

Formulating with Masurf[®] G-2C

Masurf G-2C is a multifunctional co-surfactant for toiletries performing as a thickener, foam booster, skin and hair moisturizer and emollient. G-2C is a very mild and environmentally friendly ingredient for the Personal Care Formulator that also functions to mitigate the irritation profile of typical anionic surfactants used in Personal Care applications.

Mildness/Irritation Reduction

In addition to the reported OECD test data, in vitro methods like the Zein Solubilization test related to skin irritation potential or the Red Blood Cell test related to eye irritation, and Human Occlusive Patch test at 48 hours demonstrate that Masurf G-2C is milder than other well-known co-surfactants.

Test Substance	Zein Solubilization ¹ Zein value (mg N/100ml)	Red Blood Cell ² Denaturation Index DI (%)	48hr Human Patch ³ Irritation Index (%)
Masurf G-2C/SLES	200	35	20
Sodium Laureth Sulfate (SLES)	280	65	55
Sodium Lauryl Sulfate (SLS)			100
Macat Ultra CG/SLES	220		
Macat W/SLES		30	
Masamide CO/SLES			50
Decyl Glucoside/SLES	240	45	25
Water			5

Masurf G-2C: Glycereth-2 Cocoate, **Macat Ultra GC:** Cocamidopropyl Betaine, **Macat W:** Sodium Cocamphoacetate, **Masamide CO:** Cocamide DEA

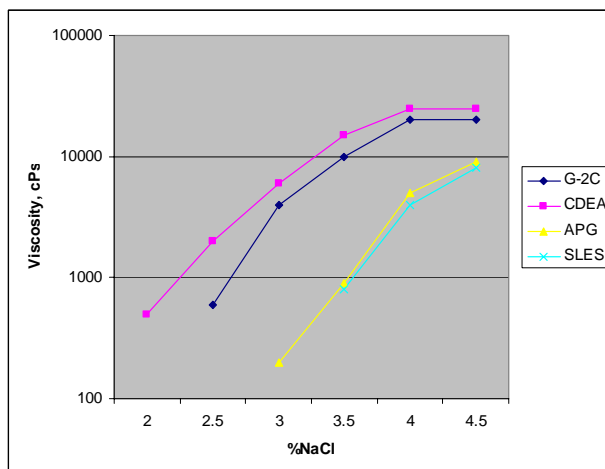
Column 1- Zein solubilization in an aqueous solution of SLES + secondary surfactant at 1:1 ratio. The concentration of SLES is kept constant at 1% in the test solutions.

Column 2 - Denaturation Index (DI) in an aqueous solution of SLES + secondary surfactant at 1:1 ratio. The concentration of SLES is kept constant at 1% in the test solutions.

Column 3 - Irritation index in 48 h Occlusive Human Patch test, in an aqueous solution of SLES + secondary surfactant at 1:1 ratio. The concentration of SLES is kept constant at 2% in the test solutions. Values are expressed as % of average scores, 48 h after patch removal related to the score obtained for SLS.

Thickening Ability

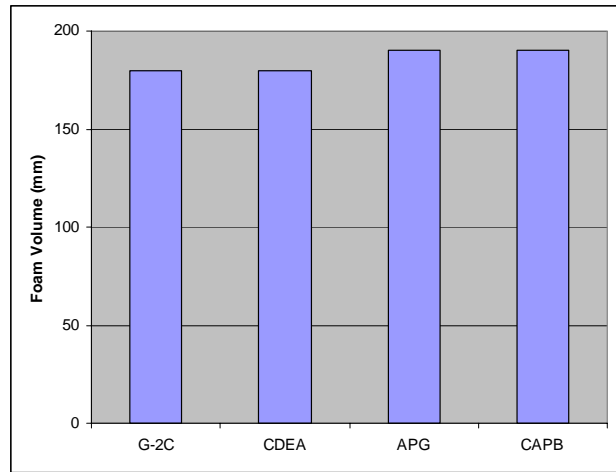
Illustrated in the figure to the right, 2% active co-surfactant was added to a 10% active SLES solution with increasing concentration of Sodium Chloride and viscosity determined. The thickening effect of Masurf G-2C is similar to that of Cocamide DEA (CDEA), but with the advantage of being nitrogen free and nitrosamine free, and being much more effective than Decyl Glucoside (APG).



