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(54) **Builder composition**

Bauzusammensetzung

Composition d'adjuvant

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Description**TECHNICAL FIELD**

5 **[0001]** The invention relates to a builder composition for use in a detergent composition which is efficient in softening hard water which contains both calcium and magnesium ions. The invention also relates to a solid detergent composition comprising the builder composition of the invention.

BACKGROUND AND PRIOR ART

10 **[0002]** The invention relates to a builder composition. By a builder composition is meant a composition that softens hard water. By softening is meant a process where the amount of dissolved alkaline earth metal ions e.g. calcium and magnesium ions present in hard water is reduced to a desired low concentration. This low concentration of the dissolved alkaline earth metal ions is believed to enhance utilisation of the surfactant used for cleaning surfaces especially fabrics thereby providing better and more economical cleaning products to the consumer. This invention more particularly is applicable for washing laundry.

15 **[0003]** Soaps, which are alkali metal salts of fatty acids have been used for washing laundry. When washing laundry with soaps, the efficiency of washing is lower when washed in hard water i.e. water having high levels of dissolved calcium and magnesium salts. The dissolved calcium and magnesium ions react very quickly with the alkali metal cation (sodium or potassium) of the soap leading to formation of calcium and magnesium soap which is insoluble in water and therefore washing in hard water gives poor cleaning. With the advent of synthetic detergents which are alkali metal salts of long chain synthetic acids of petroleum origin, similar problems persist. Popular synthetic detergents are linear alkyl benzene sulphonates, alpha olefin sulphonates, and primary alkyl sulphates which belong to the class of anionic surfactants. Surfactants of the non-ionic, cationic, amphoteric and zwitterionic character are also known. Soiled laundry when washed with synthetic surfactants in hard water also gives poor cleaning as compared to cleaning with softer water.

25 **[0004]** Compounds that react preferentially with the dissolved calcium and magnesium ions present in hard water, known as detergency builders, have been used in detergent compositions. Commonly known detergency builders are alkali metal carbonates, silicates, phosphates and structured compounds like zeolites. Sodium carbonate also known as soda ash is an inexpensive and widely used builder in detergent formulations. Premium detergents use builders like phosphates and/or zeolites since they have better building properties but are more expensive. There has been continuous work to develop more and more efficient and faster building systems using less expensive materials. Further, use of phosphates in detergents is believed by many to be responsible for the eutrophication of river and other natural waters systems. Thus a lot of effort has been put into developing faster and/or more efficient building systems using sodium carbonate as the main raw material.

35 **[0005]** US3957695 (1976, Lever Bros. Co) discloses a detergent composition based on sodium carbonate as a detergency builder which also contains a finely divided calcium carbonate having a surface area of about 30 to 100 m² /g, together with a detergent active compound or mixture of compounds, which does not form during use, an insoluble calcium salt. The composition may also additionally comprise from about 5 to about 30% of sodium silicate, by weight of the composition.

40 **[0006]** US4049586 (1977, Procter & Gamble Co.) describes a particulate detergent product consisting essentially of: (a) from about 0.5% to about 50% by weight of dry admixed calcium carbonate particles having a mean diameter of from about 0.01 to about 0.50 micron; (b) from about 5% to about 70% by weight of a builder selected from the group consisting of the alkali metal carbonates, bicarbonates, and sesquicarbonates and mixtures thereof; (c) from about 5% to about 70% by weight of alkali metal pyrophosphate; and (d) from about 5% to about 40% by weight of a water-soluble detergent selected from the group consisting of anionic, nonionic, zwitterionic, and ampholytic detergents and mixtures thereof. The composition may also additionally comprise from about 5 to about 40% of sodium silicate, by weight of the composition.

[0007] US 4174291 also discloses compositions comprising sodium carbonate, calcium carbonate and sodium silicate.

50 **[0008]** Thus, detergent compositions which comprise precipitating builders like sodium carbonate and sodium silicate along calcium carbonate have been known and used for some time now.

