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DETERGENT COMPOSITION

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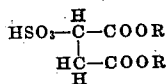
5 Claims. (Cl. 87-5)

This invention relates to a new detergent composition which is specifically designed for domestic uses such as laundering, washing dishes, cleaning rugs and upholstery, washing woodwork and the like, but which is also suitable for wider uses in commercial operations requiring a substantially neutral detergent suitable for use in any hard water and resistant to the action of acids.

Objects of the invention are to produce a detergent which dissolves readily in warm or hot water, which is stable and preferably non-caking upon storage and which is neutral and non-damaging to the hands or to fabrics.

In the prior United States Patent No. 2,028,091, dated Jan. 14, 1936, of A. O. Jaeger, one of the present inventors, there is described at length a class of esters of sulfo-dicarboxylic acids which have remarkable wetting and detergent properties in aqueous solutions when used in the form of their soluble salts. We have now discovered that mixtures of these substances with inert water-soluble carrier materials may be successfully spray-dried by the ordinary commercial spray-drying methods and that the products so obtained are highly efficient detergents for domestic and industrial use.

Any of the sulfo-dicarboxylic acid esters described in the specification of the patent above referred to may be spray-dried in conjunction with water-soluble inert carriers in accordance with the present invention, but we have found that the esters, and preferably the normal esters of sulfo-succinic acid will produce the best detergents for domestic use. These compounds have the following structural formula:



in which R is an alkyl group, and for use in the preparation of detergents of the present invention the hydrogen atom of the sulfo-succinic acid group is preferably replaced by an alkali metal salt such as sodium, potassium or ammonium, or by an organic base such as ethanolamine, alkaloid, etc. In general, the above positive metals and groups are those which produce water-soluble salts of aliphatic sulfo-dicarboxylic acid esters and in the following claims we shall use the term "water-soluble salt" to indicate this class of reagents.

While any of the esters of the aliphatic sulfo-dicarboxylic acids may be used in practicing the

alcohols having three or more carbon atoms by reason of the improved wetting and detergent properties which these esters possess. For best results, we prefer the esters of alcohols having 5-8 carbon atoms, such as amyl alcohol, hexyl alcohol, octyl alcohol, capryl alcohol, or mixtures of these alcohols, since these compounds have the greatest wetting properties. However, other alcohols may give more desirable properties for special purposes than do the ones named, although possibly with some sacrifice of wetting power, and the invention in its broadest aspects is not limited to esters of alcohols giving the greatest possible wetting powers.

The carrier materials which are used must be water-soluble as otherwise there would be serious difficulties in preparing a uniform spray-dried mixture. Water-soluble carriers also serve as an extender of the finished, spray-dried sulfo-dicarboxylic acid ester compound and make it easier to measure the small amount necessary for acceptable detergent qualities, thereby reducing waste. A suitable carrier should also be stable and non-hygroscopic in order to prevent caking of the detergent upon standing and should not develop too much acidity or alkalinity in the presence of moisture. For these reasons we prefer to use a non-hygroscopic water-soluble carrier which exhibits when in a saturated aqueous solution a pH value between 6.5 and 8.5.

A carrier having the above qualifications may be organic or inorganic. In the organic field we have used materials such as corn sugar, cane sugar, and neutral salts of organic acids such as tartrates, succinates and the like. In the inorganic field we have used a number of neutral salts such as sodium chloride, potassium chloride, and the like, but we prefer to use neutral sodium sulfate because it is easily spray-dried to a fine powder that dissolves instantly in hot water. We may also use carriers which have some detergent or cleaning properties of their own, such as sodium or potassium bicarbonate, disodium or dipotassium phosphate, and the like, either alone or preferably in admixture with sodium sulfate. Mixtures of the above or other salts may also be used.

