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ANIONIC ORGANIC SULFATE OR SULFONATE AND NONIONIC ETHOXY-PROPOXY HAIR AND SKIN COMPOSITIONS

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The invention relates to novel compositions for the washing and cleansing of the skin and hair which have a low defatting effect comprising an anionic surface active compound and a high molecular weight alkylene oxide condensation product. The invention also relates to a method of lowering the defatting effect of anionic surface active compositions without eliminating their foaming and cleansing properties.

Liquid and solid synthetic washing and cleansing agents for the care of the skin and hair, particularly shampoos and cake soaps based on sodium alkyl sulfates or sodium alkyl ether sulfates, are characterized by an excellent foaming and cleansing effect. However, they are also known to possess a relatively high defatting effect, particularly on the scalp, hair and hands, which frequently causes drying and flaking of the skin and skin irritations upon prolonged use of these products by persons with sensitive skin.

Prior art attempts to reduce the defatting effect of anionic surface active compounds such as the sodium alkyl sulfates and the sodium alkyl ether sulfates with additives have not been successful without simultaneously reducing the desirable properties thereof. Cationic surface active compounds such as high molecular weight quaternary ammonium salts have been added to liquid anionic shampoos, but only small amounts could be used because larger amounts which effectively prevent the defatting effect practically eliminated the foaming action of the shampoos and therefore a considerable portion of the cleansing action of the shampoos. Also, commercially available cationic surface active agents do not have satisfactory odor properties. The addition of hyper-fatting agents such as paraffin oil, waxes, high molecular weight fatty acids and alkyl esters of high molecular weight fatty acids to anionic surface active compositions has not been successful since they are emulsified in the same manner as the skin oils if used in low concentrations and when used in high enough concentrations to prevent defatting, they interfere with the foaming action and lead to phase separation or cloudiness of the cleansing composition.

It is an object of the invention to provide novel anionic surface active compositions for the care of skin and hair which possess low defatting effects.

It is another object of the invention to provide a novel method of lowering the defatting effect of anionic surface active compositions without eliminating their foaming and cleansing properties.

These and other objects and advantages of the invention will become obvious from the following detailed description.

The novel compositions for the care of skin and hair of the invention are comprised of an anionic surface active compound selected from the group consisting of alkali metal salts of high molecular weight organic sulfonates and sulfates and high molecular weight fatty acids and a mixed alkylene oxide adduct formed by condensing first 5 to 40 mols of ethylene oxide and then 3 to 50 mols of propylene oxide with one mole of a compound selected from the group consisting of high molecular weight amino, carboxylic acid amide, carboxylic acid, hydroxy and mercapto compounds in a weight ratio of 1:9 to 10:1. The molar ratio of ethylene oxide and propylene oxide is about 1:0.1 to 1:15, preferably 1:0.8 to 1:1.2.

The compositions of the invention have a reduced defatting effect depending upon the ratio of anionic surface active agent to mixed alkylene oxide adduct without substantially influencing the desired foaming properties of the anionic surface active agent. Moreover, when the compositions are in liquid form, there is no turbidity or phase separation. Also, the novel compositions of the invention when incorporated into shampoos make the hair noticeably softer and fuller and impart a firm set to the hair making it easier to comb and set than when the anionic surface active agents are used alone in shampoos, particularly if the mixed alkylene oxide adduct is an adduct of a high molecular weight hydroxyl or carboxyl compound.

The novel method of lowering the defatting effect of anionic surface active agents without eliminating their foaming and cleansing properties comprises adding 2 to 60 parts by weight of a mixed alkylene oxide adduct formed by condensing first 5 to 40 mols of ethylene oxide and then 3 to 50 mols of propylene oxide with 1 mol of a compound selected from the group consisting of high molecular weight amino, carboxylic acid amide, carboxylic acid, hydroxyl and mercapto compounds to each 100 parts by weight of an anionic surface active agent selected from the group consisting of the alkali metal salts of high molecular weight organic sulfates and sulfonates and high molecular weight fatty acids.

