

Soaker Compositions

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Technical Field

20 The present invention relates to the cleaning of fabrics in soaking conditions, i.e. in conditions where the fabrics are left to soak in a soaking liquor comprising water and detergent ingredients, either as a first step before a typical washing operation, or as a single step.

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Background

30 Fabric soaking operations have been described in the art. In such soaking operations, fabrics are left in contact with a soaking liquor for a prolonged period of time ranging from a few hours to overnight. This laundering process has the advantage that it maximizes the contact time between the fabrics and the key active ingredients of the soaking liquor. It also has the advantage that it reduces or eliminates the need for a typical laundering operation involving
35 the need for mechanical agitation, or that it improves the efficiency of the subsequent typical laundering operation.

Such soaking operations are typically efficient to remove tough outdoor dirt from fabrics, such as particulate soil, mud, silt and clays. Such dirt is particularly difficult to remove from fabrics. Indeed, it is believed that the very fine dirt grains like silt, typically in the range between 0.002 and 0.050 mm, and
5 clay, typically below 0.002mm in size, can insert among fabric fibers and steadily stick to the surface of the fibers. This problem is particularly acute with socks which are most exposed to silt and clay pick-up.

It is thus an object of the present invention to improve the removal of dirt,
10 particularly silt and clay, from fabric in a soaking operation.

It has been found that this object can be met by soaking fabrics in an aqueous soaking liquor comprising a soaking detergent composition, said composition comprising a sorbitan ester as defined hereinafter in combination with high
15 levels of a building and soil suspending system. The present invention encompasses the soaking detergent as well as a process of soaking fabrics in a soaking liquor formed with said soaking detergent.

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Summary of the invention

In one embodiment, the present invention encompasses compositions comprising:

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- a sorbitan ester according to the formula $C_6H_9O_2(C_2H_4O)_xR_1R_2R_3$, wherein x is an integer of from 0 to 40, R_1 , R_2 are independently OH or $(C_nH_{n+1})COO$, and R_3 is $(C_nH_{n+1})COO$ group, where n is an integer of from 11 to 17; and
- 30 - from 5% to 50% by weight of a building and soil suspending system comprising a compound selected from citric acid or citrates, silicates, zeolites, polycarboxylates, phosphates, and mixtures thereof.

In another embodiment, the present invention encompasses a process of
35 soaking fabrics, wherein said fabrics are immersed in a soaking liquor comprising water and an effective amount of the composition above.

Detailed Description of the invention

The present invention encompasses a composition and a process of soaking
5 fabrics. The composition, hereinafter referred to as the soaking composition is
used in the soaking process.

A - The composition:

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In its first embodiment, the present invention encompasses a composition
which comprises a sorbitan ester, and a high level of a building and soil
suspending system.

15 The sorbitan ester:

Accordingly, the first essential ingredient is a sorbitan ester according to the
formula $C_6H_9O_2 (C_2H_4O)_x R_1 R_2 R_3$, wherein x is an integer of from 0 to 40, R_1 , R_2
are independently OH or $(C_n H_{n+1})COO$, and R_3 is $(C_n H_{n+1})COO$ group, where
20 n is an integer of from 11 to 17.

In the preferred compositions herein, x is 0 or 20, and the most preferred
compositions herein comprise polyethoxylated (20) sorbitan tristearate, i.e.
 $C_6H_9O_2 (C_2H_4O)_{20} (C_{17} H_{35}COO)_3$, or polyethoxylated (20) sorbitan
25 monostearate, i.e. $C_6H_9O_2 (C_2H_4O)_{20} (OH)_2 (C_{17} H_{35}COO)$, or sorbitan
monostearate, i.e. $C_6H_9O_2 (OH)_2 (C_{17} H_{35}COO)$, or sorbitan monopalmitate, i.e.
 $C_6H_9O_2 (OH)_2 (C_{15} H_{31}COO)$, or mixtures thereof.

All these materials are commercially available under several trade names,
30 such as Glycosperse TS 20 from Lonza (polyethoxylated sorbitan tristearate),
Glycosperse S 20 from Lonza (polyethoxylated sorbitan monostearate),
Radiasurf 7145 from Fina (sorbitan monostearate), Radiasurf 7135 from Fina
(sorbitan monopalmitate), Armotan MP from Akzo (sorbitan monopalmitate).

35 It has further been found that combining ethoxylated sorbitan esters with non-
ethoxylated sorbitan esters provides better performance than either kind alone.

