

UNITED STATES PATENT OFFICE

2,619,467

DETERGENT MIXTURES CONTAINING
BETA AMINO PROPIONATESArthur F. Isbell, Minneapolis, Minn., assignor to
General Mills, Inc., a corporation of DelawareNo Drawing. Application April 16, 1949,
Serial No. 88,049

5 Claims. (Cl. 252-152)

1

The present invention relates to novel detergent compositions which possess unusual properties which render them of extreme value.

The detergent compositions of the present invention are composed of a plurality of ingredients, one of which has the following formula:



in which R is an aliphatic hydrocarbon group containing from twelve to eighteen carbon atoms, and X is a cation which renders the compound water soluble. Another essential ingredient of the composition is a detergent having greater hydrophilic properties than the above compounds. Typical cations in the compounds of the above formula include the alkali metal ions, ammonium ions, and organic base ions. These compounds in and of themselves possess certain detergent and surface-active properties. Some of them, particularly those in which R is a C_{12} group, are excellent surface-active agents and detergents by themselves. Others within this group, particularly those in which the R group contains from C_{14} to C_{18} , and especially those in which R contains from C_{16} to C_{18} , are less effective as foaming agents, although they do possess certain detergent surface-active properties.

These compounds may be prepared by the reaction of the corresponding amine with an ester of acrylic acid in accordance with my copending application, Serial No. 609,329, filed August 6, 1945, now Patent No. 2,468,012 issued April 19, 1949, entitled Beta Amino Propionates. This reaction results in the simple addition of the amine to the acrylic ester. The ester thus obtained may readily be hydrolyzed and converted to any suitable cationic derivative. The amines which may be employed for this condensation include the fatty amines containing from 10 to 18 carbon atoms, either saturated or unsaturated, and either straight or branched chain. They may be isolated pure amines, or may be composed of mixtures of amines, for example the mixture of amines obtained from the mixed acids of a fat or oil. They may be made from any selected saturated or unsaturated fractions of such oil acids. In general the compounds having the above formula possess similar properties but differ in the extent of their surface active and detergent properties.

It has been found that the surface-active properties and detergent properties of these compounds can be improved by mixing them with other surface-active agents which have a more predominantly hydrophilic character.

The hydrophilic surface-active agents which may be used with the beta-amino propionates

2

are of a wide variety. They include the beta-amino propionates having the above formula in which R has less than twelve carbon atoms, preferably from 6 to 10 carbon atoms. Typical of these compounds are the ones in which R is a normal heptyl or octyl group. They also include alkyl aryl sulfonates, particularly where the alkyl group is a short chain group containing 1 to 6 carbon atoms. Typical compounds include toluene sulfonate, xylene sulfonate. These sulfonates are preferably used in the form of a soluble salt. These ionic hydrophilic surface-active agents also include soluble salts of sulfates of a large variety of hydroxy compounds, including the fatty alcohols of intermediate molecular weight, polyalkylene oxide derivatives of compounds having lipophilic groups, such as alkylated phenols, fatty acid amides, and fatty acids, particularly ethylene oxide derivatives of such compounds. The hydrophilic surface-active agents useful in the present invention also include non-ionic materials such as alkylene oxide condensation products of alkylated phenol, polyalkylene glycol esters of higher fatty acids, and alkylene oxide derivatives of higher fatty acid amides, particularly ethylene oxide derivatives of such compounds.

All of the above compounds appear to alter the physical characteristics of the high molecular weight substituted beta-amino propionates. The effect of these added agents, however, is not uniform in all cases. Some of them appear to make foaming compositions out of the beta-amino propionates which in and of themselves are incapable of effecting any great degree of foam formation. For example, the beta-amino propionate in which R is predominantly the C_{18} hydrocarbon radical, is found not to produce any great amount of foam upon being agitated in water. The addition of a sodium salt of the beta-amino propionic acid in which the amino group is substituted with a normal heptyl or octyl group, produces copious quantities of foam with the C_{18} beta-amino propionate. Likewise, the addition of certain ethylene oxide derivatives of alkyl phenols to the C_{18} beta-amino propionates, results in the production of large quantities of foam. In other instances the effect of the added agent may be upon the character of the foam. For example, sodium beta-dodecylaminopropionate by itself produces copious quantities of foam. The addition of a small quantity of the sodium salt of the sulfate of lauryl alcohol produces a mixture that gives foam of higher quality than that which results from either of the ingredients alone. A similar result is obtained by the addition of sodium salt of xylene

sulfonic acid to the sodium beta-dodecylamino-propionate.

The alkyl-substituted beta-amino propionic acid salts may also be mixed with a variety of other materials. For example, they may be mixed either by themselves or in admixture with the hydrophilic wetting agents, with such builders as various phosphate salts, sulfate salts, carbonates, silicates, borates, particularly the alkali metal salts of these various acids. Other soil removing agents such as carboxymethyl cellulose, and related materials may also be compounded with these products. Similarly, the alkyl-substituted beta-amino propionic acid salts may be mixed with beta-amino propionic acid salts derived from rosin amines. These are found to result in tremendous increases in the foaming properties of the alkyl-substituted beta-amino propionic acid salts.