The mixed alkylene oxide adducts may be formed by condensing 5 to 40 mols of ethylene oxide with the high molecular weight hydroxy, carboxylic acid, carboxylic acid amide, amino or mercapto compound in the presence of an alkaline condensation agent and then 3 to 50 mols of propylene oxide under alkaline conditions. Examples of suitable alkaline condensation agents are caustic soda or potash, sodium ethylate and sodium acetate.

The high molecular weight hydroxyl, carboxylic acid, carboxylic acid amide, amino and mercapto compounds used to form the mixed alkylene oxide adducts may be aliphatic, aliphatic-cycloaliphatic, alkaryl, or aralkyl compounds. Examples of suitable high molecular weight compounds are aliphatic amines, alcohols, carboxylic acids, caroxylic acid amides and mercaptans having 8 to 22 carbon atoms such as dodecyl alcohol, dodecyl amine, dodecyl mercaptan, myristic alcohol, cetyl alcohol, stearyl alcohol, oleic acid, stearic acid, a mixture of fatty acids having 12–18 carbon atoms, behenic acid, carboxylic acids of waxes like abietylic acid, tall oil acids, dodecyl amide, stearyl amine, stearyl mercaptan, mixtures of alcohols having 10 to 22 carbon atoms obtained by reduction of natural glycerides, etc.; aliphatic-cycloaliphatic compounds such as naphthene alcohols, amines and mercaptans; aralkyl compounds such as alkyl benzyl alcohols, amines and mercaptans wherein the alkyl radical has 6 to 22 carbon atoms, etc.; and alkaryl compounds such as alkyl phenols, alkyl anilines and alkyl phenyl mercaptans wherein the alkyl radical has 6 to 22 carbon atoms. The high molecular weight hydroxyl compounds are preferred since the mixed alkylene oxide adducts formed therefrom exhibit an optimum effect on hair when used in shampoos.

The high molecular weight organic sulfates and sulfonates and high molecular weight fatty acids which are useful as anionic surface active agents for the care of skin and hair are well known in the art. The high molecular weight organic sulfates and sulfonates may be aliphatic, or aromatic and may contain hetero atoms or heterocyclic groups. Examples of suitable high molecular weight organic sulfonates and sulfates are aliphatic compounds such as alkyl sulfates and alkyl sulfonates having 6 to 18 carbon atoms, alkyl polyalkylene oxide sulfates wherein the alkyl radical has 6 to 18 carbon atoms, alkali metal

salts of high molecular weight fatty acid esters of hydroxy-alkane sulfonic acids and higher fatty acid amides of amino alkane sulfonic acids wherein the fatty acid has 8 to 18 carbon atoms and the hydroxy alkane sulfonic acid and the amino alkane sulfonic acid have 3 to 8 carbon atoms, alkali metal salts of sulfo-fatty acid esters such as the sodium salt of α-sulfostearic acid ethyl ester, alkali metal salts of the sulfate esters of fatty acid monoethanol amides such as the sodium salt of stearamide mono ethanol amide sulfate, etc.; and alkaryl compounds such as alkyl benzene sulfonates, alkyl naphthalene sulfonates wherein the alkyl radicals have 3 to 12 carbon atoms. The preferred compounds are the alkali metal salts of alkyl sulfates and alkyl polyalkylene oxide sulfates. Examples or high molecular weight fatty acids are acids having 8 to 18 carbon atoms such as lauric acid.

The novel compositions of the invention for the care of skin and hair may be prepared in the usual forms of aqueous solutions, pastes or cakes or as additives to special cosmetic compositions such as hair dyeing and their waving compositions, hair lotions, shaving lotions, face lotions, bath additives, medicated soaps, etc. When used in the usual forms, the compositions may be modified with neutral or alkaline salts such as alkali metal sulfate, alkali metal carbonates, alkali metal bicarbonates and alkali metal borates as well as with colloids such as methyl cellulose, cellulose ether, carboxylic acid salts, gelatin, etc.

