HYDROPHILIC BEESWAX DERIVATIVES†

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Hydrophilic Beeswax Derivatives

Non-ionic emulsifiers in cosmetics have many advantages(1). However, their use has been limited to stearic acid type formulas and W/O emulsions because they did not produce good cold creams. We have developed a series of hydrophilic beeswax derivatives that overcome this deficiency. Chemically, they are a combination of polyoxyethylene sorbitol and beeswax. Physically, they resemble beeswax in color, feel, and odor. Because they are surface active, they may be used as the emulsifier or as a co-emulsifier in preparing soap-free or borax-type cold cream and similar products.

Our study of these hydrophilic beeswax derivatives has included their formulation in cold creams and other cosmetic preparations. The emulsifier in all known cold creams, which are based on beeswax and borax, is the sodium soap of the fatty acids contained in beeswax. By using these new beeswax derivatives several soap-free cold creams have been developed.

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The first of these, Formula 1, is a cold cream formula (2) emulsified by one of the beeswax derivatives used in combination with polyoxyethylene sorbitan monopalmitate.

Formula 1
Cold Cream (Soap-Free)

		Per Cent
A	Mineral Oil	50
	Beeswax	7
	Tween 40*	2
	G-1726	8
B	H_2O	33
	Preservative	
C	Perfume	

The preparation of this type cream differs only slightly from that of a beeswax-borax cream in which the water phase is added to the oil phase. Best results are obtained with this type preparation when the oil phase, including the emulsifier and beeswax derivative, is melted and mixed and then added to the hot water. The creams should be hot-poured.

This formula produces a soft, high gloss cream which is very smooth textured. It "peaks" well and liquefies very readily when applied. It has better elevated temperature stability than several commercial creams.

Although beeswax has been replaced entirely by the beeswax derivatives in Formula 2, it has properties similar to a typical cold cream.

Formula 2
Cold Cream

		Per Cent
A	Mineral Oil	50
	G-1704	12
	G-1726	3
B	Water	35
	Preservative	
C	Perfume	

Preparation: Heat A and B to 70°C. Add B to A slowly with thorough agitation. Continue stirring while cooling. Perfume at 50°C. Pour.

This is a fairly soft, glossy cream which "peaks" well. It liquefies very readily and has good stability at elevated temperature.

These two formulas are examples of creams in which non-ionic emulsifiers are used in order to avoid the disadvantages of soap. However, these hydrophilic beeswax derivatives, like other non-ionic emulsifiers, are not limited to soap-free preparations. The third cold cream formula illustrates the use of the modified beeswax products in combination with soap.

Formula 3
Cold Cream (Soap Type)

		Per Cent
A	Mineral Oil	30.0
	Beeswax	12.0
	G-1704	3.5
	G-1725	1.5
B	Water	52.0
	Borax	1.0
	Preservative	
C	Perfume	

PREPARATION: Heat A and B to 70°C. Add B to A slowly with thorough agitation. Perfume at 50°C. Pour.

This is a soft, very smooth white cream which has excellent stability at high temperatures. It liquefies readily when applied to the skin. It "peaks" well.

These cold creams were evaluated by comparison with samples of popular cold cream (see table). The creams emulsified by the non-ionic derivatives are glossy and smooth textured like most of the purchased creams. They are soft in consistency and "peak" very well. Only a few of the creams used for comparison had good "peak." The creams containing the non-ionics liquefy well; about half of the test creams were non-liquefying. Water content of the test creams as determined by the Fischer titration method ranged from 10 to 35 per cent. Water content of the creams containing the beeswax derivatives ranged from 30 to 50 per cent.

pH was determined on the purchased samples. First, a 50 per cent solution of alcohol was adjusted to a pH of 7.0. Then the sample cream, at 10 per cent concentration, was dissolved in the alcohol, and the pH determined. The pH of most of the purchased creams ranged between eight and ten with about half over nine. The non-ionic creams are neutral.

As purchased, only about half of the cold creams were stable. In testing samples for stability at 50°C., the creams were removed from the jars in which they were purchased and mixed well. Since they were quite soft, this was not considered improper treatment.

They were placed in jars of uniform size and stored in a 50°C. oven for observation. Even the best of the popular cold creams separated oil or water within a week. Many of the creams containing beeswax derivatives were more stable than the commercial creams.

Cold cream is one of the most easily modified creams. By adding materials such as hydrogenated vegetable oils and lanolin, emollient creams can be prepared.