[0009] The present inventors have determined that the building provided by compositions of the prior art does not give as fast and as complete a building as would be desirable in order to deliver enhanced cleaning of consumer fabrics when they are washed in hard water.

55 **[0010]** The present inventors have determined that when two precipitating builders viz. alkali metal carbonate and alkali metal silicate are used along with a seed for precipitating calcium carbonate, the inclusion of a selective class of building enhancers provides for better building, both in the extent, as well as the rate of reduction of dissolved calcium ions as well as in dissolved magnesium ions, which help in cleaning of soiled fabrics, when washed in hard water.

[0011] It is thus an object of the present invention to provide for a builder composition that is more efficient in building

[0013] It is yet another object of the present invention to provide for a detergent composition that provides better cleaning of soiled fabrics as compared to prior art compositions especially when cleaned in hard water.

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(i) two precipitating builders which are (a) an alkali metal carbonate and (b) an alkali metal silicate;

(ii) calcium carbonate; and

(iii) a building enhancer which is a compound capable of precipitating magnesium ions from hard water selected from the group comprising alkali or alkaline earth metal oxides or hydroxides and alkali metal aluminate, zincate or titanate.

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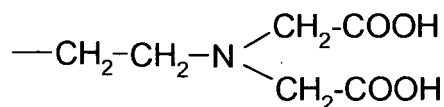
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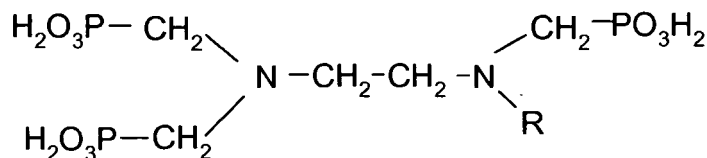
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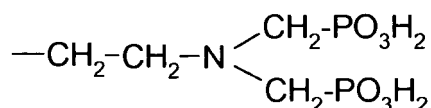
then the compound is diethylene triamine pentaacetic acid.

[0023] Amino polyphosphonic acids are compounds that have the formula:



[0024] In the above formula, when R is $\text{—CH}_2\text{—PO}_3\text{H}_2$ then the compound is ethylene diamine tetramethyl phosphonic acid. This compound is available under the brand name DEQUEST 204™.

[0025] In the above formula, when R is



then the compound is diethylene triamine pentamethyl phosphonic acid. This compound is available under the brand name DEQUEST 206™.

[0026] Nitrilo triacetic acid has the chemical formula $\text{C}_6\text{H}_9\text{NO}_6$ and is also known as amino triacetic acid.

[0027] Preferably not more than 20%, further more preferably not more than 10%, further more preferably not more than 5% of the sequestrant dissolves in the water in the first 30 seconds, more preferably in the first 45 seconds after the precipitating builders are dissolved/dispersed in the water. Examples of preferred sequestrants are sodium or potassium salt of ethylenediamine tetraacetic acid, diethylenetriamine pentaacetic acid, ethylenediamine tetramethyl phosphonic acid or diethylenetriamine pentamethyl phosphonic acid.

[0028] The sequestrant is thus preferably present in a delayed release form in order to achieve the desired dissolution profile. The inventors have determined that one way to achieve this is to incorporate the sequestrant in a defined particle size range i.e. 0.3 to 3 mm more preferably in the range of 0.75 to 2 mm.

[0029] The builder composition comprises a precipitating builder that is alkali metal silicate. The alkali metal silicate is preferably sodium silicate or potassium silicate, more preferably sodium silicate. Sodium silicate is a colorless compound of oxides of sodium and silica. It has a range of chemical formula varying in sodium oxide (Na_2O) and silicon dioxide or silica (SiO_2) contents. It is soluble in water and it is prepared by reacting silica (sand) and sodium carbonate at a high temperature ranging from 1200 to 1400°C. Aqueous solution of sodium silicate is called water glass. Sodium silicates varying in ratio of $\text{Na}_2\text{O}:\text{SiO}_2$ from 1:1.6 to 1:4 are known as colloidal silicates. These are usually sold as 20% to 50% aqueous solutions. Of the various types of sodium silicates available the preferred compound to be used in the composition of the invention is alkaline sodium silicate or sodium meta silicate. This has a concentration in water in the range of 27 - 39% and a $\text{Na}_2\text{O}:\text{SiO}_2$ ratio in the range of 3.0 to 3.5. The alkali metal silicate is preferably present in the range of 1 % to 40% by weight of the builder composition.

