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DETERGENT COMPOSITION

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The present invention relates to detergent compositions and more particularly, to washing and cleansing compositions adapted for general household use as well as for various specific applications, such as bubble bath and shampoo preparations, and the like.

Detergent compositions intended for general household purposes are required to have very considerable foaming power, first because of the real contribution to the cleansing effect rendered by the physical action of the foam, and second because of the firmly rooted belief of detergent users that foaming power is a direct function of cleansing capacity.

Detergent compositions which are to be used for general household purposes and are in addition intended to serve as bubble bath, shampoo and similar preparations, place even greater emphasis on foaming power. This is attributable to the fact that gas forming ingredients must be avoided in products designed for general household utility as a consequence of which foam alone must be relied upon for the physical effects associated with bubble bath and like preparations.

Accordingly, it is an object of the present invention to provide detergent compositions distinguished by superior foaming power.

Detergent compositions intended for the general and specific uses referred to above, must have not only a maximum of foaming power, but moreover a foam curve of such characteristics that an excess of detergent will not reduce or even destroy the foam.

For industrial applications, where the amount of detergent is precisely controlled, the foam curve may have a maximum beyond which the addition of detergent may reduce or even destroy the foam. For household uses, however, where no such control exists, it is essential that the foam, once it is built up, is not destroyed nor even reduced by an addition of detergent. Moreover, in order to be economical, the detergent composition not only should permit the addition of detergent without harmful effect on the foam already formed, but should cause such addition to result in a further increase in foam so that the entire amount of detergent is utilized for foam generating purposes.

Accordingly, it is a further object of this invention to provide detergent compositions distinguished by a straight line foam curve and a corresponding increase in foam by the addition of detergent.

Detergent compositions for household uses, in

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order to be economical, should permit the re-use of the cleansing solution once the first foam has collapsed. As a rule, however, detergent compositions now on the market will not permit new foam to be formed once the first foam has fallen, regardless of how much detergent is added. Inasmuch as the housewife is convinced that foam and the power to cleanse are one and the same thing, this generally means the discarding of the cleansing solution. It is idle to belabor the obvious wastes so entailed.

Accordingly, it is still another object of this invention to provide detergent compositions having regenerative foaming power.

For the purposes for which the present detergent compositions are intended, and particularly for such specific applications as bubble bath and shampoo preparations, it is preferable to market the compositions in liquid form. Detergent compositions in liquid form, however, tend to have a clouded appearance, and the clouded liquid does not appeal to the purchaser.

Another object of the invention, therefore, is to provide detergent compositions in the form of a clear, stable liquid.

Detergent compositions in liquid form also have the disadvantage that they tend to freeze at subnormal temperatures. This drawback, of course, places severe limitations on transportation, storage and operating conditions.

Accordingly, it is a still further object of the invention to provide a detergent composition in the form of a liquid which does not freeze at low temperatures.

Other objects, and the manner in which the same are attained, will be apparent as the specification proceeds.

We have discovered that detergent compositions meeting the objectives of the invention may be obtained by a combination of several components as more specifically pointed out below.

The basic ingredients of our composition are synthetic detergents of the gel-forming type, i. e. non-soap detergents which in admixture with a small quantity of water, form a gel. Among the many synthetic detergents which have been discovered, only a comparatively small number exhibit this property of gel-formation with water. Preferably, the synthetic gel-forming detergents selected for our compositions have the additional property of being at least slightly soluble in water, a solubility of at least 3% being desirable.

Synthetic detergents of the gel-forming type which may serve as the basic ingredients of our compositions include, for example, long chain fat-

ty acid taurides and their N-alkyl derivatives, long chain fatty acid sarcosides, and long chain fatty acid esters of hydroxy alkyl sulfonic acids.

As examples of the first class of the involved synthetic detergents, reference may be made to the sodium salt of oleyl methyl tauride, the potassium salt of cottonseed oil fatty acid ethyl tauride, the sodium salt of corn oil fatty acid methyl tauride, the sodium salt of linoleic acid methyl tauride and the like. Suitable long chain fatty acid sarcosides are the potassium salt of oleic acid sarcoside, the sodium salt of palm kernel fatty acid sarcoside, the potassium salt of linoleic acid sarcoside and the like. Illustrative of the last class of the aforesaid synthetic detergents are the sodium β-oleyl ethane sulfonate, the potassium salt of corn oil fatty acid ethane sulfonate, the sodium salt of β-ricinoleyl ethanesulfonate and the like.