Formula 4
Emollient Cream

		Per Cent
A	Beeswax	5
	Lanolin	3
	Hydrogenated Vegetable Oil	25
	Mineral Oil	20
	G-1702	5
	G-1725	5
	Antioxidant	
B	H_2O	37
	Preservative	
C	Perfume	

PREPARATION: Heat A to 70°C., B to 72°C. Add B to A with constant agitation. Perfume at 45–50°C. Pour.

This is a smooth textured, off-white cream. It has good high temperature stability. Because of its high oil content it has excellent emollient properties.

All-purpose cream, which may serve as a cleanser, emollient cream, and foundation cream, is often based on cold cream. Materials which body the cream and others which add emollience are used in Formula 5 to produce the properties of an all-purpose cream.

This is a glossy, off-white cream in which stearic acid is used for bodying the cream and lanolin and Sorbo are added to give emollient properties. Because of its high mineral oil content, and because it liquefies so readily, it is an excellent cleanser. When removed, it leaves a slight oil film which serves as a foundation for make-up.

Formula 5
All-Purpose Cream

		Per Cent
A	Stearic Acid	10
	Lanolin	4
	Beeswax	2
	Mineral Oil	20
	Tween 40*	8
	G-1706	2
B	Sorbo*	12
	H_2O	42
	Preservative	
C	Perfume	

PREPARATION: Heat A to 70°C., B to 72°C. Add B to A with agitation. Perfume at 50°C. Pour.

The beeswax derivatives also find application in hand lotion formulas. Hand lotions have high water content; this necessitates the inclusion of a hydrophilic material which will permit smooth application rather than a so-called "watery feel." The following formula is a fairly heavy white lotion which has excellent spreading properties.

Formula 6
Hand Lotion

		Per Cent
A	Stearic Acid	2.0
	Lanolin	0.5
	Span 60*	2.5
	G-1734	2.5
B	H_2O	92.5
	Preservative	
C	Perfume	

PREPARATION: Heat A to 90°C., B to 95°C. Add B to A with thorough agitation. Perfume at 50°C. Continue stirring until cool. Pour.

This lotion applies smoothly with a minimum of water roll off.

The hydrophilic beeswax derivatives retain some of the slight tackiness of beeswax and because of this they are useful in formulating hair dressings such as Formula 7.

Formula 7
Hair Dressing

		Per Cent
A	Mineral Oil	20.0
	Beeswax	5.0
	G-1706	2.5
	G-1725	2.5
B	H_2O	70.0
	Preservative	
C	Perfume	

PREPARATION: Heat A and B to 70°C. Add B to A, agitating thoroughly. Perfume at 50°C. Stir until the preparation reaches room temperature. Pour.

This emulsion is moderately heavy but it pours readily from a standard bottle. It has excellent high temperature stability.

A hair dressing which has properties similar to hair dressing containing beeswax may be formulated by replacing beeswax with the hydrophilic beeswax derivatives.

Formula 8
Hair Dressing

		Per Cent
A	Mineral oil	20
	Tween 40*	3
	G-1727	12
B	H_2O	33
	Quince seed mucilage (2½%)	32
C	Perfume	

PREPARATION: Heat A and B to 70°C. Add B to A with constant agitation. Perfume at 50°C. Continue stirring to room temperature. Pour.

The viscosity of this hair dressing can be varied by changing the quince seed content. This lotion, at 0.8% quince seed, is fairly heavy in consistency. The quince seed not only controls viscosity, but also provides some additional dressing for the hair.

The beeswax derivatives used in these formulas are light tan in color and have a consistency and odor like beeswax. Their titers are slightly lower than that of beeswax. The more lipophilic products are generally insoluble in water, like beeswax, while the more completely modified products are water dispersible. Oil solubility decreases with increasing water dispersibility.

There are several guides to formulating with these derivatives. If they are to be used alone as the emulsifiers, it is best to combine the more lipophilic emulsifiers, e.g., G-1702, G-1704, and G-1706, with the more hydrophilic emulsifiers such as G-1725, G-1726, G-1727, and G-1734.

Our tests have indicated that best results are obtained when the beeswax products are used in combination with a Span or Tween. Best emulsification is obtained when the lipophilic products are used with Tweens and when the hydrophilic products are used with Spans.