[0030] The builder composition of the invention comprises another precipitating builder that is alkali metal carbonate. The alkali metal is preferably sodium or potassium, sodium being preferred. Thus, the most preferred alkali metal carbonate is sodium carbonate. The alkali metal carbonate is preferably present in the range of 5 to 70%, more preferably in the range of 10 - 50% by weight of the builder composition.

[0031] The builder composition of the invention comprises a seed for precipitating calcium carbonate that is calcium carbonate. Calcium carbonate may be calcite, or aragonite, most preferably calcite. Calcite is preferably high surface area calcite. Preferably, the calcium carbonate has a surface area greater than 18 m^2/g , more preferably greater than 30 m^2/g , most preferably greater than 60 m^2/g . Calcium carbonate is preferably present in the range of 5 to 40 % by weight of the builder composition.

[0032] The builder composition of the invention ensures that the Ca^{2+} ion concentration in input hard water reduces

from about 140 ppm to about less than 1 ppm in about less than 2 minutes and in optimal conditions to less than 0.3 ppm in less than 2 minutes. The builder composition of the invention also ensures that the Mg^{2+} ion concentration in input hard water reduces from about 40 ppm to less than about 6 ppm in less than 2 minutes, and in optimal conditions to less than about 2 ppm in less than 2 minutes. The method of the invention has the advantage that it requires significantly

low amount of conventional sequestering builders like water soluble phosphates. In a highly preferred aspect, the composition of the invention is substantially free of water soluble phosphate builders.

[0033] According to a preferred aspect of the invention, the builder composition of the invention comprises a seed capable of precipitating magnesium ions. Examples of such seeds are magnesium carbonate and dolomite. A preferred aspect of the invention provides for magnesium carbonate or dolomite to be present in 5 to 40% by weight of the builder composition.

[0034] According to a preferred aspect of the invention there is provided a detergent composition comprising a builder composition of the first aspect of the invention and a surfactant selected from any one of the anionic, non-ionic, cationic, zwitterionic or amphoteric class. Thus, the invention also provides for a method of cleaning a fabric comprising contacting the soiled fabric with water which has been built by the builder composition of the invention, the water additionally comprising a surfactant. Most suitable are the ones which are widely available and inexpensive types e.g. anionic surfactants. Suitable anionic synthetic detergents are linear alkyl benzene sulphonates, alpha olefin sulphonates and primary alkyl sulphates. Linear alkyl benzene sulphonates (LAS) are ideally suited since they are widely and inexpensively available and have very good surfactant action. Sodium or magnesium salts of LAS acids may be used. The method of the invention works better when the surfactant is delivered in a delayed mode in water with respect to the precipitating builders and the calcium carbonate. It is preferred that the surfactant is in dissolved state 15 to 600 seconds, more preferably 30 to 480 seconds, further more preferably 45 to 300 seconds after the water has been built by the method of the invention. In this respect, the present inventors prefer the surfactant to be magnesium salt of linear alkyl benzene sulphonic acid. A way to ensure delayed dissolution of the surfactant in water is to include the magnesium salt of linear alkyl benzene sulphonic acid in a particle size in the range of 0.1 to 2 mm.

[0035] The builder composition is preferably present in the range of 5 to 80% by weight of the detergent composition. The surfactant is preferably present in 5 to 90%, preferably 10 to 50%, more preferably 15 to 35% by weight of the detergent composition. The detergent composition is preferably in the solid form e.g. in the powder, granule, bar or tablet form. The more preferred form of the detergent composition is the powder or granule form.

