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3,530,071

SCOURING CLEANSER CONTAINING CHLORINATED TRISODIUM PHOSPHATE STABILIZED AGAINST LOSS OF BLEACHING EFFECTIVENESS WITH BORAX

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No Drawing. Filed June 26, 1967, Ser. No. 649,021

Int. Cl. C11d 7/56

U.S. Cl. 252-99

10 Claims

ABSTRACT OF THE DISCLOSURE

Scouring cleansers containing water-insoluble abrasive, chlorinated trisodium orthophosphate, borax, and, optionally, organic detergent and/or alkaline detergency builder.

BACKGROUND OF THE INVENTION

Field of the invention

This invention relates to scouring cleansers containing chlorinated trisodium phosphate and a small critical amount of borax which stabilizes the chlorinated trisodium phosphate in storage but does not effect aluminum mark removal, the pH of the cleanser under use conditions being at least 11.0.

Description of prior art

Scouring cleansers containing chlorinated trisodium phosphate have been in commercial use for many years. Although the chlorinated trisodium phosphate is an effective bleach it is relatively unstable in storage, especially when the cleanser is stored in open containers in a relatively dry atmosphere.

It is an object of this invention to provide a scouring cleanser containing chlorinated trisodium phosphate in which the chlorinated trisodium phosphate is stabilized against loss of bleaching effectiveness and there is no substantial loss of the cleanser's ability to remove aluminum marks.

SUMMARY OF THE INVENTION

The above objects and other objects as will hereinafter be made obvious can be accomplished by providing a scouring cleanser having a stable bleaching system and good aluminum mark removal consisting essentially of:

(A) At least 60% by weight of a finely divided water-insoluble abrasive;

(B) From 0% to about 10% of a water-soluble anionic, nonionic, zwitterionic, or cationic organic detergent;

(C) From 0% to about 30% alkaline detergency builder;

(D) From about 2.5% to about 30% by weight of chlorinated trisodium phosphate;

(E) From about 1% to about 5% by weight of borax, the amount of borax being sufficient to stabilize the chlorinated trisodium phosphate when the composition is exposed to a relatively dry atmosphere; said cleanser having a pH under use conditions of at least 11.

The water-insoluble abrasive comprises a major portion of scouring cleansers. The scouring cleansers of this invention contain at least 60% by weight abrasive, preferably from about 60% to about 95%. Almost any water-insoluble particulate abrasive can be used in the compositions of this invention. Examples of water-insoluble abrasives suitable for use in the cleanser compositions of the present invention include finely divided particulate siliceous abrasives such as quartz, silica, feldspar, pumice, pumicite, zirconium silicate, volcanic ash, diatomaceous

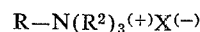
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earth, china clay, whiting, bentonite, talc and the like and calcium carbonate and aluminum oxide. A suitable particle size for this abrasive material is from about 0.3 mm. diameter to about 0.001 mm. diameter. Finer particles can also be used.

The water-soluble organic detergents which can be used in the scouring cleanser compositions of this invention are anionic, nonionic, zwitterionic and cationic organic detergents. The preferred class of organic detergents is the anionic non-soap class. The preferred anionic detergents are alkali metal alkyl benzene sulfonates wherein the alkyl group contains from about 10 to about 18 carbon atoms and alkyl sulfates which contain from about 10 to about 18 carbon atoms and wherein said alkyl groups are preferably straight chain alkyl groups.

Examples of suitable detergents for use in scouring cleanser compositions of this invention include those detergents described in U.S. Pat. 3,318,817 at column 4, line 37, through column 6, line 30, and column 9, line 6 through line 57. This list is merely illustrative. The disclosure of this patent is incorporated herein by reference.

Suitable cationic detergents are those having the formula



wherein R is an alkyl chain containing from about 8 to about 20 carbon atoms, each R² is selected from the group consisting of alkyl and alkanol groups containing from 1 to 4 carbon atoms and benzyl groups there being normally no more than one benzyl group and two R² groups can be joined by either a carbon-carbon, ether, or imino linkage to form a ring structure, and X represents a halogen atom, sulfate group, nitrate group or other pseudo-halogen group. Specific examples are coconut alkyl trimethyl amine chloride, dodecyl dimethyl benzyl bromide, and dodecyl methyl morpholino chloride.

The above organic detergents are used in amounts not to exceed 10% by weight of the composition and preferably in amounts of about 1% to about 6% by weight of the composition. The purpose of the organic detergent is to provide the primary detergency effect in cooperation with the alkaline detergency builders described herein-after.