In the following examples there are described several preferred embodiments to illustrate the invention. However, it should be understood that the invention is not to be limited to the specific embodiments.

Example I

A mixed alkylene oxide adduct was formed by the condensation of first 20 mols of ethylene oxide and then 27 mols of propylene oxide with a mixture of alkyl alcohols having 12 to 18 carbon atoms and had a turbidity temperature of 23° C. Turbidity tempertture is the temperature at which a clear aqueous solution of the said adduct hydratized upon heating and became cloudy.

Mixtures consisting of various proportions of the said adduct and a sodium alkyl sulfate mixture wherein the alkyl radicals had 12 to 18 carbon atoms were tested for their foaming properties at 25° C. and 40° C. according to test DIN 53,902. The tests were conducted with aqueous solutions containing 2 gm./l. of Na_2SO_4 and 1 gm./l. of the sulfate-adduct mixture, the water having a hardness of 10°. The height of the foam was read immediately after 30 beats. The results of the test are summarized in Table I.

TABLE I

Percent of Mixed Adduct in Sulfate-mixed Adduct Composition	Height of Foam in ml.	
	25° C.	40° C.
0	140	178
10	140	198
20	150	272
30	190	422
40	352	462
50	342	352
60	260	252
70	220	200
80	178	138
90	148	70
100	58	0

The results of Table I show that the foaming properties of the sodium alkyl sulfates are significantly increased when they are used in a mixture containing 20 to 60% by weight of the said mixed adduct.

The said aqueous solutions were tested at 40° C. for 15 minutes for their defatting effect on wool yarn which had been impregnated with skin secretion and a small amount of carbon black pigment so the results of the test could be easily seen. The ratio of yarn to solution was 1:40. The results of the tests which are summarized in Table II show that the defatting effect of the solutions decreases with an increasing percentage of the mixed adduct. Therefore, the degree of defatting may be regulated to fall within the optimum foam formation.

TABLE II

Percent of mixed adduct in sulfate-adduct mixture:	Percent defatting effect
0	67
10	40
20	26
30	19
40	11
50	7
60	8
70	7
80	3
90	2
100	2

Example II

Sodium alkyl polyalkylene oxide sulfates are particularly preferred as hair shampoos because they are less absorbed by the hair than alkyl sulfates. It was therefore of particular interest to combine the mixed adduct employed in Example I with a sodium alkyl polyalkylene oxide sulfate which had been produced from a cocoanut alcohol mixture C_{12}–C_{14}, to which 2 mols of ethylene oxide had been added per mol of mixture and which was subsequently sulfated. 2 parts of Na_2SO_4 were again added to the combination per 1 part of tenside and added to one liter of water having a 10° hardness. The foam test of Example I at 25° C. was repeated with the resulting solutions and the results of Table III show that there is a relatively regular decrease in foaming with an increase in the percentage of the mixed adduct in the mixture.

TABLE III

Percent of mixed adduct in sulfate-adduct mixture:	Height of foam in ml. at 25° C.
0	754
10	708
20	665
30	565
40	400
50	352
60	285
70	230
80	200
90	128
100	60

The defatting test of Example I was repeated with the aqueous solutions used in Table III and show in Table IV that the decreases of defatting effects of the sulfate-mixed adduct mixtures are considerable in the range of good foaming (40 to 60% of mixed adduct).

TABLE IV

Percent of mixed adduct in sulfate-adduct mixture:	Percent defatting effect
0	79
10	46
20	38
30	24
40	17
50	11
60	11
70	10

Percent of mixed adduct in sulfate-adduct mixture:	Percent defatting effect
80	10
90	9
100	0

Example III

A mixed alkylene oxide adduct having a turbidity temperature of 27° C. was formed by condensing first 9 mols of ethylene oxide and then 10 moles of propylene oxide with 1 mol of nonyl phenol and the adduct was used mixed with the alkyl polyalkylene oxide sulfate of Example II in various proportions and the mixtures were tested for defatting effect according to the previous test of Examples I and II. The results are summarized in Table V.

