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## NON-CAKING ALKYL ARYL SULFONATE DETERGENT COMPOSITIONS

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The present invention relates to improvements in particulate solid detergent compositions. More particularly, it relates to reduction and suppression of caking tendencies of particulate solid detergent compositions which contain as their active detergent ingredient sodium salts of alkyl benzene sulfonic acids having from 9 to 18 carbon atoms in the alkyl chain.

The larger proportion of commercial detergent compositions which owe their detergency to the presence of anionic organic sulfates and sulfonates are distributed on the market in the solid form, either as beads, flakes, chips, scales or granules, packed into containers such as metal drums, glass jars, wooden boxes or cartons. Many of these commercially available particulate solid detergent compositions when stored in containers, and particularly when stored in cartons and wooden boxes, undergo considerable caking and lose thereby their free-flowing characteristics. This caking is particularly pronounced during storage in warm, humid climates, and is observed to occur even though the particulate detergent material is tightly covered or sealed in the container.

The occurrence of caking has been ascribed to a number of factors: It has been said that it is occasioned by the presence of the residual moisture in the dried detergent particles; on the other hand, many of those skilled in the art believe that caking results from the penetration of the atmospheric moisture into the container, even though it may appear to be perfectly well-sealed; again, theories were propounded relating the phenomenon of caking to the particular physical structure or chemical nature of the detergent particles. Whatever be its true cause or causes, the occurrence of caking is highly undesirable and annoying. It interferes with the free flow of the particulate detergent material from the package; on shaking the opened package to disintegrate or crumble the lumps of caked material, irritating dust rises into the air; and, in addition, the remaining lumps are slow to dissolve in the wash water.

Among the various anionic detergents, those represented by water-soluble sodium salts of monoalkyl benzene sulfonic acids in which the alkyl chain contains from 9 to 18 carbon atoms, and designated in the art under the name of "alkyl benzene sulfonates" are known to be eminently suitable for various industrial applications and, particularly, for household uses. However, even though these sulfonates are considered to be among the most satisfactory and efficient detergents of the trade, they cake when exposed to warm and humid climatic conditions. This tendency to cake is responsible for the difficulties encountered heretofore in marketing these compositions in the Southern States and, in general, in all areas characterized by humid, tropical or subtropical climates.

We have now found that by intimately admixing into the particulate detergent compositions containing in each

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100 parts by weight thereof from 10 to 95 parts by weight of the aforementioned sodium salts of monoalkyl benzene sulfonic acids (sodium C<sub>9</sub>-C<sub>18</sub> monoalkyl benzene sulfonates), the remainder being essentially inorganic sodium salt builders, small amounts from 0.5 to 10.0%, and preferably from 1.0 to 5.0% by weight, based on the entire composition, of a sulfonate material from the group consisting of sodium benzene monosulfonate and sodium toluene monosulfonate, the extent of caking is very markedly reduced, and frequently caking is almost completely eliminated.

This finding is particularly remarkable and unexpected in view of the fact that the addition of like small amounts from about 0.5 to about 10.0% by weight of other low molecular weight sodium aryl sulfonates, for instance, sodium meta-xylene monosulfonate, sodium α-naphthalene monosulfonate, did not decrease but, on the contrary, increased the extent of caking in detergent compositions containing sodium C<sub>9</sub>-C<sub>18</sub> monoalkyl benzene sulfonates.

The active sodium C<sub>9</sub>-C<sub>18</sub> alkyl benzene sulfonate ingredient of the detergent composition which can be improved or stabilized against caking, in accordance with our invention, may be produced in different ways. A particularly efficient detergent is prepared by alkylating benzene with a long-chain olefin or an olefin polymer containing from 9 to 18 carbon atoms, e. g., C<sub>9</sub>-C<sub>18</sub> polypropylene, in the presence of a suitable catalyst. The resulting C<sub>9</sub>-C<sub>18</sub> alkyl benzene product, and preferably that fraction thereof which contains from 12 to 15 carbon atoms in the alkyl chain, is then subjected to sulfonation with the aid of a suitable sulfonating agent such as concentrated sulfuric acid, oleum, or SO<sub>3</sub>. Upon completion of the sulfonation reaction, the unreacted sulfuric acid can be separated from the sulfonic acid by settling and decantation. Thereafter, the recovered alkyl benzene sulfonic acids are converted to sodium salts, by neutralization with an aqueous solution of caustic or sodium carbonate. The prevailing practice is to leave all or a part of the unreacted sulfuric acid admixed with the alkyl benzene sulfonic acids and to neutralize them together to form an aqueous dispersion or slurry of the corresponding organic sodium alkyl benzene sulfonate and sodium sulfate.