[0036] According to yet another aspect of the present invention there is provided use of the builder composition of the invention for softening hard water containing both calcium and magnesium ions.

[0037] The alkali metal carbonate is preferably present in 10 to 70%, more preferably 15 to 60%, and further more preferably 25 to 50% by weight of the detergent composition. The calcium carbonate is preferably present in 3 to 50%, more preferably from 5 to 40%, most preferably from 10 to 30% by weight of the detergent composition.

[0038] According to yet another aspect of the present invention there is provided use of the detergent composition of the invention for cleaning fabrics in hard water containing both calcium and magnesium ions.

[0039] The invention will now be illustrated with respect to the following non-limiting examples.

Examples:

Examples 1 to 5 : Building kinetics

[0040] Experiments were conducted using the various builder compositions as shown in Table - 1, as per the following procedure to study the building efficacy.

[0041] 200 cc of hard water of 48 FH i.e having 128 ppm of Ca^{2+} ions and 38.4 ppm of Mg^{2+} ions were taken in a glass beaker. To this solution, various materials viz. sodium carbonate, calcite and sodium meta silicate $9H_2O$ were added such that the concentration of sodium carbonate was 0.9 grams per liter (gpl), the concentration of calcite was 0.5 gpl and the concentration of the sodium silicate was 0.75 gpl. The effect of the addition of various building enhancers was studied. The measurements were carried out as follows.

[0042] The solution was stirred for 45 seconds using a glass rod. A sample was withdrawn with the help of a syringe at pre-determined time periods after the addition of the builders, and filtered through a microfilter into 5cc glass vials. The Ca^{2+} ion and Mg^{2+} ion concentrations were determined by EDTA titration as shown below:

Measurement of Total (calcium and magnesium) ion concentration

[0043] The method involved titration with EDTA (di sodium salt of ethylene diamine tetra acetic acid) using EBT (Eriochrome Black - T) as indicator. About 2 ml of the test solution was pipetted out into a 150 ml conical flask. The solution was diluted using about 10 ml water. To this was added 5 ml of ammonia-ammonium chloride pH 10 buffer. About 35 mg of 1% EBT in potassium nitrate solution was added. A wine red colour was obtained. A standardized EDTA

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solution was added dropwise from a burette with constant stirring. As more EDTA was added the colour gradually changed from wine red to violet. The end point was identified by a sudden colour change from violet to blue. The total (of calcium and magnesium) ion concentration was calculated using the formula:

Total ion concentration = vol of EDTA * strength of EDTA/ vol of test solution taken.

[0044] The concentration in terms of FH was calculated using the formula:

Total ion concentration in FH = (Total ion concentration in ppm)/4 for Ca^{2+}

Total ion concentration in FH = (Total ion concentration in ppm)/2.4 for Mg^{2+}

[0045] The data is summarised in Table -1.

Table - 1

	Example 1	Example 2	Example 3	Example 4	Example 5
Building	None	Calcium	Calcium	Calcium	Sodium
enhancer	-	hydroxide	hydroxide	oxide	Aluminate
Concentration, gpl	-	0.05	0.1	0.05	0.25
Time, minutes	Total FH	Total FH	Total FH	Total FH	Total FH
0	48	48	48	48	48
2	8	7	5	7	6
5	5	3.5	2	2	3
15	2.5	1.25	1	1	1

[0046] The data in Table-1 indicates that better building, both in terms of lower final hardness of water and faster kinetics of building, are obtained when a builder composition of the invention is used as compared to builder composition of the prior art.

Examples 6 to 8

[0047] Experiments using a builder composition of Example 2 were carried out as shown in Table -1 except that additionally a sequestrant viz. ethylene diamine tetraacetic acid (EDTA) was used either along with the other ingredients or at some delay with respect to the other ingredients. The results are summarized in Table - 2 along with the result for Example - 2 for comparison.

