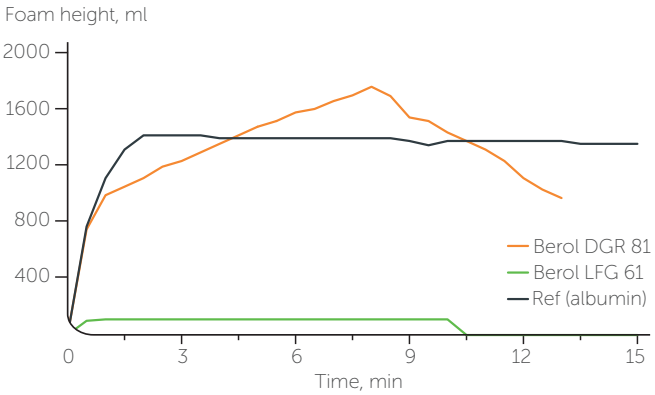
	Berol DGR 81	Berol LFG 61
Draves method 25°C, 0.1%	20 sec	>600 sec
Draves method 25°C, 0.3%		20 sec

Foaming

In many applications low foam is required. Berol LFG 61 is low foaming even at high concentrations. Berol DGR 81 is an excellent degreaser with low to medium foam. In CIP (Cleaning in Place) it is not enough to have a low foaming product, it also has to be de-foaming. In breweries, dairies and machine dishwashing, highly alkaline cleaning products are used, and here it is important not only to clean but also to eliminate protein foam. Berol LFG 61 has de-foaming properties on protein foam. This makes it suitable for use in re-circulating cleaning processes within the food industry.

In some applications foaming is required, and Berol DGR 81 can provide that. Berol DGR 81 can, and should if possible, be used as the only surfactant, but it is compatible with all other types of surfactants, if for example more foam is desired.

Foam height Berol DGR 81 and Berol LFG 61



Foaming profile of Berol DGR 81 and Berol LFG 61 when tested in the circulation method. Albumin was used as a foaming agent. The graph shows that Berol LFG 61 provides anti-foaming properties in this system at 0.033%.

Test formulations and results

	A, %	B, %	C, %	D, %
Berol DGR 81	10	10	10	10
Ampholak® YCE	-	2	-	-
Aromox® MCD-W	-	-	2	-
Aromox® 14D-W970	-	-	-	2
Dissolvine® GL-47-S	10	10	10	10
Water	80	78	78	78
Cloud point, °C	55	>70	61	57
Foam height, mm Vindan RT, 1:20				
Immediately	65	235	135	80
After 5 min	45	225	130	60
Foam height, mm Vindan RT, 1:40				
Immediately	50	220	50	45
After 5 min	35	210	45	35

Outstanding solubility in caustic

Unusually for surfactants, the solubility of both Berol DGR 81 and Berol LFG 61 increases upon the addition of caustic, making them ideal for highly alkaline cleaning applications, and allowing the formulator to develop highly concentrated cleaning products.

Berol DGR 81 and Berol LFG 61 are soluble in >40% NaOH, where other surfactants are difficult to solubilize. Berol DGR 81 and Berol LFG 61 do not need any other surfactant to be solubilized into high electrolytes.

Low concentrations of Berol DGR 81 are not soluble in water which helps the drying effect when rinsing with water. This poor solubility in low concentrations also contributes to good oil separation in the waste water.

Stability of Berol DGR 81 and Berol LFG 61 with caustic and Dissolvine GL-47-S

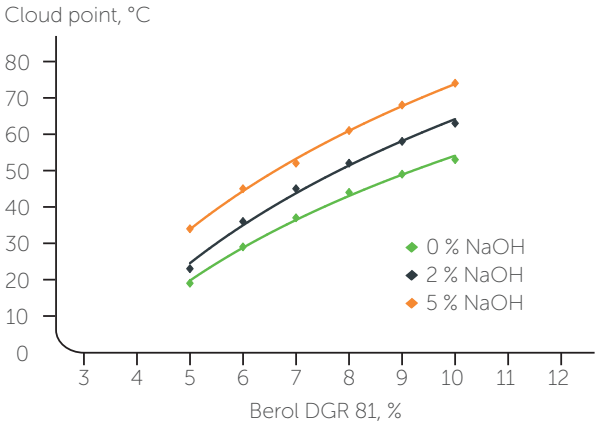
Caustic, %	Dissolvine GL-47-S, %	Water, %	Berol DGR 81 & Berol LFG 61 1%	2%	3%	4%	5%
7.5	1	86.5					
10	1	84					
12.5	1	81.5					
15	1	79					
20	1	74					

