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HIGH-FOAM PASTE DETERGENT COMPOSITION

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This invention relates to an improved paste built detergent. More particularly, this invention relates to a stable high foam paste built detergent. This invention also relates to a process for the preparation of the paste detergent.

A good built paste detergent should contain all of the essential ingredients of a good built dry detergent formulation, i.e., a surfactant, a phosphate builder, an anticorrosion agent, and an antiredeposition agent. In addition, a foam stabilizer is sometimes necessary when a high persistent foam is desirable, and other ingredients such as optical brighteners, dyes, perfumes, etc. may be incorporated where desired. However, it has not been commercially possible heretofore to incorporate these various ingredients into a paste formulation and still obtain a stable detergent. Many formulations prepared heretofore have been physically unstable resulting in separation of the detergent into two or more incompatible layers, sedimentation, etc. This has been a serious detriment to commercialization of built paste detergents in the past.

In efforts to overcome the above-mentioned disadvantages, detergent formulators have heretofore resorted to a number of undesirable devices. Sodium silicate is difficult to incorporate into detergent formulations and one common device is to leave out this essential ingredient or to decrease its concentration to much less than that necessary for proper protection of metal surfaces which come in contact with the detergent. This results in excessive corrosion of metal containers and of metal washing machine parts. Another device is to omit sodium carboxymethyl cellulose from the formulation resulting in increased greyness of fabrics laundered with such detergents. Another device is to resort to expensive combinations of specially purified surfactants with unduly large proportions of solubilizers such as sodium xylene sulfonate. These latter substances increase the cost of built detergents without contributing appreciably to detergency. More expensive potassium containing surfactants have also been used in place of less soluble, less expensive sodium-containing surfactants. It is possible to decrease the cost of these built detergents by decreasing the concentration of the expensive specially purified surfactants but the performance suffers.

It is the object of this invention to provide a stable high foam built detergent. It is a further object of this invention to provide a stable paste detergent which contains all of the essential ingredients of a good dry detergent formulation. It is another object of this invention to provide a stable paste detergent employing commercially cheap available materials. It is another object of this invention to provide a paste formulation capable of extrusion from a collapsible tube or for distribution in a jar. Furthermore, it is an object of this invention to provide a process for the preparation of this stable high foam built paste detergent.

According to this invention, there is provided a stable high-foam built detergent paste comprising tetrapotassium pyrophosphate, a sodium silicate, carboxymethyl cellulose, lauryl alcohol sulfate and water. If desired, a foam stabilizer such as fatty acid alkanol amides, water-soluble dyes and antitarnishing agents for metal surfaces may be included in the formulation.

In the above compositions, the pyrophosphate is em-

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ployed as the phosphate builder and the sodium silicate is employed as an anticorrosion agent. The lauryl alcohol sulfate is employed as a surfactant, while the carboxymethyl cellulose is used as an antiredeposition agent. The sodium silicate employed may be any silicate in which the $\text{Na}_2\text{O}/\text{SiO}_2$ ratio varies between 1:3.2 to about 1:1, preferably anhydrous sodium metasilicate, a liquid silicate, or sodium metasilicate pentahydrate is employed in the formulation. Hereinafter whenever we refer to the weight percent of the silicate employed in the formulation, it will be understood to have been calculated as weight percent silica.

The formulations of this invention may contain from about 18 to about 26 weight percent tetrapotassium pyrophosphate, from about 19 to about 47 percent by weight lauryl alcohol sulfate and from about 35 to about 55 percent by weight water. The amount of silicate employed may vary, but it is preferable to maintain it in the range of about 0.1 to about 1.7 weight percent calculated as SiO_2 . The carboxymethyl cellulose may be employed over wide ranges, but we have found it preferable to maintain it from about 0.1 to about 3 weight percent.

The amount of carboxymethyl cellulose which can be employed depends upon the degree of substitution of carboxyl groups in the molecule. The greater the degree of substitution, the more soluble the product. However, at the higher degree of substitution, the soil antiredeposition property may be slightly adversely affected. The carboxymethyl cellulose produced by Hercules Powder under the trade name "Hercules CMC 70 M" has been found to be particularly suitable. The lauryl alcohol sulfate employed may be any high assay product, but particularly good results have been obtained by using the product made by Du Pont under the trade name "Dupanol ME Dry." This product is identified in the "Du Pont Products Index" as the dry sodium salt of technical lauryl alcohol sulfate.