In the soaking composition herein, there should be from 0.01% to 10% of said sorbitan ester, preferably from 0.01% to 5%, most preferably from 0.5% to 5%.

5 **The building and soil suspending system:**

The second essential ingredient herein is a building and soil suspending system comprising a compound selected from citric acid or citrates, silicates, zeolites, polycarboxylates, phosphates, and mixtures thereof. It is also
10 essential that said system be present at a high total amount, of from 5% to 50% by weight of the total composition, preferably from 10% to 40%, most preferably from 15% to 30%.

Citric acid can be used in its acidic form or in the form of its salts (mono-, di-,
15 tri- salts) and in all its anhydrous and hydrated forms, or mixtures thereof.

Suitable silicates for use herein include alkali metal salts of silicate, or mixtures thereof. Preferred alkali metal salt of silicate to be used herein is sodium silicate. In addition to the performance benefit mentioned in the background
20 part of this application, It has been found that the decomposition of available oxygen produced in the soaking liquors upon dissolution of soaking compositions is reduced by the presence of at least 40 parts per million of sodium silicate in said soaking liquors.

25 Any type of alkali metal salt of silicate can be used herein, including the crystalline forms as well as the amorphous forms of said alkali metal salt of silicate or mixtures thereof.

Suitable crystalline forms of sodium silicate to be used are the crystalline
30 layered silicates of the granular formula



wherein M is sodium or hydrogen, x is a number from 1.9 to 4 and y is a
35 number from 0 to 20, or mixtures thereof. Crystalline layered sodium silicates of this type are disclosed in EP-A-164 514 and methods for their preparation are disclosed in DE-A-34 17 649 and DE-A-37 42 043. For the purposes of the

present invention, x in the general formula above has a value of 2, 3 or 4 and is preferably 2. More preferably M is sodium and y is 0 and preferred examples of this formula comprise the a, b, g and d forms of $\text{Na}_2\text{Si}_2\text{O}_5$. These materials are available from Hoechst AG FRG as respectively NaSKS-5, NaSKS-7, NaSKS-11 and NaSKS-6. The most preferred material is d - $\text{Na}_2\text{Si}_2\text{O}_5$, NaSKS-6. Crystalline layered silicates are incorporated in granular soaking compositions herein, either as dry mixed solids, or as solid components of agglomerates with other components.

- 10 Suitable amorphous forms of sodium silicate to be used herein have the following general formula:



- 15 wherein M is sodium or hydrogen and x is a number from 1.9 to 4, or mixtures thereof. Preferred to be used herein are the amorphous forms of $\text{Si}_2\text{O}_5 \text{ Na}_2\text{O}$.

Suitable Zeolites for use herein are aluminosilicates including those having the empirical formula:

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- 25 wherein M is sodium, potassium, ammonium or substituted ammonium, z is from about 0.5 to about 2; and y is 1; this material having a magnesium ion exchange capacity of at least about 50 milligram equivalents of CaCO_3 hardness per gram of anhydrous aluminosilicate. Preferred zeolites which have the formula:



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wherein z and y are integers of at least 6, the molar ratio of z to y is in the range from 1.0 to about 0.5, and x is an integer from about 15 to about 264.

- 35 Useful materials are commercially available. These aluminosilicates can be crystalline or amorphous in structure and can be naturally-occurring aluminosilicates or synthetically derived. A method for producing aluminosilicate ion exchange materials is disclosed in U.S. Patent 3,985,669,

Krummel, et al, issued October 12, 1976. Preferred synthetic crystalline aluminosilicate ion exchange materials useful herein are available under the designations Zeolite A, Zeolite P (B), and Zeolite X. In an especially preferred embodiment, the crystalline aluminosilicate ion exchange material has the
5 formula:



wherein x is from 20 to 30, especially about 27. This material is known as
10 Zeolite A. Preferably, the aluminosilicate has a particle size of about 0.1-10 microns in diameter.

Suitable phosphate builders for use herein include sodium and potassium tripolyphosphate, pyrophosphate, polymeric metaphosphate having a degree
15 of polymerization of from about 6 to 21, and orthophosphate. Other phosphorus builder compounds are disclosed in U.S. Pat. Nos. 3,159,581; 3,213,030; 3,422,021; 3,422,137; 3,400,176 and 3,400,148, incorporated herein by reference.