The ratio of salts of sulfo-dicarboxylic acid esters to carrier material may vary between relatively wide limits, depending upon the detergent strength desired in the composition and the particular use for which it is designed. For ordinary household use we prefer to use mixtures in which the amount of ester varies from 5-25% and the

soluble inert carrier material. When an ester is used which has high surface activity such as the esters of sulfo-succinic acid, the amount may be reduced to 5-15%, and with agents of the very highest wetting properties, such as the sodium or potassium salt of dioctyl sodium sulfosuccinate we may use as little as 5-10% of the wetting agent. In addition to the wetting agent and carrier material, the composition may also contain soaps, saponin, abrasives or other substances designed to improve its scouring, foaming and cleaning properties.

As has been stated, our detergent compositions may be prepared in any known or approved spray-drying equipment. We have obtained excellent results with a standard type of spray dryer now on the market in which the material to be dried is atomized into a vertical cylinder containing a rising vortex of hot air or hot products of combustion. Air temperatures of 600-700° F. are preferably used in this equipment and saturated solutions of the sulfo-dicarboxylic acid ester salt and inert carrier are introduced simultaneously.

The invention will be more specifically described in conjunction with the following specific example, which illustrates compositions prepared in this equipment but to which the invention is not limited.

Example

A composition containing 5-10% of sodium dioctyl sulfosuccinate is prepared as follows:

Sodium sulfate is dissolved in water to a 31% solution. Sodium dioctyl sulfosuccinate is dissolved in a mixture of water, methyl or ethyl alcohol and a small amount of butyl ether of diethylene glycol to a 60% solution.

The sodium sulfate is fed into the centrifugal atomizer of a spray drying chamber at the rate of 7½ lbs. per minute.

To produce a detergent containing 5% of sodium dioctyl sulfosuccinate and 95% of anhydrous sodium sulfate, the sulfosuccinate solution is introduced into the atomizer simultaneously at the rate of 320 cc. per minute. For a 10% composition it is introduced at the rate of 640 cc. per minute. Both solutions are introduced at atmospheric temperature.

The inlet temperature of the hot air should be about 600-640° F.

The outlet temperature of the air leaving the apparatus should be about 220-240° F.

Under these conditions an almost complete recovery of a spray dried mixture is obtained in

the form of a snow-white powder that is light, fluffy and dissolves instantly in hot water.

The rate of sulfosuccinate introduction may be varied within wide limits, and may be as high as 3200 cc. per minute, in which case a mixture containing 50% of the sulfosuccinate and 50% sodium sulfate is obtained.

Instead of using the sodium salt of dioctyl sulfosuccinate, the potassium salt may be used. In this case we prefer to use potassium sulfate instead of sodium sulfate as the carrier. When the potassium compounds are used the resulting composition has better foaming properties and the suds produced are more stable.

What we claim is:

1. A detergent composition in the form of a neutral powder which is stable, non-caking and readily soluble in water, comprising a spray-dried mixture of the sulfosuccinic ester of an aliphatic alcohol having from 5 to 8 carbon atoms and a water-soluble, non-hygroscopic carrier which is stable at spray-drying temperatures and which exhibits when in a saturated solution a pH value between 6.5 and 8.5.

2. A detergent composition in the form of a neutral powder which is stable, non-caking and readily soluble in water, comprising a spray-dried mixture containing 5-15% of the sulfosuccinic ester of an aliphatic alcohol having from 5-8 carbon atoms and at least 50% of a water-soluble, non-hygroscopic carrier which is stable at spray-drying temperatures and which exhibits when in a saturated solution a pH value between 6.5 and 8.5.

3. A detergent composition in the form of a neutral powder which is stable, non-caking and readily soluble in water, comprising a spray-dried mixture of the sulfosuccinic ester of an aliphatic alcohol having 5 to 8 carbon atoms and sodium sulfate.

4. A detergent composition in the form of a neutral powder which is stable, non-caking and readily soluble in water, comprising a spray-dried mixture of an alkali-metal salt of dioctyl sulfosuccinate and a water-soluble, non-hygroscopic carrier which is stable at spray-drying temperatures and which exhibits when in a saturated solution a pH value between 6.5 and 8.5.

5. A detergent comprising a spray-dried mixture comprising 5-15% of an alkali metal salt of dioctyl sulfosuccinate and at least 50% of sodium sulfate.

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