TABLE V

Percent of mixed adduct in sulfate-adduct mixture:	Percent defatting effect
0	79
10	67
20	55
30	41
40	34
50	21
60	12
70	11
80	8
90	6
100	2

Example IV

Because liquid cosmetic compositions such as shampoos contain no salt or only a minor amount of salt, various defatting tests were performed with mixtures of the sodium alkyl polyoxyalkylene sulfate of Example II and various ethylene oxide-propylene oxide adducts listed in Table VI which did not contain the salt additive of Na_2SO_4.

TABLE VI

	High Molecular Organic Hydroxyl Compound	Mols of Ethylene Oxide	Mols of Propylene Oxide	Turbidity Temperature, ° C.
1	Nonyl phenol	9	10	37
2	do	30	5	80
3	Coconut alcohol	20	27	23
4	do	30	16	63
5	Dimeric aliphatic alcohol	10	10	24

The defatting tests were performed on wool impregnated with skin secretion and carbon black pigment in aqueous solution having a 10° hardness and 1 gm./l. of the said sulfate-adduct mixture while maintaining a yarn: solution ratio of 1:40. The results are summarized in Table VII.

TABLE VII

Percent of Ethylene Oxide-Propylene Oxide Adducts in Sulfate-Adduct Mixture	1	2	3	4	5
0	73	72	72	75	72
10	57	59	63	62	63
20	52	55	50	48	48
30	43	44	37	38	22
40	31	30	27	26	7
50	29	17	14	15	0
60	22	13	13	9	0
70	16	10	12	4	0
80	11	0	12	0	0
90		0		0	0
100	7	0	9	0	0

Table VII shows that the reduction of the defatting effect is different, depending upon the quantitative ratios and the type of mixed adduct employed, but that it is at any rate clearly recognizable.

Example V

From Example IV the combination consisting of 70% sodium alkyl polyalkylene oxide sulfate and 30% of the mixed adduct of dimeric aliphatic alcohol (No. 5) was selected. A basic control solution of 28% of the said mixture and a control solution of 28% alkyl polyalkylene oxide sulfate mixture was prepared. Of these control solutions, concentrations between 0.5 and 8.0 gm./l. were compared.

In this concentration range the following tests were performed. The pigment removal effect after washing was determined (I) on the wool sample used in the previous examples and impregnated with skin secretion and carbon black pigment. Further, the wool was impregnated with skin secretion without carbon black pigment, but Ceres violet (R) was added as an indicator, and the defatting effect upon washing was measured in analogous fashion (II). Finally, comparative foam tests with and without the addition of mixed adduct were performed pursuant to DIN 53902 (III). The results are summarized in Table VIII below.

Example VI

A mixed alkylene oxide adduct was formed by con-

TABLE VIII

	Product	28% Tenside Mixture (gm./l.)				
		0.5	1.0	2.0	4.0	8.0
I	Pigment Removal:	Percent brightening after 15 min., 40° C., solution ratio 1:40, 10° dH.				
	Sodium alkyl polyalkylene oxide sulfate mixture.	4	25	38	54	67
	Combination of sulfate and mixed adduct No. 5.	0	0	2	12	17
II	Percent Defatting:	After 15 min., 40° C., solution ratio 1:40, 10° dH.				
	Sodium alkyl polyalkylene oxide sulfate mixture.	35	54	68	73	90
	Combination of sulfate and mixed adduct No. 5.	22	30	33	45	46
III	Foaming Effect:	Foam volume after 30 beats, 40° C., 10° dH				
	Sodium alkyl polyalkylene oxide sulfate mixture.	400	580	760	780	800
	Combination of sulfate and mixed adduct No. 5.	260	360	540	720	790

densing first 20 mols of ethylene oxide and then 6 mols of propylene oxide with 1 mol of a mixture of tallow alcohols. 4 parts by weight of the said mixed adduct, 20 parts by weight of the sodium salt of a coconut alkyl sulfate mixture and 20 parts by weight of the sodium salt of a coconut fatty acid monoethanolamide sulfate mixture were admixed in a soap mill. After the addition of dyestuff, fillers and perfume, the mass was pressed into cakes of soap which had a substantially increased skin compatibility as compared to similar cakes without the mixed adduct.

