

[54] SURFACE ACTIVE AGENTS

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[57] **ABSTRACT**

As non-ionic surface active agents are generally low in toxicity they are commonly used as additives in pharmaceuticals, cosmetics, foodstuffs, etc. However, non-ionic surface active agents which exhibit antimicrobial action or rust-inhibiting property have not hitherto been known. The present invention uses hydroxy-fatty acid amide polyoxyalkylene ether, as the active ingredients. As this substance is superior in antimicrobial action and rust-inhibiting property, the surface active agents manufactured according to the present invention exhibit not only the superior properties inherent in the conventional surface active agents, e.g., emulsifying and dispersing power, but also superior rust-inhibiting property and antimicrobial action. Further, if metal soap is added to the surface active agents, the aforementioned properties become more conspicuous.

1 Claim, No Drawings

SURFACE ACTIVE AGENTS

This application is a division of application Ser. No. 119,845, filed Mar. 1, 1971, and now U.S. Pat. No. 3,781,218.

This invention relates to surface active agents containing, as active ingredients, novel hydroxy-fatty acid amide polyoxyalkylene ethers. More particularly, this invention relates to non-ionic surface active agents comprising, as active ingredients, hydroxy-fatty acid amide polyoxyalkylene ethers which exhibit excellent dispersing, rust-inhibiting, antimicrobial and emulsifying properties, and to surface active compositions comprising said ethers and metal soaps which exhibit further improved dispersing, rust-inhibiting, antimicrobial, emulsifying and other general properties.

Heretofore, surface active agents having rust-inhibiting and antimicrobial properties have been known and the examples of such agents are amine-type cation surface active agents and some of the amphoteric surface active agents. However, many of these known agents are strongly toxic and, in addition, the activity of these agents in solution is readily affected by the pH value of the solution. Further, these known agents tend, at low temperatures, to decrease in their ability to solubilize other materials to be dissolved and to decrease their own solubility in a medium and thus these agents have the limited utilities.

The non-ionic surface active agents now available are generally less toxic and, therefore, are often acceptable as additives to pharmaceuticals, cosmetics as well as foodstuffs. However, the non-ionic surface active agents are not useful for the bacteriocidal or germicidal purposes since they generally exhibit no such antimicrobial properties and are on the contrary known to have a growth promoting property with respect to the microorganisms. Further, there are many non-ionic surface active agents which are corrosive in nature, but the agents having rust-inhibiting properties are almost unknown. Accordingly, surface active agents which are both suitable for application to the apparatus, instruments, packages, etc. employed particularly in industries requiring a high degree of sanitation such as the foodstuff, cosmetic and pharmaceutical industries and which also have cleaning, preserving and rust-inhibiting properties were hitherto unknown.

The primary object of this invention is to provide amide-type non-ionic surface active agents which are highly effective as dispersing, rust-inhibiting, antimicrobial and emulsifying agents, as well as surface active compositions containing, as active ingredients, said amide-type non-ionic surface active agents.

The present inventors searched for surface active agents suitable for the above purposes and found that hydroxy-fatty acid amide polyoxyalkylene ethers, one of the amide-type non-ionic surface active agents, have excellent antimicrobial and rust-inhibiting properties, and further that these properties are effectively improved by combining said ethers with metal soaps.

The improved activities obtainable by the surface active agents of this invention are the outstanding features of the present invention in view of the fact that the conventional non-ionic surface active agents generally have no rust-inhibiting property and the fact that, when they are combined with the metal soaps, the rust-inhibiting property inherent to metal soaps is generally

lowered by the corrosive action due to the presence of the non-ionic surface active agents.

The surface active agents of this invention are represented by the formula



wherein R is a hydrocarbon radical having 7 to 21 carbon atoms; R' is selected from the group consisting of hydrogen and a lower alkyl group; y is an integer between 1 and 50; and z is an integer not less than 1.

The surface active composition of this invention comprises the above hydroxyfatty acid amide polyoxyalkylene ethers and the metal soaps which have as their main component a substance represented by the formula



wherein R represents a hydrocarbon radical having 2 to 21 carbon atoms; x is an integer between 1 and 5 equivalent to the atomic valence of the metal M; and M represents a metal, the amount of the metal soaps used being in the range of from equivalent weight to 1/1000 by weight, preferably from equivalent weight to 1/100 on the basis of said ethers.