Another procedure for the preparation of detergent sodium monoalkyl benzene sulfonates, which can be improved or stabilized against caking in accordance with our invention, involves the condensation, in the presence of a suitable catalyst, usually AlCl<sub>3</sub>, of benzene with chlorinated C<sub>9</sub>-C<sub>18</sub> acyclic hydrocarbons, e. g., those contained in a chlorinated kerosene fraction. The resulting mixture of C<sub>9</sub>-C<sub>18</sub> monoalkyl benzenes is thereupon sulfonated and neutralized, and the final slurry of sodium alkyl benzene sulfonate and sodium sulfate is dried and reduced to the desired particle shape and size. The presence of inorganic sulfate is not only harmless but, in fact, beneficial for the surface-activity of the final alkyl benzene sulfonate detergent composition. Frequently, additional sodium sulfate and/or other inorganic sodium salts, e. g., sodium silicate, and particularly phosphates such as tetra-sodium pyrophosphate or sodium tripolyphosphate, as well as sodium carboxymethyl cellulose, may be added as a suitable "builder" to the neutralized sulfonate slurry prior to drying the same in accordance with the particular specifications for the ultimately desired detergent composition. The slurry thus built is then converted to the desired particulate solid form and size by an appropriate drying technique such as spray-drying or drum-drying.

We have observed that the presence of the aforemen-

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tioned inorganic sodium sulfate and phosphate builders in the detergent compositions in the amounts up to about 89 parts by weight in each 100 parts thereof does not markedly interfere with the anti-caking effect of the additives of our invention, so long as the active sodium alkyl benzene sulfonate ingredient of a detergent composition is present therein in an amount ranging from about 10 to about 95 parts by weight, and preferably from about 20 to about 60 parts by weight, in which case the inorganic builder content of each 100 parts of the composition may range from about 80 to about 40 parts by weight.

As mentioned hereinbefore, the effective additive for the prevention or reduction of caking in sodium alkyl benzene sulfonate detergents in accordance with the invention is selected from the group consisting of sodium benzene monosulfonate and sodium toluene monosulfonate. The recommended operative amounts of this "caking preventive" range from 0.5 to 10.0% and preferably from 1.0 to 5.0% by weight, based on the entire detergent composition including the active detergent ingredient and the inert builder or builders. By adding either one of the aforementioned two sulfonates in the amounts comprised in the aforementioned range from 0.5 to 10.0% by weight, the caking of the detergent composition can be markedly reduced and in most instances is substantially avoided. As will be seen from the description which follows, the degree of improvement obtained for each particular composition may be varied somewhat depending on the exact amount of the caking preventive employed.

Different techniques may be employed to incorporate the caking preventive into the alkyl benzene sulfonate detergent compositions. Each one of these techniques aims at securing a uniform composition in the individual dry particles of the detergent composition, so that each individual particle consists of the detergent sulfonate, inorganic builder and caking-preventive sulfonate in substantially the same proportions. When dry sodium benzene sulfonate or dry sodium toluene sulfonate is added to a dry detergent composition in the small amounts of from 0.5 to 10.0% by weight, this uniformity of particle composition cannot be achieved and, as a consequence, the desired reduction in caking cannot be secured. In fact, upon adding to a drum-dried particulate detergent composition, each 100 parts of which contains 40 parts of active detergent sodium C<sub>12</sub>-C<sub>15</sub> polypropylene benzene sulfonate and 60 parts of sodium sulfate builder, about 10% of dry powdered sodium benzene sulfonate, based on the weight of the detergent composition, and thoroughly mixing by mechanical means, the composition was observed to cake badly on storage, despite the presence of sodium benzene sulfonate.