A preferred formulation of this invention is set forth below in which all of the percents are by weight:

	Percent
Tetrapotassium pyrophosphate	20.0
Anhydrous sodium metasilicate (equivalent to 1.47% by weight SiO_2)	3.0
Carboxymethylcellulose	0.5
Technical lauryl alcohol sulfate	26.5
Water	50.0

This invention also provides a procedure for the preparation of the desired detergent. If this procedure is not followed, the desired formulation is not obtained in stable form. According to this process, the tetrapotassium pyrophosphate is dissolved in water and the carboxymethyl cellulose is then added and is completely dispersed therein. The anhydrous sodium metasilicate, or other silicate, is then added and must be completely dissolved before proceeding any further. Upon the complete dissolution of the silicate, the lauryl alcohol sulfate is added at this point and mixing is then continued until a pasty consistency is obtained. After mixing is complete, the paste will be rather thin and hot. The paste should not be allowed to exceed 60 degrees centigrade in temperature. The proper consistency is obtained when the mix cools. It has been found that the best results are accomplished with a high-speed mixer, similar in action to the Eppenbach Homo-Mixer. This type mixer allows for mixing the ingredients without the entrainment of air. This is essential, since the entrainment of air causes the formulation to be unstable.

The detergents of this formulation are all-purpose detergents and are suitable for laundering cotton, woolen goods and fine fabrics, for cleaning hard surfaces and for other wetting and detergent applications.

The detergent properties of a stable high-foam paste detergent having the following composition

	Percent
Tetrapotassium pyrophosphate.....	20.0
Anhydrous sodium metasilicate.....	3.0
Carboxymethylcellulose.....	0.5
Technical lauryl alcohol sulfate.....	26.5
Water.....	50.0

were tested by techniques similar to those described in the manual "Detergency Evaluation and Testing" by J. C. Harris (Interscience Publishers, Inc., 1954). A single wash technique is carried out in a Launder-Ometer (Atlas Electric Devices Company) at 140° F., using two commercially soiled cotton fabrics (Foster D. Snell Soiled Cotton 159 and American Conditioning House 115) in distilled water, and with three commercially soiled fabrics (Foster D. Snell Soiled Cotton 159, American Conditioning House 115, and American Conditioning House 130) in 21 g.p.g. synthetic hard water. Concentration of the detergent in the test is 0.50 percent equivalent to 0.25 percent solids content. Duplicate tests are run simultaneously with a 0.25 percent solution of a commercially available, solid, spray-dried detergent having the following approximate composition:

	Percent
Sodium tripolyphosphate.....	50.00
Sodium silicate.....	3.25
Anionic surfactant mixture.....	22.85
Sodium carboxymethylcellulose.....	0.20
Sodium sulfate.....	17.00
Water, perfume and other minor ingredients.....	6.70

In the following table, numbers represent the increase in reflectance of the soiled fabrics during the single wash. Each number represents the average of six reflectance readings made on three replicate fabric samples:

Detergency Table

Type of Fabric	Water Hardness, g.p.g.	Detergent of Invention	Spray-Dried Detergent
ACH-115.....	0	24.3	23.7
FDS-159.....	0	26.8	11.3
ACH-115.....	21	23.1	19.9
ACH-130.....	21	20.3	18.7
FDS-159.....	21	24.2	5.9

I claim:

1. A high foam stable built paste detergent composition which consists essentially of from about 18 to about 26% by weight of tetrapotassium pyrophosphate, from about 19 to about 47% by weight of sodium lauryl alcohol sulfate, from about 0.1 to about 1.7% by weight of sodium silicate calculated as SiO_2 , from about 35 to about 55% by weight of water and about 3% by weight of carboxymethyl cellulose.

2. A stable high foam built paste detergent composition which consists essentially of about 20% by weight of tetrapotassium pyrophosphate, about 3% by weight of anhydrous sodium metasilicate, about 0.5% by weight of carboxymethyl cellulose, about 26.5% by weight of sodium lauryl alcohol sulfate, and about 50% by weight of water.

3. The method of preparing a stable high foam built paste detergent composition consisting essentially of dissolving about 20% by weight of tetrapotassium pyrophosphate in water, adding and completely dispersing about 0.5% by weight of carboxymethyl cellulose in said tetrapotassium pyrophosphate solution, adding and completely dissolving about 3% by weight of anhydrous sodium metasilicate in the mixture of carboxymethyl cellulose and tetrapotassium pyrophosphate, and finally adding about 26.5% by weight of sodium lauryl alcohol sulfate with agitation and continuing the agitation until a pasty consistency is obtained, the temperature being maintained under 60° C.

4. A method for the preparation of a stable high-foam built paste detergent composition which consists essentially of dissolving from about 18 to about 26% by weight of tetrapotassium pyrophosphate in water, adding and completely dispersing from about 0.1 to about 3% by weight of carboxymethyl cellulose in the tetrapotassium pyrophosphate solution, adding and completely dissolving from about 0.1 to about 1.7% by weight of sodium silicate calculated as SiO_2 , and finally adding from about 19 to about 47% by weight of sodium lauryl alcohol sulfate with agitation, the temperature not being allowed to exceed 60° C.

References Cited in the file of this patent

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