The novel hydroxy-fatty acid amide polyalkylene ethers of the present invention can be prepared, for example, by reacting a mono- or polyhydroxy-fatty acid ester such as castor oil, hydrogenated castor oil, methyl ricinolate, 12-hydroxy-stearic acid ester, tetrahydroxy stearic acid ester and the like with an alkylene oxide such as ethylene oxide and propylene oxide to obtain a hydroxy-fatty acid ester polyoxyalkylene ether followed by ammonolysis with liquid ammonia, or by subjecting the above hydroxy-fatty acid ester to ammonolysis to obtain the corresponding acid amide which is then reacted with an alkylene oxide. Examples of the hydroxy-fatty acid amide polyoxyalkylene ethers include castor oil fatty acid amide polyoxyethylene ether, ricinoleic acid amide polyoxypropylene ether, hydrogenated castor oil fatty acid amide polyoxyethylene ether, etc. In contrast to the conventional substituted amide-type non-ionic surface active agents, the surface active agents of this invention contain free amide radicals having high hydrogen-bonding strength and hydrophilic radicals in the side chains and, therefore they are excellent in emulsifying, dispersing, wetting and anti-static properties. They also exhibit a potent antimicrobial property and a rust-inhibiting properties on a wide variety of metals and alloys such as iron, aluminum, copper, zinc, nickel, lead, tin, brass, bronze, solder, phosphorus bronze and the like because of their good affinity to the surface of the metals.

Non-ionic surface active agents are, as previously mentioned, generally less toxic, but some of the agents such as alkylphenyl derivatives show a low LD₅₀ value. For example, polyoxyethylene-(9,7)-p-tert-octylphenyl ether is said to have a LD₅₀ value of 1.7 ml/kg (acute toxicity in rat, "Handbook" p267 (1968) issued by Nikko Chemicals Co., Ltd.). The surface active agents of this invention were found to have low toxicity as evidenced by the LD₅₀ value of 20 ml/kg (acute toxicity in

mice) shown by castor oil fatty acid amide polyoxyethylene ether (6 mole addition product). Also, in the mixture of said ether and a metal soap, for example, a mixture of the above ether and a magnesium salt of castor oil fatty acid (5:1 molar ratio), the LD₅₀ value has been found to be 22 ml/kg, indicating that the toxicity is practically negligible.

The surface active agents of this invention give rise to almost no skin irritability or oversensitivity. Mixtures formed by separately combining the 7 and 21 mole product of the above ether with a magnesium salt of castor oil fatty acid (5:1 molar ratio) were diluted to form a 30% water solution and applied to rabbits once daily over a period of ten days. At the end of the test period absolutely no abnormality could be found either by the naked eye or by microscopic inspection of the tissue in either case. A further test was conducted wherein the same solutions were applied to marmots twice daily over a 3 day period. Neither an examination of either animal's reactions nor a microscopic examination of its tissue showed any abnormality.

The metal soaps used in the composition of this invention are well known metal salts of hydroxy-fatty acids of saturated or unsaturated and straight or branched chain containing 2 to 21 carbon atoms or of naphthenic acid or resin acid. The metal useful as the metal salts includes those of I to V valences in the Periodic Table, i.e., Group Ia (Li, Na, K, etc.), Group IIa (Mg, Ca, Ba, etc.), Group IIIa (B, Al, etc.), Group IVb (Si, Sn, Pb, etc.), Group Vb (As, Sb, Bi), Group Ib (Cu, Ag, etc.), Group IIb (Zn, Cd, Hg), Group IVa (Ti, Zr, etc.), Group Va (V, etc.), Group VIa (Cr, Mo, W, etc.), Group VIIa (Mn, etc.), Group VIII (Fe, Co, Ni, etc.), and the like.

As previously described, the surface active composition of this invention can be obtained by blending the amide-type non-ionic surface active agent and the metal soap in a proportion of 1:1 to 1:1/1000 by weight. This can be accomplished either by adding the metal soap to an aqueous solution of the amide-type non-ionic surface active agent or by merely blending together the two components. Since the amide-type non-ionic surface active agents of this invention are highly soluble in water and, in addition, have an excellent ability to dissolve a wide variety of metal soaps, it is possible to obtain a composition containing high concentrations of both the surface active agent and the metal soap. Further, for various applications, the properties of the surface active agent and the composition according to the present invention can be controlled by changing the addition molar numbers of alkylene oxide in the amide-type surface active agent or by changing a proportion of the amide-type surface active agent and the metal soap.