A somewhat better intermixing of the caking preventive can be obtained by adding sodium benzene sulfonate or sodium toluene sulfonate to the neutralized slurry of sodium C<sub>9</sub>-C<sub>18</sub> alkyl benzene sulfonate along with other additives and builders, whereupon the slurry will be dried and reduced to the desired particle form. However, this method may fall short of attaining the desired uniformity of the particles of detergent product if the degree of slurry agitation or the time of agitation is insufficient. Our preferred procedure, which eliminates the possibility of a non-uniform distribution of caking preventive throughout the slurry and the consequent ineffectiveness of the caking preventives, consists in dissolving or dispersing benzene sulfonic or toluene sulfonic acid, or their sodium salts in the caustic soda solution to be used in neutralizing the mixture of alkylbenzene sulfonic acid and sulfuric acid.

Still another technique leading to the ultimate production of particles of uniform composition consists in adding benzene sulfonic acid or toluene sulfonic acid to the sulfonation reaction mixture of alkyl benzene sulfonic acid and unreacted sulfuric acid, whereupon the whole

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is neutralized and dried. Also, one may add benzene sulfonic or toluene sulfonic acid to the mixture of C<sub>9</sub>-C<sub>18</sub> alkyl benzenes before subjecting this mixture to the sulfonation treatment. On neutralizing and drying the sulfonated mixture a product of uniform particle composition is obtained. Finally, one may incorporate the caking preventive by introducing benzene or toluene into the stock of C<sub>9</sub>-C<sub>18</sub> monoalkyl benzenes about to be sulfonated. The mixture of the alkyl benzenes and benzene or toluene is then sulfonated and neutralized, yielding the desired mixture of sodium alkyl benzene sulfonate detergent and sodium benzene or toluene sulfonate in the proportions required for the effective reduction of caking in accordance with the invention.

A large number of detergent compositions containing sodium alkyl benzene sulfonates with from 9 to 18 carbon atoms in the alkyl chain have been tested for the reduction of their caking tendency after admixing various amounts of different low molecular weight sodium sulfonates, and subjecting samples of the compositions to tests in a humidity cabinet. The testing procedure employed was the following: After incorporating the low molecular weight sodium sulfonate into the detergent composition in accordance with one of the several methods indicated hereinbefore, the neutralized slurry was dried to yield a product of the desired particle size and shape. Weighed samples of the dried compositions, screened through a #16 sieve and collected on a #200 sieve, were placed in small untreated sealed cardboard boxes (1½" x 2½" x 4"), and three samples of each detergent composition, together with three samples containing no low molecular weight sulfonate were placed in a completely random manner in a humidity cabinet, exposed to a relative humidity of about 80% at a temperature of about 90° F. After the exposure period which lasted 7 days, the boxes with samples were reweighed, and the extent of caking was determined by cutting away an entire side of the cardboard box and carefully transferring the sample onto a #4 sieve (¼" mesh) from a minimum height. The sieve was then gently swirled until all particles came into contact with the screen. The material which did not pass through the screen by this treatment was considered to be caked and its weight vs. the weight of the original sample was designated as "percent of material caked."

