



EMULSIFICATION OF COSMETIC INGREDIENTS

The use of emollients is an integral part of the Cosmetic and Personal Care Industry. All product forms - creams, lotions, sticks, aerosols, and liquids benefit by the addition of one or more emollients to the formula. In many cream and lotion systems the emollients are usually lipophilic and must be emulsified and this presents the formulator with the task of selecting the proper emulsifiers. Emulsion stability, processing, and use level are important considerations in making this selection.

This bulletin is designed to help the formulator select the proper emulsifier combination for a given emollient system. The emollients in this brochure are listed by chemical type as follows:

- TABLE I - Mineral Oils and Petrolatum
- TABLE II - Fatty Alcohols
- TABLE III - Esters
- TABLE IV - Lanolin Derivatives
- TABLE V - Fluids and Oils
- TABLE VI - Miscellaneous

Each emollient is accompanied by its required HLB value and one or more emulsifier combinations designed to the required HLB value. For a complete background on the HLB System, please request ICI Literature 103-3.

HOW MUCH EMULSIFIER TO USE?

This requires upfront formula knowledge of the desired stability, viscosity, nature of emollients and end product aesthetics. A good starting point is 3% emulsifier based on the total formula weight for a system with low solids to as much as 10% for a system with high solids. Our vast experience has shown that on the basis of emollient content, the emulsifier concentration should range between 20% to 40% of the oil phase.

MIXTURE OF EMOLLIENTS

Most cosmetic emulsions contain more than one emollient. To determine the required HLB for a mixture, the individual required HLB for each emollient is multiplied by its w/w percentage in the oil phase. The sum of these values gives the approximate required HLB value.

CHEMICAL TYPE OF EMULSIFIERS

The Chemical type of emulsifiers is also important to HLB value. Once the required HLB has been established for a system, it is then important that the correct chemical type emulsifier be selected. This publication suggests various chemical types and combinations of emulsifiers that will produce excellent results.

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Product	Chemical Composition	CTFA Adopted Name
ARLACEL® 40	Sorbitan monopalmitate	Sorbitan palmitate
ARLACEL 60	Sorbitan monostearate	Sorbitan stearate
ARLACEL 80	Sorbitan monooleate	Sorbitan oleate
ARLAMOL® E	Polyoxypropylene 15 stearyl ether with 0.1% BHT added as preservative	PPG-15 stearyl ether
ARLASOLVE® 200	Polyoxyethylene 20 isohexadecyl ether with 0.01% BHA and 0.005% citric acid added as preservatives	Isoceteth-20
BRIJ® 30SP	Polyoxyethylene 4 lauryl ether with 0.01% BHA and 0.005% citric acid added as preservatives	Laureth-4
BRIJ 35SP	Polyoxethylene 23 lauryl ether with 0.01% BHA and 0.005% citric acid added as preservatives	Laureth-23
BRIJ 52	Polyoxyethylene 2 cetyl ether with 0.01% BHA and 0.005% citric acid added as preservatives	Ceteth-2
BRIJ 58	Polyoxyethylene 20 cetyl ether with 0.01% BHA and 0.005% citric acid added as preservatives	Ceteth-20
BRIJ 72	Polyoxyethylene 2 stearyl ether with 0.01% BHA and 0.005% citric acid added as preservatives	Steareth-2
BRIJ 76	Polyoxyethylene 10 stearyl ether with 0.01% BHA and 0.005% citric acid added as preservatives	Steareth-10
BRIJ 78	Polyoxyethylene 20 stearyl ether with 0.01% BHA and 0.005% citric acid added as preservatives	Steareth-20
BRIJ 700	Polyoxyethylene 100 stearyl ether with 0.01% BHA and 0.005% citric acid added as preservatives	Steareth-100
BRIJ 721	Polyoxyethylene 21 stearyl ether with 0.01% BHA and 0.005% citric acid added as preservatives	Steareth-21
TWEEN® 20	Polyoxyethylene 20 sorbitan monolaurate	Polysorbate 20
TWEEN 40	Polyoxyethylene 20 sorbitan monopalmitate	Polysorbate 40
TWEEN 60	Polyoxyethylene 20 sorbitan monostearate	Polysorbate 60
TWEEN 80	Polyoxyethylene 20 sorbitan monooleate	Polysorbate 80
TWEEN 85	Polyoxyethylene 20 sorbitan trioleate	Polysorbate 85