Example VII

The percentage defatting effect of an anionic surface active mixture of 70% potassium laurate and 30% of the mixed adduct used in Example III was compared with potassium laurate alone over a range of concentrations. Wool yarn, which had been impregnated with 5% skin secretion, was washed at a solution ratio of 1 to 40 for 15 minutes at 40° C. in water of 10° hardness. The following Table IX shows that the concurrent use of the mixed adducts also produced a strong reduction of the defatting effect in this case.

TABLE IX

Conc., g./l.	Percent Defatting Effect	
	100% Potassium Laurate	70% Potassium Laurate, 30% Mixed Adduct
2	0	11
3	38	17
3.5	62	21
4	80	22
5	84	24
6	86	24
6.5	87	----------
7	87	22
7.5	87	----------
8	87	23
9	----------	22

In view of the distinct reduction of the defatting effect, it is also possible to achieve a satisfactory defatting reduction with smaller amounts of mixed adduct, while the foaming power of the mixture is substantially maintained.

Example VIII

The combination of Example VI is substituted by a composition consisting of 7 parts by weight of a condensation product of tallow acids with 10 mols of ethylene oxide and 20 mols of propylene oxide, 40 parts by weight of the sodium salt of a coconut fatty acid monoethanolamide sulfate mixture and 30 parts by weight of the sodium salt of a cocanut alkyl sulfate mixture.

Various modifications of the compositions and method of the invention may be made without departing from the spirit or scope thereof, and it is to be understood that the invention is to be limited only as defined in the appended claims.

We claim:

1. A composition for the care of the skin and hair having low de-fatting properties comprising an anionic surface active compound selected from the group consisting of the alkali metal salts of organic sulfonates and sulfates having 6 to 18 carbon atoms and fatty acids having 8 to 18 carbon atoms; and a mixed alkylene oxide adduct formed by condensing first 5 to 40 mols of ethylene oxide and then 3 to 50 mols of propylene oxide with 1 mol of a compound selected from the group consisting of amines, alcohols, carboxylic acids, carboxylic acid amides and mercaptans, having 8 to 22 carbon atoms in a weight ratio of 1:9 to 10:1.

2. The composition of claim 1 wherein the anionic surface active compound is sodium alkyl sulfate wherein the alkyl radical has 6 to 18 carbon atoms.

3. The composition of claim 1 wherein the anionic surface active compound is sodium alkyl polyalkylene oxide sulfate wherein the alkyl radical has 6 to 18 carbon atoms.

4. The composition of claim 1 wherein the mixed alkylene oxide adduct is derived from an alcohol of 8 to 22 carbon atoms.

5. The composition of claim 1 wherein the mixed alkylene oxide adduct is derived from a carboxylic acid of 8 to 22 carbon atoms.

6. A composition for the care of the skin and hair having low defatting properties comprising sodium alkyl sulfate wherein the alkyl radical has 6 to 18 carbon atoms and a mixed alkylene oxide adduct formed by condensing first 5 to 40 mols of ethylene oxide and then 3 to 50 mols of propylene oxide with one mole of an alcohol of 8 to 22 carbon atoms in a weight ratio of 2:1 to 30:1.

7. A composition for the care of the skin and hair having low defatting properties comprising sodium alkyl polyalkylene oxide sulfate wherein the alkyl radical has 6 to 18 carbon atoms and a mixed alkylene oxide adduct formed by condensing first 5 to 40 mols of ethylene oxide and then 3 to 50 mols of propylene oxide with one mol of an alcohol of 8 to 22 carbon atoms in a weight ratio of 2:1 to 30:1.

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