Consistency is an important consideration in formulation. When a heavy cream is desired, the more lipophilic products, that is those more nearly resembling beeswax, are the best to choose. If a thinner consistency is wanted, it is best to include one of the Tweens when formulating.

Although these rules generally

Properties of Commercial Cold Creams

	Color	Texture	Sheen	Consistency	Liquefying Action	Acid number*	pH†	Approximate % Water‡	Shrinkage	Stability as purchased	Stability at 50°C.
A	White	Smooth	Glossy	Soft, slight "peak"	Very good	0.9	9.2	23	None	Slight oil separation	Slight water separation, 7 days
B	Cream	Smooth	Glossy	Soft, slight "peak"	Very good	0.3	9.3	21	None	Slight oil separation	Slight oil separation, 1 day
C	Off-white	Smooth	Glossy	Soft, slight "peak"	Very good	1.9	8.9	17	Slight	Definite oil separation	Oil separation, 1 day
D	White	Smooth	Glossy	Soft, very slight "peak"	Very good	1.3	8.0	18.5	Slight	Definite oil separation	Oil separation, 1 day
E	Off-white	Smooth	Glossy	Soft, slight "peak"	Very good	1.2	9.7	24.5	None	Stable	Slight oil, water separation, 7 days
F	Flesh	Smooth	Glossy	Firm, good "peak"	Fair	1.4	9.0	20	None	Stable	Oil separation, 1 day
G	Cream	Smooth	Glossy	Medium soft, very good "peak"	Poor	1.8	8.5	19	Slight	Lanolin-like separation	Oil separation, 1 day
H	Cream	Smooth	Glossy	Soft, very good "peak"	Fair	2.0	7.3	30	None	Stable	Slight oil separation, 2 days
J	Off-white	Smooth	Very slightly glossy	Soft, very good "peak"	Poor	6.0	7.0	34	None	Stable	Slight water separation, 2 days
K	Pink	Slightly grainy	Glossy	Medium soft, very slight "peak"	Fair	1.2	8.3	11	None	Oil separation, color streaking	Oil separation, 1 day
L	White	Smooth	Glossy	Firm, poor "peak"	Fair	1.5	9.6	18.5	None	Stable	Oil separation, 1 day

* Beeswax samples from different sources are known to contain different quantities of free fatty acids. Acid numbers of these cold creams may not be comparable because of differences in raw materials.

† pH was determined on 10% solutions of the creams, in 50% alcohol solution previously neutralized to a pH of 7.0.

‡ Water content was determined by the Fischer titration method.

apply it must be remembered that each emulsion problem is different and should be treated individually.

Summary

A new type of beeswax derivative has been developed that is hydrophilic in character. Products ranging in degree of water dispersibility have been prepared. These derivatives may have two functions in cosmetic formulation; they may be used as emulsifiers or, in addition to being used as emulsifiers, they may serve as cosmetic ingredients—i.e., to replace beeswax. These derivatives are non-ionic and they possess characteristic advantages over soaps as emulsifiers.

Although the non-ionics have been widely used by the cosmetic industry, satisfactory soap-free cold creams have not been prepared. The modified beeswax derivatives permit the preparation of soap-free cold creams which have good stability. In combination with other non-ionics, or in soap-type preparations, the beeswax products produce cosmetics which have desirable physical properties as well as unusually good stability.

Ingredients

Beeswax, white—Will and Baumer Candle Co. Borax—General Chemical Co. Hydrogenated Vegetable Oil, "Covo"—Lever Brothers Co. Lanolin, anhydrous—N. I. Malmstrom and Co. Mineral Oil, "Marcol GX"—Standard Oil Co. Quince Seed, Persian No. 1—Orbis Products Corp. Stearic Acid, triple pressed—Hardesty Chemical Co., Inc. Sorbo, Span 60, Tween 40, G-1702, G-1704, G-1706, G-1725, G-1726, G-1727, and G-1734—Atlas Powder Co.

Bibliography

(1) Griffin, W. C., and Rose, R. S., "Cosmetic Formulations Employing Non-Ionic Emulsifiers," Proceedings of the Scientific Section of the Toilet Goods Assoc., Inc., No. 4, Dec. 6, 1945.
(2) DeNavarre, M. G., "The Chemistry and Manufacture of Cosmetics," D. Van Nostrand Co., Inc., New York, N. Y. (1941).

* Span, Tween, Sorbo, Reg. U. S. Pat. Off., Atlas Powder Co.