The following Table I contains the results of a number of tests carried out on samples of a representative alkyl benzene sulfonate detergent composition, namely, sodium polypropylene benzene sulfonate prepared in accordance with the procedure described in U. S. Patent No. 2,477,383, issued to A. H. Lewis on July 26, 1949, by polymerizing propylene to form a mixture of C<sub>12</sub>-C<sub>15</sub> polypropylenes, alkylating benzene with these polypropylenes in the presence of a hydrofluoric acid catalyst, sulfonating with caustic soda solution and drying to small particles. The data assembled in this table show the proportions of the active detergent, builder and caking preventive in each formulation in percent by weight, as well as the method of drying the formulation and the mode of incorporating the caking preventive and finally the "percent of material caked," based on the total detergent composition. To indicate the mode of incorporating the sodium benzene monosulfonate, sodium toluene sulfonate and other anti-caking additive, the following symbols are used in the table: "A" refers to the runs in which the additive was introduced into the mixture of alkyl benzenes (namely, C<sub>12</sub> to C<sub>15</sub> polypropylene benzene); "B" refers to those runs in which the low molecular weight aromatic sulfonic acid, such as benzene sulfonic, was added to the caustic employed to neutralize the mixture of alkyl benzene sulfonic acid and unreacted sulfuric acid; finally, "C" denotes those runs in which the additive was directly incorporated in the neutralized slurry of sodium C<sub>9</sub>-C<sub>18</sub> alkyl benzene sulfonate and sodium sulfate.

TABLE I

Results of caking tests on various detergent formulations

| Test No. | Composition of Formulation                                                                   |                                     |                                           |                               | Method of drying formulation | Method of incorporating additive | Percent materials caked |
|----------|----------------------------------------------------------------------------------------------|-------------------------------------|-------------------------------------------|-------------------------------|------------------------------|----------------------------------|-------------------------|
|          | Percent by weight of sodium C <sub>12</sub> -C <sub>15</sub> polypropylene benzene sulfonate | Percent by weight of sodium sulfate | Name of additive                          | Percent by weight of additive |                              |                                  |                         |
| 1        | 40                                                                                           | 60.0                                |                                           |                               | Drum-dried                   |                                  | 65                      |
| 2        | 40                                                                                           | 59.35                               | Sodium benzene sulfonate                  | 0.65                          | do                           | A                                | 7                       |
| 3        | 40                                                                                           | 58.7                                | do                                        | 1.3                           | do                           | A                                | 6                       |
| 4        | 40                                                                                           | 56.8                                | do                                        | 3.2                           | do                           | A                                | 10                      |
| 5        | 40                                                                                           | 53.9                                | do                                        | 6.1                           | do                           | A                                | 2                       |
| 6        | 40                                                                                           | 51.1                                | do                                        | 8.9                           | do                           | A                                | 3                       |
| 7        | 40                                                                                           | 55.7                                | Sodium ditertiary butyl benzene sulfonate | 4.3                           | do                           | A                                | 72                      |
| 8        | 40                                                                                           | 53.6                                | Sodium amyl naphthalene sulfonate         | 6.4                           | do                           | A                                | 100                     |
| 9        | 40                                                                                           | 57.37                               | Sodium o-xylene sulfonate                 | 2.63                          | do                           | A                                | 91                      |
| 10       | 40                                                                                           | 50.0                                | Sodium benzene sulfonate                  | 10.00                         | do                           | C                                | 1                       |
| 11       | 40                                                                                           | 59.4                                | Sodium toluene sulfonate                  | 0.6                           | do                           | A                                | 10                      |
| 12       | 40                                                                                           | 58.8                                | do                                        | 1.2                           | do                           | A                                | 8                       |
| 13       | 40                                                                                           | 57.1                                | do                                        | 2.9                           | do                           | A                                | 20                      |
| 14       | 40                                                                                           | 54.4                                | do                                        | 5.6                           | do                           | A                                | 10                      |
| 15       | 40                                                                                           | 51.8                                | do                                        | 8.2                           | do                           | A                                | 1                       |
| 16       | 40                                                                                           | 57.0                                | Sodium m-xylene sulfonate                 | 3.0                           | do                           | B                                | 75                      |
| 17       | 40                                                                                           | 55.0                                | do                                        | 5.0                           | do                           | B                                | 100                     |
| 18       | 40                                                                                           | 52.1                                | do                                        | 7.9                           | do                           | A                                | 71                      |
| 19       | 40                                                                                           | 57.0                                | Sodium p-xylene sulfonate                 | 3.0                           | do                           | B                                | 70                      |
| 20       | 40                                                                                           | 55.0                                | do                                        | 5.0                           | do                           | B                                | 100                     |
| 21       | 40                                                                                           | 52.7                                | Sodium alpha naphthalene sulfonate        | 7.3                           | do                           | A                                | 96                      |
| 22       | 40                                                                                           | 60.0                                |                                           |                               | Spray-dried                  |                                  | 100                     |
| 23       | 40                                                                                           | 57.0                                | Sodium benzene sulfonate                  | 3.0                           | do                           | B                                | 2                       |
| 24       | 40                                                                                           | 59.0                                | do                                        | 1.0                           | Drum-dried                   | B                                | 19                      |
| 25       | 40                                                                                           | 57.0                                | do                                        | 3.0                           | do                           | B                                | 1                       |
| 26       | 40                                                                                           | 55.0                                | do                                        | 5.0                           | do                           | B                                | 0                       |
| 27       | 40                                                                                           | 59.0                                | Sodium toluene sulfonate                  | 1.0                           | do                           | B                                | 12                      |
| 28       | 40                                                                                           | 57.0                                | do                                        | 3.0                           | do                           | B                                | 15                      |
| 29       | 40                                                                                           | 55.0                                | do                                        | 5.0                           | do                           | B                                | 1                       |