Hazy Clear

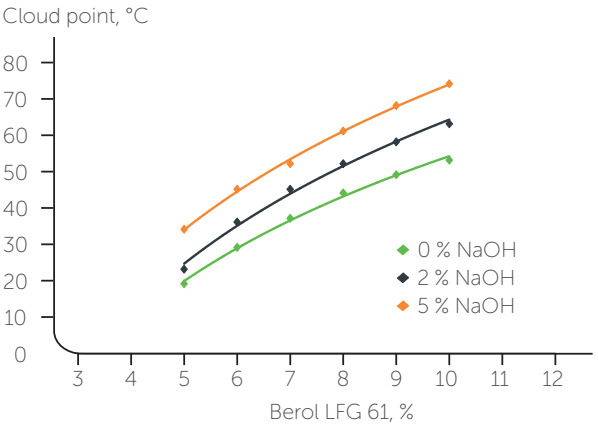
Cloud points rise with concentration

The cloud point increases with increasing amount of Berol LFG 61 or Berol DGR 81 and/or increasing amount of NaOH. Increasing the amount of chelating agent in the formulation has a decreasing effect on the cloud point.

Cloud point Berol DGR 81 + NaOH



Cloud point Berol LFG 61 + NaOH



Both graphs: x% Product, 0, 2 and 5% NaOH,
10% Dissolvine GL-47-S and balance with demineralized water

Degreasing, mineral oil vegetable fat and charred fat

In industrial cleaning, dirt usually contains mineral oil/grease and particles. To emulsify mineral oil a high pH is not important, but to have good dispersing of the particles the pH should be ~11.

When the oil/grease is charred and difficult to emulsify, a high amount of caustic is necessary to boost performance. Both Berol DGR 81 and Berol LFG 61 work well in this situation, due to enhanced wetting and penetration of the soil.

Berol DGR 81, formulated with water and an appropriate complexing agent, is an excellent degreaser and is suitable for use in vehicle cleaning in all types of machines, both in high pressure and brush machines. Low concentrations of Berol DGR 81 are not soluble in water which helps the "drying" effect when rinsing with water. This poor solubility in low concentrations also contributes to very good oil separation in the waste water.

Pigment removal and dispersing

To remove particles and to keep them dispersed in the solution so they do not re-deposit onto the surface is important in all cleaning applications. For example, in vehicle cleaning dirt contains a lot of particles, not only from the road but also from pollution from the air. These particles, "traffic film", are extremely small and very difficult to remove in touchless/brushless machines, which have become more and more common today. Using highly alkaline cleaning formulations, enabled by using Berol LFG 61 or Berol DGR 81, help lift such soils from vehicle surfaces, keeps them dispersed and enhances vehicle cleanliness.

Examples of cleaning formulations

Alkaline cleaner

5-10%	Berol DGR 81 or Berol LFG 61
3-5%	Complexing agent
5-40%	Caustic
Balance	Water
Use concentration	1:10 - 1:40

If more foam is desired a foam booster can be added with Berol DGR 81.

Acid cleaner

4%	Berol DGR 81 or Berol LFG 61
20%	Phosphoric, citric or hydrochloric acid
Balance	Water
Use concentration	As is

Guidelines for processing formulations

1. Start with water
2. Dissolve the salts
3. Add Berol DGR 81 / Berol LFG 61
4. Mix
5. Confirm formulation cloud point reaches target.
6. Repeat steps 3 to 5 with more surfactant if a higher cloud point needed.

Applications

Berol DGR 81

- Vehicle cleaning
- Food industry cleaning
- Engineering cleaning
- Acid cleaning
- Oven cleaning
- Offshore cleaning
- Smokehouse cleaning
- All-purpose cleaning

Berol LFG 61

- CIP (Cleaning in Place)
- Brewery and dairy cleaning
- Machine dishwashing
- Rinse aid for machine dishwashing

Contact us directly for detailed product information and sample request at cleaning@nouryon.com

USA and Canada
Chicago, USA
T +1 312 544 7000

South America
Itupeva, Brazil
T +55 11 4591 8938

Central America and Caribbean
Mexico City, Mexico
T +52 55 5261 7895

China
Shanghai, China
T +86 21 2220 5000

South East Asia
Singapore
T +65 6635 5183

India
Mumbai, India
T +91 22 6842 6700

Europe
Stenungsund, Sweden
T +46 303 850 00

Middle East
Dubai, United Arab Emirates
T +971 (0) 4 2471500

Russia
Moscow, Russia
T +7 495 766 1606

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