20 Suitable polycarboxylate builders for use herein include ether polycarboxylates, including oxydisuccinate, as disclosed in Berg, U.S. Patent 3,128,287, issued April 7, 1964, and Lamberti et al, U.S. Patent 3,635,830, issued January 18, 1972. See also "TMS/TDS" builders of U.S. Patent 4,663,071, issued to Bush et al, on May 5, 1987. Suitable ether
25 polycarboxylates also include cyclic compounds, particularly alicyclic compounds, such as those described in U.S. Patents 3,923,679; 3,835,163; 4,120,874 and 4,102,903.

Other useful detergency builders include the ether hydroxypolycarboxylates,
30 1,3,5-trihydroxy benzene-2,4,6-trisulphonic acid, and carboxymethyloxysuccinic acid, the various alkali metal, ammonium and substituted ammonium salts of polyacetic acids such as ethylenediamine tetraacetic acid and nitrilotriacetic acid, as well as polycarboxylates such as
35 mellitic acid, succinic acid, oxydisuccinic acid, polymaleic acid, benzene 1,3,5-tricarboxylic acid, carboxymethyloxysuccinic acid, and soluble salts thereof.

Also suitable in the detergent compositions of the present invention are the 3,3-dicarboxy-4-oxa-1,6-hexanedioates and the related compounds disclosed in U.S. Patent 4,566,984, Bush, issued January 28, 1986. Useful succinic acid builders include the C₅-C₂₀ alkyl and alkenyl succinic acids and salts thereof.

5 A particularly preferred compound of this type is dodecenylsuccinic acid. Specific examples of succinate builders include: laurylsuccinate, myristylsuccinate, palmitylsuccinate, 2-dodecenylsuccinate (preferred), 2-pentadecenylsuccinate, and the like. Laurylsuccinates are the preferred builders of this group, and are described in European Patent Application

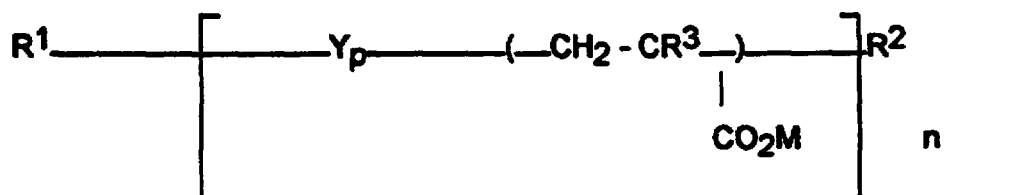
10 86200690.5/0,200,263, published November 5, 1986.

Other suitable polycarboxylates are disclosed in U.S. Patent 4,144,226, Crutchfield et al, issued March 13, 1979 and in U.S. Patent 3,308,067, Diehl, issued March 7, 1967. See also Diehl U.S. Patent 3,723,322.

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Other suitable polycarboxylate builders for use herein include builders according to formula I

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wherein Y is a comonomer or comonomer mixture; R¹ and R² are bleach- and alkali-stable polymer-end groups; R³ is H, OH or C₁₋₄ alkyl; M is H, alkali metal, alkaline earth metal, ammonium or substituted ammonium; p is from 0 to

30 2; and n is at least 10, or mixtures thereof.

Preferred polymers for use herein fall into two categories. The first category belongs to the class of copolymeric polymers which are formed from an unsaturated polycarboxylic acid such as maleic acid, citraconic acid, itaconic

35 acid, mesaconic acid and salts thereof as first monomer, and an unsaturated monocarboxylic acid such as acrylic acid or an alpha-C₁₋₄ alkyl acrylic acid as second monomer. Referring to formula I hereinabove, the polymers belonging

to said first class are those where p is not 0 and Y is selected from the acids listed hereinabove. Preferred polymers of this class are those according to formula I hereinabove, where Y is maleic acid. Also, in a preferred embodiment, R^3 and M are H, and n is such that the polymers have a molecular weight of from 1000 to 400 000 atomic mass units.

The second category of preferred polymers for use herein belongs to the class of polymers in which, referring to formula I hereinabove, p is 0 and R^3 is H or C_{1-4} alkyl. In a preferred embodiment n is such that the polymers have a molecular weight of from 1000 to 400 000 atomic mass units. In a highly preferred embodiment, R^3 and M are H.

The alkali-stable polymer end groups R^1 and R^2 in formula I hereinabove suitably include alkyl groups, oxyalkyl groups and alkyl carboxylic acid groups and salts and esters thereof.