The quantity of the detergent ingredient which may be utilized varies within fairly wide limits, being effective in amounts ranging from about 5 to about 25% of the composition.

Another essential ingredient of the composition is an agent for changing the micelle structure of the detergent gel-component. This agent has the important function of transforming the micelle structure of the gel to that of a free flowing, mobile liquid. These agents must not only influence the micelle structure of the detergent gel-component, but also must be soluble in water.

We have discovered that suitable agents for transforming the micelle structure of the gel-component, are water-soluble organic compounds having a diethyleneglycol structure, or water-soluble organic compounds containing a butyl radical, and preferably, water soluble organic compounds having both a diethyleneglycol structure and a mono-butyl radical.

Diethyleneglycol mono-butyl-ether of the formula $C_4H_9OCH_2CH_2OCH_2CH_2OH$ is a preferred example of an agent for transforming the micelle structure of the gel-component of the composition. This compound is prepared from butyl alcohol by addition of two moles of ethylene oxide, and is relatively non-volatile, boiling as it does at 230° C. Butyl alcohol, butyl acetate, or diethyleneglycol monoethylether are other examples of agents suitable for transforming the micelle structure of the gel-component. These agents may be present in amounts varying from about 1.25% to about 12.5% of the composition.

In addition to transforming the micelle structure of the detergent gel-component, the diethyleneglycol mono-butyl-ether or similar agent changes the foam characteristics of the detergent. Whereas the detergent, by itself, has a foam curve with a maximum, i. e., a foam curve which tapers off after a peak point has been reached so that a further addition of detergent reduces rather than increases the amount of foam, the diethyleneglycol mono-butyl-ether or similar agent, when combined with the detergent component, has the effect of changing the foam curve into a straight line, which means that additional amounts of detergent composition result in proportional increases in foam.

The micelle structure transforming agent has the further effect of imparting regenerative foaming power to the composition. Thus, when foam generation has ceased and the foam has been used up in a cleansing operation, the diethyleneglycol mono-butyl-ether or similar agent causes a further addition of detergent to be effective in rebuilding the foam. This is a surprising effect and in marked contrast to the behavior of the detergent components per se which, once foam generation has stopped and the foam has fallen, do not rebuild the foam regardless of the amount of detergent added.

Incorporation into the compositions of the diethyleneglycol mono-butyl-ether or similar ingredient is responsible for the non-freezing characteristic of the compositions which is a very important property of the liquid end product as it removes transportation, storage and operating limitations usually associated with liquid products subject to freezing at low temperatures.

When the micelle structure of the detergent gel-component is transformed by the diethyleneglycol mono-butyl-ether or its equivalent, a liquid is obtained which is to be diluted with water to yield the desired concentrated composition for packaging and sale. The liquid when so diluted has a cloudy appearance which would make the sales thereof extremely difficult. As is known, appearance plays an important part in the selection of most household products and this is particularly true as regards washing and cleansing agents intended to be used on the skin or on delicate fabrics. When such agents have a cloudy or muddy appearance, they repel rather than attract prospective customers.

It has been ascertained that the cloudiness of the aforesaid liquids may be completely eliminated and a perfectly clear, transparent, pleasantly appearing product obtained by the incorporation in the composition of a small amount of an ion sequestering agent. Ion sequestering agents are widely used as components of detergent compositions but solely for the purpose of softening the water in which such compositions are used. In order to be effective for this purpose, comparatively large amounts of the sequestering agents must be present. For instance, where our ion sequestering agent utilized in the composition contemplated here, for the purpose of solubilizing the salts causing the hardness of water, it would be essential to use an amount thereof in excess of 50% of the composition. However, inasmuch as our ion sequestering agents perform an entirely different function, they are used in very small amounts, say amounts ranging from .5 to 5% of the detergent composition.

As the ion sequestering agent, we may use a compound capable of solubilizing the salts which cause hardness of water. This is true despite the fact emphasized above that the agents in our compositions are not utilized to perform their usual function of softening water in which the compositions are used but rather to insure that the compositions packaged and sold may be clear and free from cloudiness.