The various properties of the hydroxy-fatty acid amide polyoxyethylene ether of the present invention are as follows: its solubility in petroleum solvents and ethyl ether is a little low, but it is easily soluble in most of the other solvents; the agents in which more than about 7 moles of ethylene oxide are added give a clear aqueous solution; the optimum chain length of polyoxyethylene group (POE) for the emulsifying, solubilizing, and antistatic properties varies depending upon the type of substances for which such properties are utilized; the agents having relatively short chains are superior in lowering of surface tension, in wetting, rust-inhibiting and antimicrobial properties and in wettability; and the agents having relatively long chains are su-

perior in the dispersing, cleaning and foaming properties. Hydroxy-fatty acid amide polyoxypropylene ether has lower water-solubility than that of POE ether and has, in some instances, a solubilizing activity inferior to POE ether.

The metal soap as one of the additives of the surface active composition of this invention shows the following tendency. In the metal soap comprising a different metal and a given fatty acid, the order of higher solubility of the soap is K, Na>Li, Mg>Ba, Mn, Co>Zn, Cd>Pb, Fe, and, in the metal soap comprising a different fatty acid and a given metal, the shorter the chain length, the higher the unsaturation and the more branched chains, the higher the solubility. Also, hydroxylic acids are particularly soluble at a low temperature. The activity of the metal soap is generally superior when the metal is an alkali earth metal, manganese or cobalt, but the metal soaps comprising other metals have also specific characteristics. A potassium and sodium soap and a lithium salt of a hydroxylic acid exhibit an increased solubility in water, and a mixture of one of the above soaps and a hydroxy-fatty acid amide polyalkylene ether ($\gamma = 0-3$) having a short POE chain or a hydroxy-fatty acid amide polyoxypropylene ether give a clear aqueous solution, and is often superior in cleaning and dispersing properties. Further, superior antimicrobial properties are exhibited by silver, lead and bismuth soaps, superior dispersing properties by zinc, zirconium and vanadium soaps, superior emulsifying properties by chrome soap and superior rust-inhibiting and other properties by aluminum soap.

The surface active agent of this invention is further characterized by the fact that its activity is not adversely affected by the changes of pH value. Soaps are generally decomposed and precipitated at acidic pH values thereby losing their surface activity, and other ionic surface active agents are also precipitated more or less in an acidic or alkaline solution, resulting in decrease or loss of their surface activity. In contrast, the surface active composition of this invention shows less decomposition and precipitation over a wide range of pH values because the composition is a solubilized system of the metal soap with the hydroxy-fatty acid amide polyoxyalkylene ether, and, accordingly, the activity of the composition is not significantly lowered in either at acidic or alkaline pH values and is, rather, improved in some instances. In aqueous solutions of non-ionic surface active agents, the shorter the polyoxyethylene chain the lower the cloud point, and their activity sharply decreases at a temperature above the cloud point. However, in the surface active composition of this invention, the increase in the cloud point due to the dissociation of the soap is observed in any cases when, of course, the soap is an alkali soap and even when the soap is a water-insoluble metal soap. For example, when a castor oil fatty acid amide polyoxyethylene ether (6 mole addition product; cloud point, 47.0°C) is combined with magnesium ricinolate at a molar ratio of 5:1, the cloud point rises more than 10°C. This means that the temperature range within which the composition is effective can be broadened, and this is very advantageous in practical use.

The hydroxy-fatty acid amide polyoxyalkylene ethers of this invention can be combined with other substances than the metal soaps as illustrated above. When the surface active agents of this invention are incorporated into various surface active agents, the emulsifying, dispersing, cleaning, solubilizing, rust-inhibiting,

solubility and foaming properties of the resulting blend are strengthened synergistically depending upon the length of the polyoxyalkylene chain in the former agents. When the chain length is relatively short, foam stability, sustained cleaning and wetting properties are significantly improved. The hydroxy-fatty acid amide polyoxyalkylene ethers of this invention exhibit an excellent solubilizing property. Also, those containing a relatively short chain exhibit a potent antimicrobial property. Such properties are useful when, for example, the product is used for dissolving iodine in water thereby preparing an aqueous iodine solution which has excellent antimicrobial property and low toxicity.