Foaming Ability

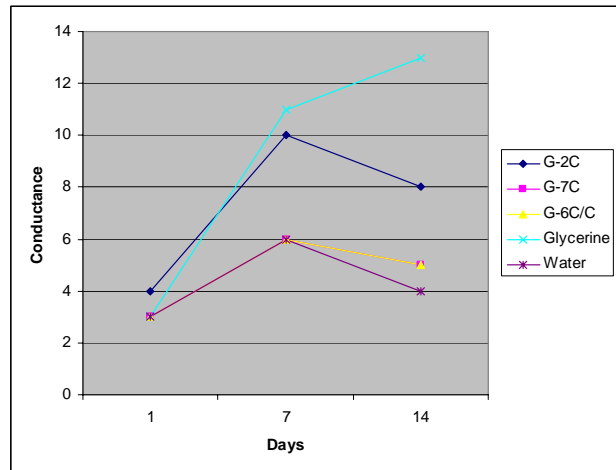
Illustrated in the figure to the right, 2% active co-surfactant was added to a 10% active SLES solution with foaming ability measured by the Ross Miles (DIN 53902) method. Masurf G-2C is a good foam booster and stabilizer, improving creaminess and making foam more pleasant during application. It is comparable to the most used co-surfactants, even in the presence of sebum oils.

G-2C: Masurf G-2C (glycereth-2 cocoate), CDEA: Masamide CO (cocamide DEA), APG: Decyl glucoside, CAPB: Macat Ultra CG (cocamidopropyl betaine)



Moisturizing Effect

The moisturizing effect of glycerine and its derivatives are well known. The moisturizing ability of Masurf G-2C was compared to two different emollients, PEG-7 Glyceryl Cocoate (G-7C) and PEG-6 Caprylic/Capric Glycerides (G-6C/C) in a simple composition containing 10% of emollient, 1.5% Polysorbate 60, 0.5% Sorbitan Monostearate and water. In this illustration glycerin was considered as positive control and water as negative control. After application on the same area 2 times a day for two weeks, conductance was measured. Masurf G-2C showed better effectiveness compared to the other emollients.



Formulation Considerations

It is important to point out that Masurf G-2C is only water dispersible. To maintain low temperature formulation clarity, it is recommended to maintain a ratio of anionic/G-2C to above 10 to 3 (active), or to add other co-surfactants such as Macat Ultra CDO (Cocamidopropylamine Oxide) or Macat LHS (Lauryl Hydroxysultaine). In the examples below, the two thickeners, PEG-150 Distearate and PEG-120 Methyl Glucose Dioleate (**A**) are substituted with 2% of Masurf G-2C, resulting in a similar baby shampoo in viscosity, foaming ability, and mildness, but with an increased cloud point (8°C vs. -10°C). Replacing Macat W (Sodium Cocoamphoacetate) (**B**) with Macat LHS or Macat Ultra CDO results in two final baby shampoos (**C** and **D**) with similar properties and low temperature clarity. Most notably, the use of PEG 150 Distearate, with its melting point and solubilizing issues can be avoided.

Baby Shampoo Components	A Wt%	B Wt%	C Wt%	D Wt%
Water	q.s. to 100%	q.s. to 100%	q.s. to 100%	q.s. to 100%
Sodium Lauryl Ether Sulfate, 27%	8.0	8.0	8.0	8.0
Polysorbate 20	1.0	1.0	1.0	1.0
PEG 150 Distearate	1.2			
PEG-120 Methyl Glucose Dioleate	1.5	0.2	0.6	1.0
Macat W	15.0	15.0		
Macat LHS			13.0	
Macat Ultra CDO				16.5
Masurf G-2C		2.0	2.0	2.0
Viscosity @20°C, cPs	1360	700	2470	3300
Cloud Point, °C	-10	8	-6	-10