In the above, n , the degree of polymerization of the polymer can be determined from the weight average polymer molecular weight by dividing the latter by the average monomer molecular weight. Thus, for a maleic-acrylic copolymer having a weight average molecular weight of 15,500 and comprising 30 mole % of maleic acid derived units, n is 182 (i.e. $15,500 / (116 \times 0.3 + 72 \times 0.7)$).

Temperature-controlled columns at 40°C against sodium polystyrene sulphonate polymer standards, available from Polymer Laboratories Ltd., Shropshire, UK, the polymer standards being 0.15M sodium dihydrogen phosphate and 0.02M tetramethyl ammonium hydroxide at pH 7.0 in 80/20 water/acetonitrile.

Of all the above, highly preferred polymers for use herein are those of the first category in which n averages from 100 to 800, preferably from 120 to 400.

Preferred builder and soil suspending system for use herein is anhydrous citric acid, or polymers of maleic or acrylic acid, or copolymers of maleic and acrylic acid.

Optionals:

The soaking composition of the present invention may further comprise a variety of other ingredients.

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As an optimal but highly preferred ingredient, the composition may further comprise an oxygen bleach. Indeed, oxygen bleaches provide a multitude of benefits such as bleaching of stains, deodorization, as well as disinfectancy, and the sorbitan esters according to the present invention have a further particular advantage that they are resistant to oxydation by oxygen bleaches. The oxygen bleach in the composition may come from a variety of sources such as hydrogen peroxide or any of the addition compounds of hydrogen peroxide, or organic peroxyacid, or mixtures thereof. By addition compounds of hydrogen peroxide it is meant compounds which are formed by the addition of hydrogen peroxide to a second chemical compound, which may be for example an inorganic salt, urea or organic carboxylate, to provide the addition compound. Examples of the addition compounds of hydrogen peroxide include inorganic perhydrate salts; the compounds hydrogen peroxide forms with organic carboxylates, urea, and compounds in which hydrogen peroxide is clathrated.

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Other suitable oxygen bleaches include persulphates, particularly potassium persulphate $K_2S_2O_8$ and sodium persulphate $Na_2S_2O_8$. Examples of inorganic perhydrate salts include perborate, percarbonate, perphosphate and persilicate salts. The inorganic perhydrate salts are normally the alkali metal salts.

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The alkali metal salt of percarbonate, perborate or mixtures thereof, are the preferred inorganic perhydrate salts for use herein. Preferred alkali metal salt of percarbonate is sodium percarbonate.

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Soaking compositions in the present invention may comprise from 0% to 60% by weight of composition of a hydrogen peroxyde source, preferably from 0% to 40% and more preferably from 10% to 40%.

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When the soaking compositions herein comprise an oxygen bleach, it is preferred for them to further comprise bleach activators. Examples of suitable

compounds of this type are disclosed in British Patent GB 1 586 769 and GB 2 143 231. Preferred examples of such compounds are tetracetyl ethylene diamine, (TAED), sodium 3, 5, 5 trimethyl hexanoyloxybenzene sulphonate, diperoxy dodecanoic acid as described for instance in US 4 818 425 and nonylamide of peroxyadipic acid as described for instance in US 4 259 201 and n-nonanoyloxybenzenesulphonate (NOBS), and acetyl triethyl citrate (ATC) such as described in European patent application 91870207.7. Also particularly preferred are N-acyl caprolactam selected from the group consisting of substituted or unsubstituted benzoyl caprolactam, octanoyl caprolactam, nonanoyl caprolactam, hexanoyl caprolactam, decanoyl caprolactam, undecenoyl caprolactam, formyl caprolactam, acetyl caprolactam, propanoyl caprolactam, butanoyl caprolactam pentanoyl caprolactam. The soaking compositions herein may comprise mixtures of said bleach activators.

Preferred mixtures of bleach activators herein comprise n-nonanoyloxybenzenesulphonate (NOBS) together with a second bleach activator having a low tendency to generate diacyl peroxide, but which delivers mainly peracid. Said second bleach activators may include tetracetyl ethylene diamine (TAED), acetyl triethyl citrate (ATC), acetyl caprolactam, benzoyl caprolactam and the like, or mixtures thereof. Said mixtures of bleach activators are preferably used in the embodiment of the present invention where the soaking liquors are controlled to a pH below 9.5. Indeed, it has been found that mixtures of bleach activators comprising n-nonanoyloxybenzenesulphonate and said second bleach activators, allow to boost particulate soil cleaning performance while exhibiting at the same time good performance on diacyl peroxide sensitive soil (e.g. beta-carotene) and on peracid sensitive soil (e.g. body soils).