The activities of the surface active agent and composition can often be increased by adding thereto various builders. For example, wetting, rust-inhibiting, emulsifying, cleaning and other properties, in particular at acidic pH values, of the 5:1 mole mixture of hydroxy-fatty acid amide polyoxyethylene ether and a magnesium salt of castor oil fatty acid can be increased by incorporating sodium tripolyphosphate in an amount ranging from equimolar to one-fifth mole on the basis of said ether. Other suitable builders include a wide variety of phosphates, sulphates, nitrite, carbonates, borates silicates and ethanalamines and CMC, urea, EDTA, sodium nitrilotriacetate, sodium toluene sulfonate and the like which are known to those skilled in the art.

The hydroxy-fatty acid amide polyoxyalkylene ethers of this invention are easily dispersible or soluble in various organic solvents, and a dispersion or solution in such solvent as benzene, toluene, carbon tetrachloride, trichloroethane, trichloroethylene, iso-propyl alcohol, kerosene, etc. is highly effective in enhancing the cleaning, dispersing, emulsifying, solubilizing, wetting, rust-inhibiting and antistatic properties. The mixture of the ether and the metal soap is also soluble in a wide variety of organic solvents, and a solution of the mixture in benzene, toluene, carbon tetrachloride, cottonseed oil, trichloroethane, trichloroethylene, iso-propanol, kerosene or the like often shows excellent cleaning, dispersing, emulsifying, solubilizing, wetting, rust-inhibiting, antimicrobial and antistatic properties.

As set forth above, the surface active agents of this invention are non-ionic surface active agents being by

nature of relatively low toxicity, but exhibiting an antimicrobial property on some species of the microorganism comparable to that of the cationic surface active agents. Also, the surface active agents of this invention are characterized in that they are useful rust-inhibiting agents with respect to aluminum, iron, copper, etc. Further, the surface active properties of the agents can be improved by incorporating metal soaps and/or other additives.

The following examples illustrate the surface active agents of this invention comprising hydroxy-fatty acid amide polyoxyethylene ether, and the surface active composition comprising said ethers and the metal soaps, but these examples are given for illustrative purpose only and are not to be construed as limiting the scope of this invention.

EXAMPLE 1

The various properties of the known surface active agents were compared with those of the castor oil fatty acid amide polyoxyethylene ethers (8 and 25 mole addition products) at a temperature of 30°C and a concentration of 0.02 mol/l. The results obtained as shown in Table 1. The numerical values in Table 1 were determined according to methods reported by one of the inventors [H. Suzuki, Yukagaku, 15, 475 (1966); *ibid*, 16, 667 (1967); *ibid*, 18, 136 (1969); H. Suzuki Kogyokagaku Zasshi, 72, 2253 (1969); *ibid*, Yukagaku, 19, 125 (1970)]. That is to say, surface tension was determined by the ring method, wetting power for felt and cotton by the disk method, foaming power by the semi-micro improved T-K method and in each of these cases the temperature was 30°C. The results obtained in respect of emulsifying property is that obtained after 2 hours after shaking at 95°C. Dispersing power was determined from the cloudiness after the solution had stood 4 hours after shaking and the antimicrobial action is expressed as the minimum inhibitory concentration obtained by the plate culture method after 3 days at 30°C. The rust-inhibiting property is expressed in terms of change in weight of the metal plate after soaking 10 days at 30°C. The other results are represented in terms of A to E in the order better to poorer results.

Table 1

Property	Surface Active Agent	Products of This Invention		Anionic *3 ABS	Cationic *4 DPC	*5 T-20	Non-ionic *6 NP-15	*7 StAd-15	Remarks
		*1 COAd-8	*2 COAd-25						
*8									
Rust-Inhibiting (mg/dm ² /10 days)	Soft Iron	-5.2	-17.0	-22.7	-85.0	-19.1	-77.0	-81.5	*11
	Aluminum	B	C	E	E	D	D	D	
	Brass	C	C	E	E	C	D	C	
*9	Penicillium	100	1000	500	5	>2000	>2000	1000	*11
Antimicrobial (mol/l × 10 ³)	Citrinum								
	Bacillus	C	D	D	A	E	E	E	*12
	Subtilis								
Dispersing (%)	Manganese Dioxide	41.0	46.2	37.2	2.6	2.2	3.3	26.5	
	Carbon Black	C	A	B	E	A	C	D	
	Felt	13.1	253	16.3	16.4	260	320	180	*11
Wetting (sec)	Cotton	75.1	>500	7.5	>500	>500	>500	>500	*11
	Foam Volume	165	240	262	113	170	242	151	
Foaming (%)	*10								
	Stability	25	19	5	92	46	75	21	
Emulsifying (%)	Kerosene	75	89	90	0	84	90	85	*12
Surface Tension (dyne/cm)		35.5	41.4	36.1	45.2	37.7	42.0	40.7	*11