The results presented in Table I clearly point out that the addition of low molecular weight monoaryl sulfonates from the group consisting of sodium benzene sulfonate and sodium toluene sulfonate effects a remarkable improvement in the quality of particulate alkyl benzene sulfonate detergent compositions by stabilizing them against caking on storage. This improvement brought about by the incorporation of caking preventives into the alkyl benzene sulfonate detergent compositions in relatively small amounts of the order of 1.0 to 5.0% by weight of the detergent composition is particularly unexpected in view of the lack of improvement generally observed upon incorporating many other low molecular weight aromatic sulfonates into such detergent compositions. In fact, frequently the caking is increased upon such an addition. Test runs Nos. 16, 17, 18, 19, 20 and 21 of Table I, in which sodium meta-xylene sulfonate, sodium para-xylene sulfonate and sodium  $\alpha$ -naphthalene sulfonate were used, illustrate this lack of improvement and the adverse effect of these additives on the stability of detergent compositions to caking.

Table II contains data relative to the effect of addition of low molecular weight sulfonates in accordance with our invention to alkyl benzene sulfonate detergent formulations which in addition to sodium sulfate builder also contain sodium tripolyphosphate as a builder.

The samples containing the caking preventives and those without them were also compared with respect to detergency, wetting power and foaming power, and it was observed that the detergency, wetting power and foaming of the detergent compositions which contained either the sodium benzene sulfonate or sodium toluene sulfonate caking preventive in accordance with the invention were of the same order of magnitude as those of the compositions which contained no additive. Detergency measurements have been made by using hard-twisted white cotton strips soiled with a greasy soil (of oil, tallow and carbon black) in a Launderometer at 140° F., the detergent composition being employed in varying concentrations (0.1; 0.2; 0.3; 0.4%) in hard water (300 parts per million). Detergency (whiteness level) was rated with reference to an arbitrarily chosen standard called "Soap Index," obtained with a 0.4% concentration of a well-known soap in hard water (300 parts per million) and assumed to be equal 100. Foam heights were determined by the Ross-Miles method described in "Oil and Soap," vol. 18, p. 99 (1941). Wetting times in seconds were determined by the "Canvas-Square Method," measuring the time required by a 1 inch square of 10 ounce #6 cotton-duck canvas to sink to the bottom when placed on the surface of 200 cc. of a solution of 0.25% of the sulfonate detergent com-