The alkaline detergency builders provided the proper pH for the composition and enhance the detergency effect of the organic detergent. The alkaline detergency builder should be used in amounts less than about 30% by weight of the composition preferably in amounts from about 5% to about 15% by weight of the composition. Suitable examples of alkaline detergency builders include those described in U.S. Pat. 3,309,319 at column 4, line 44 through column 5, line 9. The disclosure of this patent is incorporated herein by reference.

As stated hereinbefore the composition should contain from 2.5% to about 30% by weight chlorinated trisodium phosphate. The chlorinated trisodium phosphate is the product first described in U.S. Pat. 1,555,474. The disclosure of this patent is incorporated herein by reference. The chlorinated trisodium phosphate should be used in amounts from about 2.5% to about 30% by weight of the composition and preferably from about 12% to about 22% by weight of the composition.

The borax (sodium tetraboratedecahydrate) is added to the composition to stabilize the chlorinated trisodium phosphate. The amount of borax used should be from about 1% to about 5% by weight of the composition. The borax is unique in that it contains a large amount of water of crystallization which acts as a reservoir of moisture to keep the chlorinated trisodium phosphate in a humid atmosphere where it is more stable. It is surprising that such a small amount of borax will serve to

stabilize the chlorinated trisodium phosphate. It is important that the borax comprises no more than about 5% by weight of the composition since the borax tends to lower the pH of the use solution of the composition and a highly alkaline solution is required for effective aluminum mark removal. The pH of use solutions of the composition should be at least about 11 to provide effective aluminum mark material.

If the pH is lowered by the borax to a small degree, there is also an increase in the bleaching speed of the composition since chlorinated trisodium phosphate bleaches slower in highly alkaline solutions. There is a balance that must be achieved to provide improved bleaching speed while not adversely affecting aluminum mark removal. The preferred pH range is from 11 to about 11.4.

The stabilization of the chlorinated trisodium phosphate also improves the odor of the compositions.

Other ingredients can also be present in the compositions of this invention. Suitable inert inorganic salts can also be included in the compositions in amounts less than about 20% by weight of the composition. Examples of inert inorganic salts include sodium chloride, sodium sulfate, potassium chloride, potassium sulfate, etc. Other minor ingredients which can be included are soil suspending agents such as sodium carboxymethylcellulose, sodium carboxymethylhydroxyethylcellulose, dyes pigments, optical brighteners, antibacterial agents, tarnish inhibitors such as benzotriazole, etc.

The invention can be better understood by reference to the following specific examples.

EXAMPLE I

In all of the examples herein, the components had the following descriptions.

The silica abrasive contained about 99.8% silica, approximately 0.2% moisture and about 0.033% pigment. The particle size varied from about 5 microns to about 50 microns with the major portion of the particles being in the range from about 10 microns to about 20 microns.

The chlorinated trisodium phosphate was a commercial grade containing about 3.5% sodium hypochlorite, 41% Na_3PO_4 , 52% H_2O and the remainder mainly NaCl. The particle size in Tyler mesh screen sizes was such that almost all would pass a 35 mesh screen and the major portion would pass a 100-mesh screen and be retained on a 200 mesh screen. About 30% of the material would pass a 200 mesh screen.

The detergent composition was a spray dried granule having the formula:

	Percent
Sodium alkyl (C_{11}) benzene sulfonate	17.3
Sodium toluene sulfonate	2.0
Sodium tripolyphosphate	49.5
Sodium silicate (1.6 ratio)	6.1
Sodium sulfate	13.9
Minor ingredients including unsulfonated materials, pigments, etc.	1.2
Water	Balance

The borax decahydrate had an Na_2O content of 17%, a B_2O_3 content of 38%, and a moisture content of about 45%. The particle size was such that almost all particles would pass a 65 mesh Tyler screen and be retained on a 200 mesh screen. About 24% would pass a 200 mesh screen.