Table 1-continued

Property	Surface Active Agent	Products of This Invention		Anionic *3	Cationic *4	*5	Non-ionic *6	*7	Remarks
		COAd-8	COAd-25	ABS	DPC	T-20	NP-15	StAd-15	
Antistatic	Nylon-Fabric	B	B	D	D	E	E	C	

*1 Castor oil fatty acid amide polyoxyethylene ether (8 mole addition product).

*2 Castor oil fatty acid amide polyoxyethylene ether (25 mole addition product).

*3 Sodium alkylbenzene sulfonate.

*4 Dodecylpyridinium chloride.

*5 Tween 20.

*6 Polyoxyethylene nonylphenyl ether (15 mole addition product).

*7 Stearic acid amide polyoxyethylene addition product (15 mole addition product).

*8 Determined as difference in weight.

*9 Minimum Inhibitory Concentration.

*10 Foam breaking ratio (determined after one minute); the smaller the more stable.

*11 the smaller the better.

*12 the larger the better.

EXAMPLE 2

The comparative test for various surface active properties was conducted at a temperature of 30°C using each of the compositions consisting of a typical surface active agent and a magnesium salt of castor oil fatty acid in a molar ratio of 0.02 : 0.004 per liter. The results obtained are as shown in Table 2. The compositions used in the above test were prepared in the following manner: 1.30 g castor oil fatty acid amide polyoxyethylene ether (8 mole addition product) was dissolved in 40 ml of water and 0.248 g of a magnesium salt of castor oil fatty acid was added to the solution and the mixture was heated with shaking to dissolve the salt. After cooling, the volume of the resulting solution was made up to 100 ml with water [the molar ratio of 5 : 1, 0.02 : 0.004 (mol/l)].

added to a portion of the solution (1), and the mixture was heated with shaking to dissolve the salt. After cooling, the total volume of the solution was made up to 100 ml with water to produce an aqueous solution (2) of the surface active composition of this invention [the molar ratio of 5 : 1, 0.05 : 0.01 (mol/l)]. The various surface activities of the resulting aqueous solution (1) and (2) at a temperature of 15°C were determined and compared with each other. The results obtained are as shown in Table 3.

Table 3

Property	Solution (1)	Solution (2)
Rust-Inhibiting	Soft Iron	C
	Aluminum	B
	Brass	A
	Penicillium	B

Table 2

Property	Surface Active Agent	Products of This Invention COAd-8	Non-ionic Surfactant NP-15	Cationic Surfactant DPC	Anionic Surfactant ABS
Rust-Inhibiting (mg/dm ² /10 days)	Soft Iron	0	-3.0	-27.0	-8.2
	Aluminum	A	B	B	B
	Brass	B	C	C	C
Antimicrobial (mol/l×10 ⁵)	Penicillium	100	>2000	1	2000
	Citrinum				
	Bacillus	C	E	A	D
	Subtilis				
Dispersing (%)	Manganese Dioxide	57.5	41.5	40.3	50.3
Wetting (sec)	Carbon Black	B	A	C	B
	Felt	1.3	15.2	2.2	2.7
	Cotton	6.1	2.9	13.5	2.4
Foaming (ml)	Foam Volume	220	255	194	152
	Stability	30	64	12	23
Emulsifying (%)	Kerosene	91	92	61	95
Surface Tension (dyne/cm)		33.4	35.1	32.0	30.3
Antistatic	Nylon-Fabric	A	B	B	B

As is clear from the results shown in Table 2, the composition of this invention exhibits the best activity in the rust-inhibiting of the metal and the best antimicrobial action second to the cation surface active agent which is toxic in nature, as well as the best antistatic property, the best dispersing power for manganese dioxide and the best wetting power into the felt.