The following examples will serve to illustrate the invention:

Example 1

A comparison was made between the foaming ability of a 0.1% solution of the sodium salt of beta-amino propionic acid prepared from the amines derived from soybean oil acids, with a 0.1% solution of a mixture of the same beta-amino propionate with an ethylene oxide derivative of an alkyl phenol in which the mixture was composed of 95 parts of the beta-amino propionate and 5 parts of the alkyl phenol ethylene oxide derivative. The comparison was made in the standard Ross Miles foaming test. The results show that the beta-amino propionate compound by itself gave 31 mm. of foam, whereas the mixture gave 115 mm. The ethylene oxide derivative of the alkyl phenol at 0.1% gave 94 mm. of foam by itself under similar conditions.

Example 2

A comparison was made between the foaming ability of a 0.1% solution of the sodium salt of beta-amino propionic acid prepared from the amines derived from soybean oil acids, with a 0.1% solution of a mixture of the same beta-amino propionic acid salt with the sodium salt of beta-amino propionic acid derived from n-heptyl amine, with the following results:

Detergents	Ratio A to B	Foaming Test
Heptyl (A).....		None.
Soy (B).....		39 mm.
	5:95	44 mm.
Heptyl (A)+Soy (B).....	25:75	45 mm.
	50:50	104 mm.

Example 3

A comparison was made between the foaming ability of a 0.1% solution of the sodium salt of beta-amino propionic acid prepared from the amines derived from soybean oil acids, with a 0.1% solution of a mixture of the same beta-amino propionic acid salt with sodium xylene sulfonate with the following results:

Detergents	Ratio A to B	Foaming Test
Sulfonate (A).....		Mm.
Soy (B).....		18
	5:95	39
Sulfonate (A)+Soy (B).....	25:75	43
	50:50	44
		53

This example demonstrates how a very inexpensive material such as sodium xylene sulfonate can be used in high concentration with the more expensive beta-amino propionate salt, and at the same time materially improve its foaming characteristics. Thus a substantial increase in foaming properties is obtained along with a very substantial reduction in the cost of the composition.

Example 4

A comparison was made between a 0.1% solution of the sodium beta-amino propionates derived from the soybean oil acid amines with a 0.1% solution of a mixture composed of 85 parts of the soybean oil acid amine derivative and 15 parts of the sodium salt of beta-amino propionic acid derived from rosin acid amines. The comparison was made in accordance with the Ross Miles foaming test referred to in Example 1. The results show that the sample composed solely of the soybean oil acid amine derivative produced 31 mm. of foam, whereas the mixture produced 143 mm. The rosin acid derivative by itself produced a foam of 113 mm.

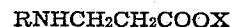
The beta-amino propionate salts having the formula herein described are also compatible with soaps in general, and the soaps may be used as extenders for these beta-amino propionates.

The above examples are intended to be illustrative only and not as limiting the invention. It will be apparent from the examples that considerable variation is possible in the relative proportions of ingredients. The examples show that various characteristic properties may be developed by varying relative proportions. It is also apparent that the specific examples show the effect of typical compounds within the group which they represent. It will be apparent that other compounds within the same group may be used in the examples with the same or similar effect.

While various modifications of the invention have been described, it will be apparent that other modifications are possible without departing from the spirit of the invention.

I claim as my invention:

1. A detergent composition comprising a mixture of a beta-amino propionate compound having the formula



in which R is an aliphatic hydrocarbon group containing from 12 to 18 carbon atoms and X is a cation which renders the compound water-soluble, and a detergent compound having greater hydrophilic properties than said beta-amino propionate, said detergent compound being selected from the group consisting of water soluble salts of alkylaryl sulfonates in which the alkyl group contains from 1-6 carbon atoms, ethylene oxide derivatives of alkylphenol and beta amino propionates having the above formula in which R is an aliphatic hydrocarbon group containing from 6-10 carbon atoms.

2. A detergent composition comprising a mixture of a beta-amino propionate compound having the formula



in which R is an aliphatic hydrocarbon group containing from 12 to 18 carbon atoms and X is a cation which renders the compound water-soluble, and a water-soluble salt of an alkylaryl sulfonate in which the alkyl group contains from 1-6 carbon atoms.

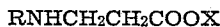
5

3. A detergent composition comprising a mixture of a beta-amino propionate compound having the formula



in which R is an aliphatic hydrocarbon group containing from 12 to 18 carbon atoms and X is a cation which renders the compound water-soluble, and an ethylene oxide derivative of an alkyl phenol.

4. A detergent composition comprising a mixture of beta-amino propionate compounds having the following formula



in which X is a cation which renders the compound water-soluble, in one of said compounds R being an aliphatic hydrocarbon group containing from 14 to 18 carbon atoms, and in another of said compounds R being an aliphatic hydrocarbon group containing from 6 to 10 carbon atoms.

5. A detergent composition comprising a mixture of compounds having the following formula



6

in which X is an alkali metal and in which R is the mixed aliphatic hydrocarbon groups of the amines derived from a fatty oil, said composition also containing a compound having the above formula in which X is an alkali metal and in which R is an aliphatic hydrocarbon group containing from 6 to 10 carbon atoms.

ARTHUR F. ISBELL.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
1,968,793	Bertsch	July 31, 1934
1,970,578	Schoeller	Aug. 21, 1934
2,097,864	Platz	Nov. 2, 1937
2,164,781	Platz	July 4, 1939
2,195,974	Reppe	Apr. 2, 1940
2,413,968	Hallowell	Jan. 7, 1947