252-99. AU 165 EX
11-5-74 XR 3,846,346

United States Patent [19]

Conn

[11] **3,846,346**

[45] **Nov. 5, 1974**

[54] **DETERGENT COMPOSITION WITH CONTROLLED ALKALINITY**

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[22] Filed: **Nov. 6, 1972**

[21] Appl. No.: **303,731**

Related U.S. Application Data

[63] Continuation of Ser. No. 109,654, Jan. 25, 1971, abandoned.

[52] **U.S. Cl.** **252/527**, 252/99, 252/127

[51] **Int. Cl.** **C11d 3/066**

[58] **Field of Search** ..... 252/527, 99, DIG. 11

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[57] **ABSTRACT**

A detergent composition containing 5 to 40 percent of a nonionic or anionic surfactant, 10 to 50 percent of sodium nitrolotriacetate or sodium tripolyphosphate squestering agent, and optionally anti-redeposition agents and optical brighteners, is improved by adding 5 to 40 percent alkali metal silicate and 5 to 40 percent of borax, ethylenediaminetetraacetic acid, nitriloacetic acid or diethylenetriaminepentaacetic acid as a pH controller.

10 Claims, No Drawings

DETERGENT COMPOSITION WITH CONTROLLED ALKALINITY

This is a continuation of application Ser. No. 109,654, filed Jan. 25, 1971, now abandoned.

Many detergents contain alkaline salts as builders, such as alkali metal phosphates, alkali metal silicates, and alkali metal carbonates. The phosphates contribute building properties such as alkalinity, deflocculation and sequestration; the silicates contribute alkalinity, buffering, deflocculation and metal corrosion prevention, while the carbonates contribute alkalinity and some buffering capacity. These properties all contribute to good detergency, but excess alkali causes serious problems in consumer detergents. Highly alkaline materials are harsh on the skin in applications like hand laundering. They also attack fine china overglaze patterns in machine dishwashing. Thus, optimum amounts of alkaline builders, particularly alkali metal silicates, could not be incorporated in these consumer detergents.

Many detergents are made by blending a surfactant, or several surfactants, with one or more alkaline builder salts and perhaps several detergent adjuncts, such as bleach, antiredeposition agent, perfume, etc. For some, such as laundry detergents and automatic dishwasher detergents, high levels of condensed phosphates (up to 50–60 percent) are included, mainly for hard water sequestration. However, laundry detergents have been limited to about 6 to 10 percent sodium silicate solids to remain within a suitable pH range of 9.5 to 10.2 when dissolved in a normal washing solution of about 0.1 to 0.2 percent solids. I have found that larger amounts of alkali metal silicate can be incorporated in the detergent composition without increasing the pH by including a somewhat slowly dissolving, relatively acidic ingredient in the composition. Examples of these slowly dissolving, relatively acidic materials are fused borax, ethylenediaminetetraacetic acid (EDTA) and Nitrilotriacetic acid (NTA).

Larger amounts of sodium silicate can be included in dishwasher detergents since wash solutions of these normally have pH about 10.5 to 12 at a solids content of 0.2 to 0.25 percent. However, at the upper end of this range, china overglaze corrosion is excessive. Including the proper amount of one of the above slowly dissolving, relatively acidic ingredients reduces the solution pH to the optimum range of 10.5 to 11.0.

Detergent compositions according to this invention are made by blending surfactant(s) with alkaline builder salt(s) and a material to control the pH of the product in use. Other ingredients, such as optical brightener, bleach, filler, perfume or dye, may also be included. A typical mixture useful as a laundry detergent consists of a surfactant, such as ethoxylated nonylphenol, 5 to 40 percent, sequestering agent, such as STPP, 10 to 50 percent; alkali metal silicate, 5 to 40 percent; relatively acidic pH controller, such as fused borax or NTA 5 to 40 percent; anti-redeposition agent, such as CMC, 0 to 5 percent; optical brightener 0 to 2 percent. Other ingredients, such as soda ash, sodium sulfate, perfume and dye, can also be included. A typical mixture made according to this invention useful as a dishwashing detergent consists of alkali metal silicate 10 to 60 percent; sequestering agent, such as STPP sodium tripolyphosphate or sodium nitrilotriacetic acid 10 to 50 percent; relatively acidic pH controller, such as fused borax or NTA 10 to 30 percent, nonionic surfactant 0 to 3 percent and bleach 0 to 3 percent.