The following samples were prepared and stored to determine the stability of the chlorinated trisodium phosphate

Run	Silica abrasive	Chlorinated trisodium phosphate	Detergent granules	Perfume	Borax
1-----	70.05	16.5	13.3	0.15	0
2-----	68.05	16.5	13.3	0.15	2.0
3-----	66.05	16.5	13.3	0.15	4.0

The stability data was as follows:

PERCENT REMAINING OF ORIGINAL AVAILABLE CHLORINE AFTER STORAGE AT 80° F. SEALED

Run	5 weeks	11 weeks	4 months	6 months
1-----	94.5	78.2	65.5	36.4
2-----	97.4	88.0	77.5	51.8
3-----	98.2	94.8	84.4	66.6

EXAMPLE II

In this example, two products were stored in open containers for one month and five days at 80° F. The compositions were as follows:

Run	Percent by weight	
	4	5
Silica abrasive	71.15	68.15
Chlorinated trisodium phosphate	15.6	15.6
Detergent granules	13.1	13.1
Perfume	0.15	0.15
Borax		3.0
Percent remaining of original available chlorine after storage unsealed in dry 80° F. air for the month	16	31.2

EXAMPLE III

The following compositions show the lower pH's associated with higher levels of borax.

Run	6	7	8	9
Silica abrasive	70.0	67.0	64.0	61.0
Detergent granules	13.3	13.3	13.3	13.3
Chlorinated trisodium phosphate	16.7	16.7	16.7	16.7
Perfume	(1)	(1)	(1)	(1)
Borax		3	6	9
pH (5% slurry of cleanser composition in water)	11.5	11.1	10.4	9.9

¹ Trace.

When the pH drops below 11 the composition does not remove aluminum marks well.

When in the above examples the following detergents are substituted either wholly or in part (e.g., 1:1 ratio by weight) for the sodium alkyl benzene sulfonate detergent substantially equivalent results are obtained in that the borax stabilizes the chlorinated trisodium phosphate.

Sodium, potassium and/or ammonium

- (a) Coconut soap;
- (b) Tallow soap;
- (c) Alkyl sulfate wherein the alkyl is derived from coconut oil;
- (d) Alkyl sulfate wherein the alkyl radical is derived from tallow;
- (e) Alkyl sulfonate prepared by sulfonating alpha olefins containing an average of about 12 carbon atoms;
- (f) Alkyl benzene sulfonates containing straight alkyl chains containing an average of about 12 carbon atoms;
- (g) Alkyl glyceryl ether sulfonates wherein the alkyl group is derived from coconut oil;
- (h) Coconut oil fatty acid monoglyceride sulfates wherein the fatty acid group is derived from coconut oil;
- (i) Fatty acid monoglyceryl sulfonate wherein the fatty acid group is derived from coconut oil;
- (j) Alkyl ethylene oxide sulfates wherein the alkyl radical is derived from tallow, and where there are about 3 moles of ethylene oxide per mole of fatty alcohol;
- (k) Alkyl phenol ethylene oxide sulfates containing about 4 units of ethylene oxide per molecule in which the alkyl radical contains about 9 carbon atoms;
- (l) Fatty acyl isethionates wherein the fatty acyl groups are derived from coconut oil;
- (m) The condensation product of ethylene oxide with a condensation product of propylene oxide and propylene glycol, the ethylene oxide constituting 50% of the total weight of the condensation product and the total molecular weight of the condensation product being about 3600;

- (n) Alkyl phenol ethylene oxides wherein the alkyl group contains about 12 carbon atoms and there are approximately 10 moles of ethylene oxide per mole of alkyl phenol the condensation product of alcohols derived from coconut oil and about 10 moles of ethylene oxide per mole of coconut alcohol;
- (o) Dodecyl dimethyl amine oxide;
- (p) Tetradecyl dimethyl phosphine oxide;
- (q) 3-(N,N-dimethyl-N-hexadecylammonio)-propane-1-sulfonate;
- (r) 3-(N,N-dimethyl-N-coconutalkylammonio)-2-hydroxy-propane-1-sulfonate;
- (s) 3-(N,N-diethyl-N-hexadecylammonio)-propane-1-carboxylate;
- (t) Dodecyl-beta-alanine;
- (u) N-dodecyl taurine;
- (v) N-dodecylaspartate;
- (w) Coconut alkyl triethylamine chloride;
- (x) Dodecyl dimethylbenzylbromide
- (y) Dodecyl methyl morpholine methylsulfate;
- (z) Dodecyl methyl pyridene nitrate; and

mixture thereof, e.g. 1:1 mixtures of coconut soap and alkyl sulfonates; alkyl sulfates and alkyl benzene sulfonates; coconut oil fatty acid monoglyceride sulfates and fatty acyl isethionates; and alkyl phenol ethylene oxide and dodecyl dimethyl amine oxide.