Suitable sequestering agents for our purpose are amino polycarboxylic acids such as ethylene-bis-(iminodiacetic) acid, nitrilo-triacetic acid, iminodiacetic acid, o-carboxy-N-phenyl iminodiacetic acid, C-phenyl-nitrilo-triacetic acid, C-imino-methyl-nitrilo-triacetic acid, and similar compounds disclosed in U. S. P. 2,240,957; alkali metal hexametaphosphate such as sodium hexametaphosphate, the sodium tripolyphosphates disclosed in U. S. P. 2,239,284; tetra-alkali pyrophosphates such as tetra-sodium pyrophosphate, tetra-potassium pyrophosphate and the like.

The preferred sequestering agent for our purposes is ethylene-bis-(iminodiacetic) acid.

The remaining ingredient of the composition is water. This may be present in an amount vary-

ing from about 55 to about 94% by weight of the composition. The quantity of water is therefore, relatively small as it must be since the compositions must be packaged and sold with a very high content of active ingredient. When the compositions are to be used, they are added to large volumes of water and for practical purposes, it is recommended that there be utilized about 15 parts by volume of the composition for each 8000 parts of water. The resulting highly diluted liquids are extremely effective for general household utility, bubble bath preparations and the like, possessing as they do, the very valuable characteristics outlined above.

The detergent compositions according to this invention are prepared in a simple manner. The gel-forming detergent component is mixed with a small amount of water until a gel is obtained. The agent for transforming the micelle structure of the gel is then added and the mixture is stirred whereupon a liquid is obtained which is diluted with the remainder of the amount of water to be contained in the composition. The clouded liquid thus obtained is then clarified by the addition, under stirring, of the sequestering or clarifying agent. The result is a stable, clear detergent liquid ready for use.

The following examples illustrate a number of detergent compositions according to the invention, all parts being by weight of the composition:

Example 1

	Parts
Sodium salt of oleyl methyl tauride	15.0
Diethyleneglycol mono butyl ether	5.0
Ethylene-bis-(iminodiacetic) acid	2 5
Water	77.5

Example 2

Potassium salt of oleic acid sarcoside	20.0
Butyl alcohol	7.5
Tetra-sodium pyrophosphate	3.5
Water	69.0

Example 3

Sodium β-oleyl ethane sulfonate	17.5
Diethyleneglycol mono-ethyl-ether	2.5
Tetra-potassium pyrophosphate	1.0
Water	89.0

Example 4

Sodium salt of oleyl methyl tauride	17.5
Diethyleneglycol mono butyl ether	6.5
Tetra-sodium pyrophosphate	3.0
Water	73.0

Example 5

Sodium salt of oleic acid sarcoside	22.5
Diethyleneglycol mono butyl ether	10.0
Ethylene-bis-(iminodiacetic) acid	4.5
Water	63.0

Example 6

The composition is the same as in Example 1 excepting that the sodium salt of oleyl methyl tauride is replaced by the potassium salt of cottonseed oil fatty acid ethyl tauride.

Example 7

The composition is the same as in Example 1 excepting that the ethylene-bis-(iminodiacetic) acid is replaced by sodium hexa-meta phosphate.

Example 8

The composition is the same as in Example 2 excepting that the tetra-sodium pyrophosphate is replaced by nitrilo-triacetic acid.

We wish it to be understood that we do not desire to be limited to the exact details of the invention as described for purposes of illustration as various modifications within the scope of the claims may be made without departure from the invention or sacrifice of any of the advantages thereof.

We claim:

1. A detergent composition in liquid form comprising from about 5 to about 25 per cent by weight of sodium salt of oleyl methyl tauride, from about 1.25 to about 12.5 per cent of diethyleneglycol mono butyl-ether, from about 0.5 to about 5 per cent of ethylene-bis-(iminodiacetic) acid, and from about 57.5 to about 93.25 per cent of water.

2. A detergent composition in liquid form, comprising from 5 to 25% by weight of a gel forming synthetic detergent selected from the group consisting of fatty acid taurides, fatty acid sarcosides and fatty acid esters of hydroxy alkyl sulfonic acids, from 1.25 to 12.5% of an agent for transforming the micelle structure of the gel formed by said detergent, comprising a diethyleneglycol mono alkyl ether, from .5 to 5% of an ion sequestering agent and from 57.5 to 93.25% of water.

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