The sodium silicate can be a liquid, sometimes called water glass, with SiO_2/Na_2O ratio of 1.5 to 4 and water content of about 40 to 60 percent. It can also be a solid with SiO_2/Na_2O ratio of 0.5 to 3.5 and water content of 0 to 30 percent.

These silicates are alkaline materials, so that substantial amounts of silicates in the formula often make the detergent too caustic. In order to maintain the alkalinity at the optimum level, the amount of controlling agent will depend on the alkalinity and quantity of more alkaline salts present. Thus, higher levels of these materials are required as the SiO_2/Na_2O ratio of the silicate decreases and as the level of the alkaline salt increases.

With liquid silicates, the relatively acidic component can dissolve rapidly in the wash bath. However, with solid silicates, particularly with the SiO_2/Na_2O greater than 1, the relatively acidic component should dissolve more slowly than the silicate. We have found that insolubles are formed if the acidic component dissolves before the sodium silicate and the silicate may not dissolve completely.

Any solid acidic material can be employed in the detergent formulations of this invention as long as it dissolves more slowly in the wash water than the alkaline salts, particularly alkali metal silicates. Both organic and inorganic materials are useful. Examples of useful materials are fused borax, EDTA, NTA and diethylenetriaminepentaacetic acid.

EXAMPLES

A better understanding of the invention can be obtained from the following illustrative examples which should not be considered restrictive. In all cases, parts are given on a weight basis.

EXAMPLE 1

The following mixture was made in a Young Ribbon Blender: 28 parts Nacconol NRSF, 31 parts GD Silicate ($SiO_2/Na_2O = 2.0$; $H_2O = 18.5$ percent), 25 parts anhydrous STPP, 15 parts fused borax, 1 part CMC and 0.1 part Blancophor CN. A laundry detergency test using this formula gave excellent results. The wash solution (0.2 percent) had pH of 10.0 and did not contain any insoluble matter.

EXAMPLE 2

The following mixture was made and tested as a laundry detergent: 15 parts Triton X–100, 37.5 parts STPP, 24.3 parts B-W Sodium Silicate ($SiO_2/Na_2O = 1.6$, $H_2O = 49$ percent), 10.0 parts of fused borax, 7.3 parts of Na_2SO_4, 1.0 part CMC, and 0.1 part Blancophor CN and 4.8 parts of water. An 0.2 percent solution showed excellent cotton detergency, had a pH of 10.15 and did not contain any insoluble material.

EXAMPLE 3

The following mixture was made and tested as in Example 2: 15 parts Triton X–100, 40.0 parts STPP, 26.6 parts of N Sodium Silicate ($SiO_2/Na_2O = 3.2$, $H_2O = 62.4$ percent), 2.5 parts of fused borax, 14.8 parts of sodium sulfate, 1.0 parts CMC and 0.1 part of Blancophor CN. A 0.2 percent solution had a pH of 10.0, had no insolubles and was an excellent detergent.

EXAMPLE 4

The following blend was made and added to water at 60°C to make an 0.2 percent solution: 28 parts of Nacconol NRSF, 30 parts of GD Silicate, 25 parts STPP, 10 parts of boric acid, 6 parts sodium sulfate and 1 part CMC. A white precipitate (SiO_2) did not dissolve. The same mix was made and dissolved, except the boric acid was held out until the remaining ingredients had dissolved. After dissolving the boric acid to give the complete formula, there was no precipitate.