Also when in the above examples the following alkaline detergency builders are substituted, either wholly or in part, (e.g., a 1:1 ratio by weight) for the sodium triphosphate, substantially equivalent results are obtained in that the borax stabilizes the chlorinated trisodium phosphates, carbonates, tripolyphosphates, pyrophosphate, hexametaphosphates, ethylenediaminetetraacetates, N-(2-hydroxyethyl)-ethylene diamine triacetates, nitrilotriacetates, N - (2-hydroxyethyl)-nitrilotriacetates, phytates, ethane - 1-hydroxy-1,1-diphosphonates, methylene diphosphonates, ethylenediphosphonates, isopropylidene diphosphonates, benzylmethylidene, diphosphonates, chloromethylidene diphosphonates, polyitaconates, polyaconitates, polymaleates, polymesaconates, polyfumates, polymethylene malonates, polycitronates and 1:1 copolymers of the preceding polymers with ethylene, said polymers having molecular weights of approximately 175,000 and mixtures thereof in e.g. a 1:1 ratio by weight.

When in the above examples the following abrasives are substituted, either wholly or in part, (e.g., a 1:1 ratio by weight), for the silica abrasive, substantially equivalent results are obtained in that borax stabilizes the chlorinated trisodium phosphate. Feldspar, pumice, pumicite, zirconium silicate, volcanic ash, diatomaceous earth, china clay, whiting, bentonite, talc, calcium carbonate and aluminum oxide where the above abrasives have the same particle size as the silica in the above examples.

All percentages parts, and ratios herein are by weight unless otherwise specified.

I claim:

1. A scouring cleanser having a stable bleaching system and good aluminum mark removal consisting essentially of:

- (a) at least 60% by weight of a water-insoluble abrasive selected from the group consisting of quartz,

silica, feldspar, pumice, pumicite, zirconium silicate, volcanic ash, diatomaceous earth, china clay, whiting, bentonite, talc, calcium carbonate and aluminum oxide having a particle size from about 0.3 mm. diameter to about 0.001 mm. diameter;

- (b) from 0% to about 10% by weight of a water-soluble anionic, nonionic, zwitterionic, or cationic organic detergent;

- (c) from about 0% to about 30% by weight alkaline detergency builder;

- (d) from about 2.5% to about 30% by weight of chlorinated trisodium phosphate containing from about 1% to about 4% by weight of available chlorine; and

- (e) from about 1% to about 5% by weight of borax, the amount of borax being sufficient to stabilize the chlorinated trisodium phosphate when the composition is exposed to a relatively dry atmosphere, said cleanser having a pH under use conditions of at least 11.0.

2. The composition of claim 1 wherein the water-soluble organic detergent is a water-soluble synthetic anionic detergent which is an organic reaction product having an alkyl or alkyl benzene radical wherein said alkyl radical contains 10 to 18 carbon atoms and an anionic radical selected from the group consisting of sulfate and sulfonate.

3. The composition of claim 1 wherein the water-insoluble abrasive material is a water-soluble silica having a particle size less than 0.3 mm. in diameter.

4. The composition of claim 1 wherein the water-soluble detergent is a straight chain alkyl benzene sulfonate having an alkyl group containing from about 8 to about 16 carbon atoms.

5. The composition of claim 1 wherein the borax is present at a level of about 3%.

6. The composition of claim 1 having a pH from about 11 from about 11.4.

7. The composition of claim 1 containing from about 12% to about 22% chlorinated trisodium phosphate containing from 1% to 4% by weight of available chlorine.

8. The composition of claim 1 containing from about 5% to about 15% alkaline detergency builder.

9. The composition of claim 1 containing from about 1% to about 6% water-soluble anionic, nonionic, zwitterionic or cationic organic detergent.

10. The composition of claim 1 containing from about 60% to about 95% by weight of a water-insoluble abrasive having a particle size from about 0.3 mm. to about 0.001 mm. diameter.

References Cited

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MAYER WEINBLATT, Primary Examiner

U.S. Cl. X.R.

252—187

PO-1050
(5/69)

UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,530,071 Dated September 22, 1970

Inventor(s) Franklin Dale Moore

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Column 6, Claim 2, line 21, for "detedgent" read ---
detergent ---;

Column 6, Claim 3, line 29, for "water-soluble" read
--- water-insoluble ---;

Column 6, Claim 9, line 45, for "switteri6nic" read
--- zwitterionic ---.

SIGNED AND
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JAN 18 1971

(SEAL)

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