EXAMPLE 3

3.91 g of castor oil fatty acid amide polyoxyethylene ether (11 mole addition product) was dissolved in water to produce 40 ml of an aqueous solution (1). 0.732 g of a barium salt of castor oil fatty acid was

Antimicrobial	Citrinum	C	A
	Bacillus	E	C
	Subtilis		
	Manganese Dioxide		
Dispersing (%)	Carbon Black	50.1	61.2
Wetting (sec)	Felt	3.5	2.0
	Cotton	3.0	1.3
	Foam Volume	B	A
	Stability	B	A
	Kerosene	B	A
Surface Tension (dyne/cm)		36.0	34.1
Antistatic	Nylon-Fabric	B	A

EXAMPLES 4 TO 10

Table 4

Example	Amide Type	Surfactant Amount (g)	Type	Metal Soap Amount (g)	Molar Ratio	Surfactant/Metal Soap (mol/l) Concentration
4	COAd—20 *1	0.589	Na Laurate	0.037	3/1	0.005/0.00167
5	COAd—13	4.350	Ni Castor Oil Fatty Acid	0.033	100/1	0.05/0.0005
6	COAd—6	0.056	Mg Castor Oil Fatty Acid	0.012	5/1	0.001/0.0002
7	COAd—9	0.347	Ca Oleate	0.030	10/1	0.005/0.0005
8	COAd—17	1.046	Mn Laurate	0.045	10/1	0.01/0.001
9	COAd—4	0.237	K Castor Oil Fatty Acid	0.135	1/0.8	0.005/0.004
10	COAd—14	0.914	Co Laurate	0.076	6/1	0.01/0.00167

*1 The value indicates the molar number of ethylene oxide.

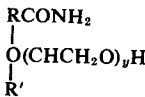
Table 5

Example		4		5		6		7		8		9		10	
Temperature of Solution (°C)		22		22		30		22		22		25		25	
Property	Solution	*1 Sol.	*2 Mix.	Sol.	Mix.	Sol.	Mix.	Sol	Mix.	Sol.	Mix.	Sol.	Mix.	Sol.	Mix.
Rust-Inhibiting	Soft Iron	C	A	C	B	C	A	B	A	C	A	B	A	B	A
	Aluminum	C	B	B	A	B	A	B	B	C	A	C	A	B	A
	Brass	C	B	C	B	C	B	C	B	C	B	C	B	C	B
	Penicillium Citrinum	D	C	B	A	A	A	B	A	C	A	A	A	D	B
Antimicrobial	Bacillus Subtilis	E	E	D	C	D	B	E	D	E	C	D	C	E	B
Dispersing	Manganese Dioxide	B	B	B	A	C	A	C	B	B	A	C	B	B	A
	Carbon Black	C	B	B	A	C	C	C	C	B	B	C	B	C	C
	Felt	E	D	D	C	D	C	C	B	C	A	D	B	B	A
Wetting	Cotton	E	D	D	E	E	E	D	B	C	A	D	B	B	A
Foaming	Foam Volume	B	A	B	A	D	C	C	B	B	A	D	B	B	A
	Stability	B	A	B	A	C	B	B	A	B	A	C	B	B	A
Emulsifying	Kerosene	C	B	B	A	C	B	C	B	B	A	D	B	B	A
Surface Tension (dyne/cm)		42.1	38.1	36.6	34.9	35.2	33.0	35.6	33.5	39.6	32.1	32.5	33.2	38.2	31.6
(dyne/cm)															
Antistatic	Nylon-Fabric	C	B	B	A	C	B	B	B	C	B	C	B	C	B

*1 Solution of castor oil fatty acid amide polyoxyethylenen ether.
*2 Solution of said ether plus barium salt of castor oil fatty acid.

In the same manner as set forth in Example 2, aqueous solutions comprising (1) various addition products of a castor oil fatty acid amide-type non-ionic surface active agent and ethylene oxide in different molar ratios and (2) various metal soaps in different amounts were prepared, and surface activities were determined and compared with those of the aqueous solutions containing only the corresponding addition products. The results obtained are as shown in Table 5. Further, Table 1 shows the composition of the example aqueous solutions shown in Table 5. The volume of each aqueous solution in Table 4 is 100 ml.

What is claimed is:
1. A surface active agent of the formula



wherein R is an alphatic hydrocarbon radical having 17 carbon atoms, and the polyoxyalkylene chain is attached at the No. 12 carbon atom of said RCONH₂ R' is selected from the group consisting of hydrogen and al and a lower alkyl group, and y is an integer of from 1 to 50.

* * * * *