TABLE II

Results of caking tests on detergent formulations containing sodium sulfate and sodium tripolyphosphates as builders

| Test # | Composition of Formulation                                                                   |                                     |                                              |                            | Percent by weight of additive | Method of drying | Method of incorporating additive | Percent material cake |
|--------|----------------------------------------------------------------------------------------------|-------------------------------------|----------------------------------------------|----------------------------|-------------------------------|------------------|----------------------------------|-----------------------|
|        | Sodium C <sub>12</sub> -C <sub>15</sub> polypropylene benzene sulfonate in percent by weight | Sodium sulfate in percent by weight | Sodium tripolyphosphate in percent by weight | Additive to prevent caking |                               |                  |                                  |                       |
| 1      | 36.8                                                                                         | *16.5                               | 42.1                                         |                            |                               | Drum-dried       |                                  | 84                    |
| 2      | 36.8                                                                                         | *14.5                               | 42.1                                         | Sodium benzene sulfonate   | 2                             | do               | B                                | 12                    |
| 3      | 36.8                                                                                         | *16.5                               | 42.1                                         |                            |                               | Spray-dried      |                                  | 100                   |
| 4      | 36.8                                                                                         | *14.5                               | 42.1                                         | Sodium benzene sulfonate   | 2                             | do               |                                  | 11                    |
| 5      | 23.5                                                                                         | 21.5                                | 55.0                                         |                            |                               | Drum-dried       |                                  | 41                    |
| 6      | 23.5                                                                                         | 19.5                                | 55.0                                         | Sodium benzene sulfonate   | 2                             | do               | B                                | 8                     |

\*Figures marked with an asterisk include 3.5% of sodium silicate and 1.1% of sodium carboxy methyl cellulose.

position in a 250 cc. beaker. Measurements were taken using both distilled and hard waters.

Table III contains representative test data on detergency, wetting power and foaming of detergent compositions containing sodium benzene sulfonate and sodium toluene sulfonate caking preventives in accordance with the invention. These data clearly show that the presence of caking preventives has no adverse effect on either of these three significant characteristics of alkyl benzene sulfonate detergent compositions.

TABLE III

Test data on detergency, wetting and foaming of alkyl benzene sulfonate detergent compositions containing caking preventives

| Test # | Composition of Drum-Dried Formulation                                                      |                                  |                                             |                            |                               | Soap index at 0.2% concentration in hard water | Wetting times in seconds at 0.25% concentration in— |            | Foam heights in mm. at 0.2% concentration in hard water—percent lard oil added |     |     |     |
|--------|--------------------------------------------------------------------------------------------|----------------------------------|---------------------------------------------|----------------------------|-------------------------------|------------------------------------------------|-----------------------------------------------------|------------|--------------------------------------------------------------------------------|-----|-----|-----|
|        | Percent by weight sodium C <sub>12</sub> -C <sub>15</sub> poly-propylene benzene sulfonate | Percent by weight sodium sulfate | Percent by weight sodium tri-poly-phosphate | Additive to prevent caking | Percent by weight of additive |                                                | Distilled Water                                     | Hard Water | 0.0                                                                            | 0.1 | 0.2 | 1.0 |
|        |                                                                                            |                                  |                                             |                            |                               |                                                |                                                     |            |                                                                                |     |     |     |
| 1      | 40                                                                                         | 60                               |                                             |                            |                               | 59                                             | 22.5                                                | 13.2       | 183                                                                            | 115 | 108 | 84  |
| 2      | 40                                                                                         | 55                               |                                             | Sodium benzene sulfonate   | 5                             | 50                                             | 20.5                                                | 13.7       | 184                                                                            | 139 | 122 | 85  |
| 3      | 40                                                                                         | 57                               |                                             | do                         | 3                             |                                                | 21.6                                                | 14.2       | 182                                                                            | 160 | 150 | 107 |
| 4      | 40                                                                                         | 57                               |                                             | Sodium toluene sulfonate   | 3                             |                                                | 21.3                                                | 15.7       | 178                                                                            | 156 | 140 | 112 |
| 5      | 36.8                                                                                       | *16.5                            | 42.1                                        |                            |                               | 97                                             |                                                     |            |                                                                                |     |     |     |
| 6      | 36.8                                                                                       | *14.5                            | 42.1                                        | Sodium benzene sulfonate   | 2                             | 101                                            |                                                     |            |                                                                                |     |     |     |
| 7      | 23.8                                                                                       | 21.5                             | 55.0                                        |                            |                               | 84                                             |                                                     |            |                                                                                |     |     |     |
| 8      | 23.8                                                                                       | 19.5                             | 55.0                                        | Sodium benzene sulfonate   | 2                             | 89                                             |                                                     |            |                                                                                |     |     |     |

\*Figures marked with an asterisk include 3.5% of sodium silicate and 1.1% of sodium carboxymethyl cellulose.