Table - 2

	Example 2	Example 6	Example 7	Example 8
Concentration of EDTA, ppm	Not added	30	30	60
EDTA particle size, mm	-	As solution	As solution	0.85-1.7
Mode of EDTA addition	-	2 minutes after others	Along with others	Along with others

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(continued)

Time, minutes	Total FH	Total FH	Total FH	Total FH
0	48	48	48	48
2	7	5	5	3
5	3.5	3.5	4	2
15	1.25	1	1	0.5

[0048] The data in Table - 2 indicates that when a sequestrant is used, in addition to the building enhancer, better building is obtained, both in terms of faster kinetics and in terms of lower final hardness of water.

Examples 9 to 12: Cleaning of Fabrics

[0049] Various cleaning experiments were done using the following procedure. 700 ml of water of 48 FH hardness (containing Ca: Mg ions in the ratio of 2:1) was taken in a 1 L steel container. Nine test monitors (three each of WFK 10D, WFK20D and AS9) were taken. WFK10D is a cotton fabric having composite soil, WFK20D is a poly-cotton fabric having composite soil and AS9 is a cotton fabric having other variety of composite soil. The experiments were done with a liquor to cloth ratio of 50:1. The compositions were added to the water (at 4 gpl) and stirred for 5 minutes at 90 rpm to dissolve the composition. The fabrics were then added and allowed to soak for 15 minutes. Washing was then carried out for 30 minutes with agitation at 90 rpm. The fabrics were then rinsed 3 times at for 3 minutes each. The fabrics were then air dried. The reflectance of the fabric before and after washing was measured using a reflectometer at a wavelength of 460 nm. The ΔR^*_{460} value is the difference in the reflectance between the washed fabric and the unwashed fabric and is an average value over the three test monitors used.

[0050] Example 9 is a detergent composition as per the invention. Example 10 is a detergent composition similar to Example 9 but without the building enhancer included. Examples 11 is product "Rin Advanced" which is one of the best sodium carbonate based detergent product available in the Indian market. The compositions of examples 9 and 10 are given in Table-3.

Table - 3

Example	9	10	11
Surfactant	Mg LAS	MgLAS	NaLAS
Surfactant concentration, wt%	20.0	20.0	16.0
Sodium carbonate, wt%	30.0	30.0	35.0
ForcalU, wt%	16.7	16.7	8.0
Sodium silicate, wt%	25.0	25.0	-
Calcium hydroxide, wt%	1.7	-	-
STPP, wt%	-	-	6.0
Others, wt%	To 100	To 100	To 100

[0051] In the above table,
MgLAS refers to Magnesium salt of linear alkyl benzene sulphonic acid
NaLAS refers to Sodium salt of linear alkyl benzene sulphonic acid
ForcalU is a commercially available calcite having surface area of 18 - 20 m²/g.
STPP refers to sodium tripolyphosphate
Others refers to mainly fillers which is sodium chloride, sodium sulfite, and moisture.

[0052] The comparative data on cleaning for various fabrics is given in Table 4 below:

Table- 4

Example	$\Delta R^*(460)$ WFK10D	$\Delta R^*(460)$ WFK20D	$\Delta R^*(460)$ AS9
9	19.0	25.9	13.4
10	16.0	21.0	9.2
11	15.5	21.0	10.4

[0053] The data in Table-4 indicates that improved cleaning is obtained with a detergent composition on inclusion of a builder enhancer of the invention. Further the composition of the invention provides better cleaning as compared to one of the best commercially available product of this class.

[0054] The invention thus provides for a builder composition which gives faster building as compared to methods available in the present state of the art especially when the hard water contains both calcium and magnesium ions. Consequently the soiled fabrics are cleaned better.

Claims

1. A builder composition comprising:

- (i) two precipitating builders which are (a) an alkali metal carbonate and (b) an alkali metal silicate;
- (ii) calcium carbonate; and
- (iii) a building enhancer which is a compound capable of precipitating magnesium ions from hard water selected from the group comprising alkali or alkaline earth metal oxides or hydroxides and alkali metal aluminate, zincate or titanate.