Accordingly, the soaking compositions herein may comprise from 0% to 15% by weight of the total composition of n-nonanoyloxybenzenesulphonate, preferably from 1% to 10% and more preferably from 3% to 7% and from 0% to 15% by weight of the total composition of said second bleach activator preferably from 1% to 10% and more preferably from 3% to 7%.

When the soaking compositions herein comprise an oxygen bleach, it may be desirable for them to further comprise chelating agents which help to control

the level of free heavy metal ions in the soaking liquors, thus avoiding rapid decomposition of the oxygen released by said source of available oxygen. Suitable amino carboxylate chelating agents which may be used herein include diethylene triamino pentacetic acid, ethylenediamine tetraacetates (EDTA), N-
5 hydroxyethylethylenediamine triacetates, nitrilotriacetates, ethylenediamine tetrapropionates, triethylenetetraamine hexaacetates, and ethanoldiglycines, alkali metal ammonium and substituted ammonium salts thereof or mixtures thereof. Further suitable chelating agents include ethylenediamine-N,N'-
10 disuccinic acids (EDDS) or alkali metal, alkaline earth metal, ammonium, or substituted ammonium salts thereof. Particularly suitable EDDS compounds are the free acid form and the sodium or magnesium salt or complex thereof. Also others suitable chelating agents may be the organic phosphonates, including amino alkylene poly(alkylene phosphonate), alkali metal ethane 1-
15 hydroxy diphosphonates, nitrilo trimethylene phosphonates, ethylene diamine tetra methylene phosphonates and diethylene triamine penta methylene phosphonates. The phosphonate compounds may be present either in their acid form or in the form of their metal alkali salt. Preferably the organic phosphonate compounds where present are in the form of their magnesium salt.

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The soaking compositions in the present invention may accordingly comprise from 0% to 5% by weight of the total compositions of said chelating agents, preferably from 0% to 3%, more preferably from 0.05% to 2%.

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Soaking compositions in the present invention may further comprise other optional ingredients such as surfactants, fillers, optical brighteners, enzymes, other chelants, dispersants, surfactants, soil release agents, photoactivated
30 bleaches such as Zn phthalocyanine sulphonate, dyes, dye transfer inhibitors, pigments and perfumes. Said optional ingredients can be added in varying amounts as desired.

The compositions herein can be manufactured in solid, preferably granular, or
35 liquid form.

B - The process:

In a second embodiment, the present invention encompasses a process of soaking fabrics. As used herein, the expression "process of soaking fabrics" refers to the action of leaving fabrics to soak in a soaking liquor comprising water and a composition as described hereinabove, for a period of time sufficient to clean said fabrics. The soaking process can be performed independently from any other process, such as a typical laundering operation, or a first step before a second, typical laundering step. In the preferred soaking processes of the invention, fabrics are left to soak for a period of time ranging from 10 minutes to 24 hours, preferably from 30 min to 24 hours, most preferably 4 hours to 24 hours. After the fabrics have been immersed in said soaking liquor for a sufficient period of time, they can be removed and rinsed with water. The fabrics can also be washed in a normal laundering operation after they have been soaked, with or without having been rinsed inbetween the soaking operation and the subsequent laundering operation.

In the soaking process herein, a soaking composition described hereinabove is diluted in an appropriate amount of water to produce a soaking liquor. Suitable doses may range from 45 to 50 grams of soaking composition in 3.5 to 5 liters of water, down to 90 to 100 grams of soaking composition in 20 to 45 liters of water. Typically one dose is 45-50 grams in 3.5 to 5 Lt for a concentrated soak (bucket/sink). For washing machine soaked, the dose is 90-100 grams in about 20 (Europe) to 45 (US) liter of water. The fabrics to be soaked are then immersed in the soaking liquor for an appropriate period of time. There are factors which may influence overall performance of the process on particulate dirt/soils. Such factors include prolonged soaking time. Indeed, the longer fabrics are soaked, the better the end results. Ideally soaking time is overnight, i.e. 12 hours up to 24 hours. Another factor is the initial warm or lukewarm temperature. Indeed higher initial temperatures of the soaking liquors ensure large benefits in performance.