Another surprising effect of the incorporation of sodium benzene sulfonate or sodium toluene sulfonate caking preventives in sodium alkyl benzene sulfonate detergent compositions in accordance with this invention is the substantial improvement in the bulk color of dried detergent formulations. These formulations appear whiter on visual observation. Tristimulus color measurements likewise indicate that these formulations are substantially brighter. These latter determinations were made in accordance with the procedure described in "Handbook of Colorimetry," by A. C. Hardy, published in 1936 by the Massachusetts Institute of Technology Press. In a typical example of these colorimetric determinations, a sample of the detergent formulation containing 40% by weight of sodium C<sub>12</sub>-C<sub>15</sub> polypropylene benzene sulfonate, 57% by weight of sodium sulfate, and 3% by weight of sodium benzene sulfonate was found to have a 88.5% brightness for a dominant wave length of 577 mμ and 8% saturation, while the same formulation without the caking preventive displayed a degree of brightness equal to 79.5 at a dominant wave length of 587 mμ and 15% saturation.

Considering the small proportions of sodium benzene sulfonate and sodium toluene sulfonate which effectively decrease the caking of the detergent composition, one can readily appreciate that this and other previously mentioned advantages of our invention are secured with practically no increase in the manufacturing costs.

It should be understood that the foregoing description and experimental data are merely illustrative of the invention and are not to be interpreted in limitation thereof, except as defined in the annexed claims.

We claim:

1. A substantially non-caking, solid, particulate detergent composition consisting essentially of a mixture of (a) a detergent material containing in each 100 parts thereof from 10 to 95 parts by weight of a sodium salt of a monoalkyl benzene sulfonic acid having from 9 to 18 carbon atoms

in the alkyl chain, the remainder of said detergent being essentially an inorganic sodium salt builder, and (b) from about 0.5% to about 10% by weight based on the entire composition of a sulfonate material selected from the group consisting of sodium benzene monosulfonate and sodium toluene monosulfonate; said composition being in the form of substantially non-caking, dry particles of substantially uniform composition obtained by drying an aqueous dispersion containing said components (a) and (b) of said composition.

2. The detergent composition of claim 1 wherein said sulfonate material is present in an amount equal to from about 1% to about 5% by weight based on the entire composition.

3. The composition of claim 1 wherein said sulfonate material is sodium benzene monosulfonate.

4. The composition of claim 1 wherein said sulfonate material is sodium toluene monosulfonate.

5. The composition of claim 1 wherein said inorganic sodium salt builder is sodium sulfate.

6. The composition of claim 1 wherein said inorganic sodium salt builder is a sodium phosphate.

7. The composition of claim 1 wherein said detergent material contains in each 100 parts thereof from about 20 to about 60 parts by weight of a sodium salt of a monoalkyl benzene sulfonic acid having from 12 to 15 carbon atoms in the alkyl chain, said alkyl chain being derived from a propylene polymer.

8. The method of preparing a substantially non-caking, solid, particulate detergent composition which comprises providing a slurry formed from water and a solid phase consisting essentially of a mixture of (a) a detergent containing in each 100 parts thereof from 10 to 95 parts by weight of a sodium salt of a monoalkyl benzene sulfonic acid having from 9 to 18 carbon atoms in the alkyl chain, the remainder of said detergent being essentially an inorganic sodium salt builder, and (b) from about 0.5% to about 10% by weight based on the entire composition of a sulfonate material selected from the group consisting of sodium benzene monosulfonate and sodium toluene monosulfonate, and substantially completely removing water from said slurry to produce said substantially non-caking detergent composition.

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