

UNITED STATES PATENT OFFICE

2,651,645

SURFACE ACTIVE AGENTS

James M. Cross, Belvidere, N. J., assignor to General Aniline & Film Corporation, New York, N. Y., a corporation of Delaware

No Drawing. Application June 9, 1948,
Serial No. 32,039

4 Claims. (Cl. 260—401)

1

The present invention relates to surface active agents of the N-acyl-N-aliphatic taurate class, and more particularly to such surface active agents having very high wetting power.

It has long been recognized that compounds containing a hydrophobic and a hydrophilic group possess surface activity. They are capable of reducing the surface tension of water and its interfacial tension against oils. They are good wetting agents, i. e., their solutions wet greasy surfaces much better than water does.

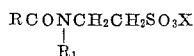
U. S. P. 1,932,180 discloses a number of N-acyl-N-aliphatic taurates, and states that they are suitable for use as washing, cleansing, softening and dispersing agents.

A theory has been developed that improved surface activity is imparted to compounds containing a hydrophobic and hydrophilic group where a balance is struck between the two groups. It has been assumed that in compounds of the class of the aforementioned taurates, the ideal balance is realized where the acyl group is a radical derived from a higher molecular weight vegetal carboxylic acid, i. e., stearic, palmitic, oleic and the like. On the basis of this assumption, it has been believed that the substituent group on the nitrogen atom other than the acyl group has little effect on the surface activity of the involved compounds so long as it does not render the compounds insoluble. As a consequence there have been marketed for years compounds of the above class in which the aliphatic group is methyl and the acyl group is one of the aforesaid radicals.

I have now ascertained that this belief is incorrect and that maximum surface activity is portrayed by the taurates if a definite ratio be maintained between the sum of the carbon atoms in the acyl group and in the aliphatic substituent on the nitrogen atom on the one hand, and the carbon atoms in the acyl group, and such aliphatic substituent on the other hand.

Compounds possessing maximum surface activity by such apportionment of the carbon atoms in the involved radicals constitute the purposes and objects of the present invention.

The compounds contemplated herein have the following structural formula:



wherein R is alkyl, R₁ is an aliphatic hydrocarbon radical, i. e., alkyl or cycloalkyl, and X is hydrogen or an alkali metal or ammonium. In these compounds the sum of the carbon atoms in RCO

2

and R₁ must be at least 16 but not greater than 19. The number of carbon atoms in RCO must be at least 8 but not greater than 14, whereas the number of carbon atoms in R₁ must be at least 5 but not greater than 8. This of course means that the carbon atoms in R must be in the range of from 7 to 13. It has been found that if these conditions are observed, the surface activity of the compounds is very high as calculated from wetting power according to the Draves method. If, however, the ratios set forth be disregarded, then automatically the wetting power of the resulting compounds decreases materially.

Based on the values given for RCO above, it will be apparent that R must be heptyl, octyl, nonyl, decyl, undecyl, dodecyl or tridecyl. R₁, on the other hand, must be amyl, isoamyl, hexyl, heptyl, octyl, iso-octyl, cyclohexyl or the like, so long as the number of carbon atoms is within the stated range. X is hydrogen, sodium, potassium, lithium, ammonium or the like.

The compounds are prepared according to conventional methods, as by reacting the desired acyl chloride with the desired taurate salt in the presence of an acid binding agent at a temperature ranging from about 5 to 50° C. Suitable acid binding agents are caustic soda or pyridine.

The alkali metal salt of the taurines used are for the most part well known compounds. In any case they can be prepared by heating to a temperature ranging from 180 to 240° C. an aqueous alkaline solution of hydroxyethyl sulfonic acid and the desired amine. The alkalinity may be supplied by the use of alkali metal hydroxide, such as caustic soda, caustic potash and the like, sodium carbonate, potassium carbonate, etc.