2. A builder composition as claimed in claim 1 wherein said building enhancer is calcium hydroxide, calcium oxide or alkali metal aluminate or zincate.

3. A builder composition as claimed in claim 1 or 2 wherein the building enhancer is present in the range of 0.1 to 7.5% by weight of the builder composition.

4. A builder composition as claimed in any one of the preceding claims comprising a sequestrant selected from amino polycarboxylic acid, amino polyphosphonic acid, nitrilo triacetic acid or salts thereof

5. A builder composition as claimed in claim 4 wherein the sequestrant has a particle size in the range of 0.3 to 3 mm.

6. A builder composition as claimed in any one of the preceding claims wherein the alkali metal silicate is present in the range of 1 to 40% by weight of the builder composition.

7. A builder composition as claimed in any one of the preceding claims wherein said alkali metal carbonate is present in the range of 5 to 70% by weight of the builder composition.

8. A builder composition as claimed in any one of the preceding claims wherein calcium carbonate is present in the range of 5 to 40 % by weight of the builder composition.

9. A builder composition as claimed in any one of the preceding claims comprising a seed capable of precipitating magnesium ions which is selected from magnesium carbonate or dolomite.

10. A detergent composition comprising:

- (i) a builder composition as claimed in any one of the preceding claims and
- (ii) a surfactant selected from any one of the anionic, non-ionic, cationic, zwitterionic or amphoteric class.

11. A detergent composition as claimed in claim 10 wherein said builder composition is present in the range of 5 to 80% by weight of the detergent composition.

12. A detergent composition as claimed in claims 10 or 11 wherein said surfactant is magnesium salt of linear alkyl benzene sulphonic acid.

13. A detergent composition as claimed in claim 12 wherein particle size of said magnesium salt of linear alkyl benzene sulphonic acid is in the range of 0.1 to 2 mm.

Patentansprüche

1. Builder-Zusammensetzung, umfassend:

- (i) zwei präzipitierende Builder, die (a) ein Alkalimetallcarbonat und (b) ein Alkalimetallsilicat sind;
- (ii) Calciumcarbonat und
- (iii) einen "Building-Enhancer", der eine Verbindung ist, die fähig ist, Magnesiumionen aus hartem Wasser zu präzipitieren, ausgewählt aus der Gruppe, umfassend Alkali- oder Erdalkalimetalloxide oder -hydroxide und Alkalimetallaluminat, -zinkat oder -titanat.

2. Builder-Zusammensetzung, wie sie in Anspruch 1 beansprucht ist, wobei der "Building-Enhancer" Calciumhydroxid, Calciumoxid oder Alkalimetallaluminat oder -zinkat ist.

3. Builder-Zusammensetzung, wie sie in Anspruch 1 oder 2 beansprucht ist, wobei der "Building-Enhancer" im Bereich von 0,1 bis 7,5 Gewichts-% der Builder-Zusammensetzung vorliegt.

4. Builder-Zusammensetzung, wie sie in einem der vorangehenden Ansprüche beansprucht ist, umfassend ein Sequestriermittel, ausgewählt aus Aminopolycarbonsäure, Aminopolyphosphonsäure, Nitrilotriessigsäure oder Salzen davon.

5. Builder-Zusammensetzung, wie sie in Anspruch 4 beansprucht ist, wobei das Sequestriermittel eine Partikelgröße im Bereich von 0,3 bis 3 mm hat.

6. Builder-Zusammensetzung, wie sie in einem der vorangehenden Ansprüche beansprucht ist, wobei das Alkalimetallsilicat im Bereich von 1 bis 40 Gewichts-% der Builder-Zusammensetzung vorliegt.

7. Builder-Zusammensetzung, wie sie in einem der vorangehenden Ansprüche beansprucht ist, wobei das Alkalimetallcarbonat im Bereich von 5 bis 70 Gewichts-% der Builder-Zusammensetzung vorliegt.