EXAMPLE 5

The following mix was made in a Patterson-Kelley Blender: 48 parts of Metso Beads Sodium Metasilicate, 36 parts of sodium nitrilotriacetate solids, 12 parts of nitrilotriacetic acid, 1.6 parts of sodium dichloroisocyanurate and 2 parts of Triton CF-54. A 0.25 percent solution had a pH of 11.2 and was quite corrosive to china overglaze.

EXAMPLE 6

The following mix was made in a Patterson-Kelley Blender: 48 parts of Metso Beads, 24 parts of sodium nitrilotriacetate solids, 24 parts of nitrilotriacetic acid, 1.6 parts sodium dichloroisocyanurate and 2 parts of Triton CF-54. A 0.25 percent solution had a pH of 10.7 and was not corrosive to china overglaze.

More or less detailed claims will be presented hereinafter and even though such claims are rather specific in nature those skilled in the art to which this invention pertains will recognize that there are obvious equivalents for the specific materials recited therein. Some of these obvious equivalents are disclosed herein, other obvious equivalents will immediately occur to one skilled in the art, and still other obvious equivalents could be readily ascertained upon rather simple, routine, noninventive experimentation. Certainly no invention would be involved in substituting one or more of such obvious equivalents for the materials specifically recited in the claims. It is intended that all such obvious equivalents be encompassed within the scope of this invention and patent grant in accordance with the well-known doctrine of equivalents, as well as changed proportions of the ingredients which do not render the composition unsuitable for the disclosed purposes. Therefore, this application for Letters Patent is intended to cover all such modifications, changes and substitutions as would reasonably fall within the scope of the appended claims.

What I claim is:

1. A detergent composition for use in laundering, consisting essentially of 5 to 40 percent surfactant, 10 to 50 percent sequestering agent, 0 to 5 percent antiredeposition agent, 0 to 2 percent optical brightener, wherein said sequestering agent is selected from the group consisting of sodium nitrolotriacetate and sodium tripolyphosphate and said surfactant is selected from a group consisting of nonionic and anionic surfactants, and including the improvement consisting of using at least 5 percent and up to 40 percent alkali metal silicate and 5 to 40 percent of a relatively acidic pH controller selected from a group consisting of fused borax, ethelenediaminetetraacetic acid, nitrilotriacetic acids and diethylenetriaminepentaacetic acid and whereby a normal wash solution of said composition has a pH of 9.5 to 10.5.

2. A detergent according to claim **1** wherein said surfactant is ethoxylated nonylphenol.

3. A detergent according to claim **1** wherein said relatively acidic pH controller is fused borax.

4. A detergent according to claim **1** wherein said relatively acidic pH controller is NTA.

5. A detergent composition according to claim **1** wherein said alkali metal silicate is sodium silicate and comprises 12.4 to 50 percent of the composition.

6. A detergent composition according to claim **1** wherein said alkali metal silicate is sodium silicate and comprises 24 to 50 percent of the composition.

7. A detergent composition for use in dishwashing, consisting essentially of 0 to 5 percent nonionic surfactant; 10 to 50 percent sequestering agent selected from a group consisting of sodium nitrilotriacetate and sodium tripolyphosphate, and including the improvement consisting of using at least 10 and up to 60 percent alkali metal silicate and 10 to 30 percent of a relatively acidic pH controller selected from a group consisting of fused borax, nitrilotriacetic acid, ethylenediaminetetraacetic acid and diethylenetriaminepentaacetic acid and whereby a normal wash solution of the composition has a pH of 10 to 11.5.

8. A detergent according to claim **7** wherein said surfactant is ethoxylated nonylphenol.

9. A detergent according to claim **1** wherein said relatively acidic pH controller is fused borax.

10. A detergent according to claim **7** wherein said relatively acidic pH controller is nitrilotriacetic acid.

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