Examples of compounds embraced by the above formula and which we have found to have very high wetting properties are the sodium or other alkali metal salt of:

1. N-lauroyl-N-hexyl taurate;
2. N-lauroyl-N-(amyl-isoamyl mixture) taurate;
3. N-decanoyl-N-octyl taurate;
4. N-myristoyl-N-(amyl-isoamyl mixture) taurate;
5. N-decanoyl-N-heptyl taurate;
6. N-caprylyl-N-octyl taurate;
7. N-undecenoyl-N-octyl taurate;
8. N-lauroyl-N-heptyl taurate;
9. N-lauroyl-N-cyclohexyl taurate;
10. N-decanoyl-N(2-ethylhexyl) taurate.

3

The term "amyl-isoamyl mixture" as employed above means that the hydrocarbon substituent on the taurate-N atom is either the amyl or the isoamyl radical, i. e., the product is a mixture of the amyl and isoamyl derivatives. The corresponding taurate is prepared from a commercial mixture of amyl amines.

The invention is illustrated by the following table which discloses the wetting power of the compounds contemplated herein in terms of grams per liter of the wetting agent necessary to give a 25 second sinking time at 25° C. while utilizing a 1.5 gram hook or a 3.0 gram hook (Draves test). As test pieces, unboiled cotton skeins weighing 5 grams and being 18 inches in length are attached to the aforesaid hooks. The skeins are placed in a 500 cc. glass cylinder containing the wetting agent in aqueous solution.

RCO	R ₁	1.5 Gm. Hook	3.0 Gm. Hook
12 lauroyl.....	6 hexyl.....	.33	.187
Do.....	5 amyl and isoamyl mixture.	.30	.210
10 decanoyl.....	8 octyl.....	.44	.228
14 myristoyl.....	5 amyl and isoamyl mixture.	.487	.246
10 decanoyl.....	7 heptyl.....	.26	.19
8 caprylyl.....	8 octyl.....	.36	.29
11 undecenoyl.....	do.....	.485	.3
12 lauroyl.....	7 heptyl.....	.46	.33
Do.....	6 cyclohexyl.....	.40	.265
10 decanoyl.....	8 2-ethylhexyl.....		.167

The wetting efficiency of the compounds in this table is in marked contrast to the wetting efficiency of similar compounds, which, however, do not conform to the stated requirements. This is established by the following table:

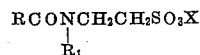
RCO	R ₁	1.5 Gm. Hook	3.0 Gm. Hook
12 lauroyl.....	1 methyl.....	Too weak to measure..	9.5
16 palmityl.....	4 butyl.....	>10.....	1.92
14 myristoyl.....	do.....	1.....	<1
11 undecenoyl.....	1 methyl.....	7.35.....	6.75
18 9-octadecanoyl.....	6 cyclohexyl.....	poor, inconsistent.....	2.50
Do.....	5 amyl.....	4.5.....	2.25

4

Various modifications of the invention will occur to persons skilled in this art, and I therefore do not intend to be limited in the patent granted except as necessitated by the appended claims.

I claim:

1. Compounds of the following formula:



wherein R is an alkyl radical, R₁ is a saturated aliphatic hydrocarbon radical, and X is selected from the class consisting of hydrogen and salt forming groups, the sum of the carbon atoms in RCO and R₁ being at least 16 but not greater than 19, the number of carbon atoms in RCO being at least 8 but not greater than 14 and the number of carbon atoms in R₁ being at least 5 but not greater than 8.

2. The sodium salt of N-decanoyl-N-(2-ethylhexyl)-taurine.

3. The sodium salt of N-lauroyl-N-hexyl taurine.

4. The mixture of the sodium salts of N-lauroyl-N-amyl-taurine and N-lauroyl-N-iso-amyl taurine.

JAMES M. CROSS.

References Cited in the file of this patent

UNITED STATES PATENTS

Number	Name	Date
1,932,180	Guenther et al.	Oct. 24, 1933
2,045,015	Koerding et al.	June 23, 1936