The process herein is suitable for cleaning a variety of fabrics, but finds a preferred application in the soaking of socks, which are particularly exposed to silt and clay pick-up.

Examples

The following compositions are prepared by mixing the listed ingredients in the listed proportions.

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<u>Ingredient</u>	<u>1</u> (%w/w)	<u>2</u> (%w/w)	<u>3</u> (%w/w)
Sorbitan mono-stearate (SMS)	—	3.00	—
Sorbitan tristearate EO 20 (STS EO 20)	—	—	3.00
Citric acid	12	12	12
Zeolite A	11	11	11
Polyacrylate (Acusol 445ND)	11	11	11
Silicate (amorphous; 1.6 r)	0.3	0.3	0.3
Sodium perborate monohydrate	26	26	26
Sodium percarbonate	0	0	0
Sodium carbonate	4	4	4
Sodium sulphate	10	10	10
NOBS	12	12	12
Anionic (LAS/AS/AES)	7	7	7
Other, inerts and minors	up to 100	up to 100	up to 100

<u>Ingredient</u>	<u>4</u> (%w/w)	<u>5</u> (%w/w)	<u>6</u> (%w/w)
Sorbitan mono-stearate (SMS)	2.50	0	0
Sorbitan monostearate EO 20 (SMS EO 20)	0	3.00	0
Sorbitan tristearate EO 20 (STS EO 20)	0.50	0	3.00
Citric acid	10	10	10
Zeolite A	0	0	0
Polyacrylate (Acusol 445 ND)	11	11	11
Silicate (amorphous; 1.6r)	0.4	0.4	0.4
Sodium perborate monohydrate	0	0	0
Sodium percarbonate	31	31	31
Sodium sulphate	24	24	24
NOBS	6	6	6
TAED	5	5	5
Anionic (LAS/AS/AES)	7	7	7
Others, inerts and minors	up to 100	up to 100	up to 100

Soaking liquors are formed by diluting each time 45 g of said compositions in between 3.5 lit. to 5.0 lit. of water. 0.5 to 2 Kg of fabrics are then each time
5 immersed in said soaking liquor for a time ranging from 10 minutes to 24 hours. Finally, the fabrics are removed from the soaking liquors, rinsed with water and washed with a regular washing process, handwash or washing machine wash, with a regular detergent, with or without re-using the soaking liquor, then said fabrics are left to dry.

Claims

- 5 1. A soaking composition comprising:
- a sorbitan ester according to the formula $C_6H_8O_2 (C_2H_4O)_x R_1R_2R_3$, wherein x is an integer of from 0 to 40, R_1 , R_2 are independently OH or $(C_n H_{n+1})COO$, and R_3 is $(C_n H_{n+1})COO$ group, where n is an integer of from 11 to 17; and
- 10 -from 5% to 50% by weight of a building and soil suspending system comprising a compound selected from citric acid or citrates, silicates, zeolites, polycarboxylates, phosphates and mixtures thereof.
- 15 2. A composition according to claim 1 which comprises from 0.01% to 10% of said sorbitan ester, preferably from 0.01% to 5%, most preferably from 0.5% to 5%.
- 20 3. A composition according to the preceding claims where said sorbitan ester is polyethoxylated (20) sorbitan tristearate, or polyethoxylated (20) sorbitan monostearate, or sorbitan monostearate, or sorbitan monopalmitate, or mixtures thereof.
- 25 4. A composition according to the preceding claims which comprises a non ethoxylated sorbitan ester and an ethoxylated sorbitan ester.
5. A composition according to the preceding claims which comprises system be from 10% to 40%, most preferably from 15% to 30% by weight of the total composition, of said building and soil suspending system.
- 30 6. A composition according to the preceding claims wherein said building and soil suspending system is comprised of anhydrous citric acid, or polymers of maleic or acrylic acid, or copolymers of maleic and acrylic acid.
- 35 7. A composition according to the preceding claims which further comprises an oxygen bleach.



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8. A composition according to claim 7 which comprises an activator for said bleach.
- 5 9. A process of soaking fabrics, wherein said fabrics are immersed in a soaking liquor comprising an effective amount of a composition according to any of the preceding claims, for an effective period of time, then removed from said soaking liquor.
- 10 10. A process according to claim 9 wherein said time ranges from 10 minutes to 24 hours.