REQUIRED HLB VALUES AND EMULSIFIER RECOMMENDATIONS

Table I
MINERAL OILS AND PETROLATUM

Ingredient	Required HLB (± 1)	Emulsifier Choice	Ratio
Isoparaffinic hydrocarbon Isopar ¹	12.5	TWEEN 21/ARLATONE B	75/25
Mineral oil, light ²	10.5	BRIJ 78/ARLACEL 60 BRIJ 78/BRIJ 72	55/45 55/45
Mineral oil, heavy ³	10.0	BRIJ 721/ARLACEL 60	50/50
Mineral oil, medium Drakeol 190 ⁴	9.0	BRIJ 58/BRIJ 52 BRIJ 700/BRIJ 72	35/65 30/70
Petrolatum	7.0	BRIJ 76/BRIJ 72 BRIJ 78/BRIJ 72 BRIJ 35SP/BRIJ 72	30/70 15/85 20/80
Mineral Jelly, #5 ⁴	6.0	BRIJ 35SP/BRIJ 72 BRIJ 78/BRIJ 72 TWEEN 60/ARLACEL 60	10/90 10/90 10/90

Table II
FATTY ALCOHOLS

Ingredient	Required HLB (± 1)	Emulsifier Choice	Ratio
Stearyl alcohol	15.5	BRIJ 721	100
Cetyl alcohol	15.5	BRIJ 721	100
Isohexadecyl alcohol	11.5	BRIJ 721/ARLACEL 60 BRIJ 78/ARLACEL 60 TWEEN 85	65/35 65/35 100

Table III
ESTERS

Ingredient	Required HLB (± 1)	Emulsifier Choice	Ratio
C ₁₂₋₁₅ Alcohols ⁵	13.0	BRIJ 721/BRIJ 72	75/25
Isopropyl myristate	11.5	BRIJ 78/ARLACEL 60 TWEEN 85	65/35 100
Isopropyl palmitate	11.5	TWEEN 85 BRIJ 78/BRIJ 72	100 65/35
Cetyl palmitate	10.0	BRIJ 721/BRIJ 72	50/50
2-ethylhexyl oxystearate	10.0	BRIJ 721/BRIJ 72	50/50
Isodecyl isononanoate	9.0	BRIJ 721/BRIJ 72	40/60
Diisopropyl adipate	9.0	TWEEN 60/ARLACEL 60 BRIJ 78/BRIJ 72 TWEEN 80/ARLACEL 80	45/55 60/40 45/55
Myristyl myristate	8.5	BRIJ 721/BRIJ 72	35/65
Isotridecyl isononanoate	8.0	BRIJ 721/BRIJ 72	30/70
2-ethylhexyl stearate	7.5	BRIJ 721/BRIJ 72	25/75
Arachidyl propionate	7.0	BRIJ 78/BRIJ 72 ARLASOLVE 200/BRIJ 52	20/80 15.85

Table IV
LANOLIN DERIVATIVES

Ingredient	Required HLB (± 1)	Emulsifier Choice	Ratio
Isopropyl lanolate	14.0	BRIJ 78/BRIJ 72	85/15
Acetylated lanolin	14.0	BRIJ 721/BRIJ 72	85/15
Lanolin, anhydrous	9.0	BRIJ 78/BRIJ 72	40/60
Liquid Lanolin	9.0	ARLASOLVE 200/BRIJ 52 TWEEN 40/ARLACEL 40	35/65 25/75

Table V
FLUIDS AND OILS

Ingredient	Required HLB (± 1)	Emulsifier Choice	Ratio
Silicone Fluid (D4)	8.0	TWEEN 40/ARLACEL 40	15/85
		BRIJ 35SP/BRIJ 52	25/75
		TWEEN 60/ARLACEL 60	30/70
Silicone Fluid (D5)	7.5	BRIJ 78/BRIJ 72	25/75
		TWEEN 40/ARLACEL 40	90/10
Jojoba oil	6-7	BRIJ 721/BRIJ 72	20/80
Arlamol E [®]	7.0	BRIJ 721/BRIJ 72	20/80
Peanut oil	6.0	TWEEN 60/ARLACEL 60	15/85
Cottonseed oil	5.5	TWEEN 60/ARLACEL 60	5/95
		TWEEN 20/ARLACEL 60	5/95
Silicone Fluid 200	5.0	BRIJ 52	100
		BRIJ 72/BRIJ 721	90/10
Mink oil	5.0	TWEEN 60/ARLACEL 60	10/90
		BRIJ 72	100
		BRIJ 52	100

Table VI
MISCELLANEOUS EMOLLIENTS

Ingredient	Required HLB (± 1)	Emulsifier Choice	Ratio
Vita-Cos ⁷	16.0	BRIJ 700/BRIJ 72	80/20
Ritaderm [®]	9.0	BRIJ 721/BRIJ 72	40/60
Castorwax [®]	8.0	BRIJ 721/BRIJ 72	30/70
Vitamin A Palmitate	6.0	BRIJ 721/BRIJ 72	10/90
Vitamin E	6.0	BRIJ 721/BRIJ 72	10/90
Padimate O [®]	10.0	BRIJ 721/BRIJ	50/50
Caprylic/Capric tryglyceride	5.0	ARLACEL 60	100
		BRIJ 72	100