8. Builder-Zusammensetzung, wie sie in einem der vorangehenden Ansprüche beansprucht ist, wobei Calciumcarbonat im Bereich von 5 bis 40 Gewichts-% der Builder-Zusammensetzung vorliegt.

9. Builder-Zusammensetzung, wie sie in einem der vorangehenden Ansprüche beansprucht ist, umfassend ein Impfmittel, das fähig ist, Magnesiumionen zu präzipitieren, das ausgewählt ist aus Magnesiumcarbonat und Dolomit.

10. Waschmittel/Reinigungsmittel, umfassend:

- (i) eine Builder-Zusammensetzung, wie sie in einem der vorangehenden Ansprüche beansprucht ist, und
- (ii) ein Tensid, ausgewählt aus einer der anionischen, nicht-ionischen, kationischen, zwitterionischen oder amphoteren Klassen.

11. Waschmittel/Reinigungsmittel, wie es in Anspruch 10 beansprucht ist, wobei die Builder-Zusammensetzung im Bereich von 5 bis 80 Gewichts-% des Waschmittels/Reinigungsmittels vorliegt.

12. Waschmittel/Reinigungsmittel, wie es in Anspruch 10 oder 11 beansprucht ist, wobei das Tensid Magnesiumsalz von lineares Alkyl-benzolsulfonsäure ist.

13. Waschmittel/Reinigungsmittel, wie es in Anspruch 12 beansprucht ist, wobei die Partikelgröße des Magnesiumsalzes von lineares Alkyl-benzolsulfonsäure im Bereich von 0,1 bis 2 mm ist.

Revendications

1. Composition d'adjuvants comprenant :

- (i) deux adjuvants de précipitation qui sont (a) un carbonate de métal alcalin et (b) un silicate de métal alcalin ;
- (ii) du carbonate de calcium ; et
- (iii) un activateur adjuvant qui est un composé capable de précipiter des ions magnésium à partir d'eau dure, choisi dans le groupe constitué par des oxydes ou hydroxydes de métaux alcalins ou alcalino-terreux et un aluminate, zincate ou titanate de métal alcalin.

2. Composition d'adjuvants selon la revendication 1, dans laquelle ledit activateur adjuvant est l'hydroxyde de calcium, l'oxyde de calcium ou un aluminate ou zincate de métal alcalin.

3. Composition d'adjuvants selon la revendication 1 ou 2, dans laquelle l'activateur adjuvant est présent dans la plage de 0,1 à 7,5 % en poids de la composition d'adjuvants.

4. Composition d'adjuvants selon l'une quelconque des revendications précédentes, comprenant un séquestrant choisi parmi l'acide amino poly-carboxylique, l'acide amino polyphosphonique, l'acide nitrilotriacétique ou leurs sels.

5. Composition d'adjuvants selon la revendication 4, dans laquelle le séquestrant a une taille de particule dans la plage de 0,3 à 3 mm.

6. Composition d'adjuvants selon l'une quelconque des revendications précédentes, dans laquelle le silicate de métal alcalin est présent dans la plage de 1 à 40 % en poids de la composition d'adjuvants.

7. Composition d'adjuvants selon l'une quelconque des revendications précédentes, dans laquelle ledit carbonate de métal alcalin est présent dans la plage de 5 à 70 % en poids de la composition d'adjuvants.

8. Composition d'adjuvants selon l'une quelconque des revendications précédentes, dans laquelle le carbonate de calcium est présent dans la plage de 5 à 40 % en poids de la composition d'adjuvants.

9. Composition d'adjuvants selon l'une quelconque des revendications précédentes, comprenant un germe capable de précipiter des ions magnésium qui est choisi parmi le carbonate de magnésium ou la dolomite.

10. Composition détergente comprenant :

- (i) une composition d'adjuvants selon l'une quelconque des revendications précédentes, et
- (ii) un agent tensioactif choisi dans l'une quelconque des catégories anionique, non ionique, cationique, zwitterionique ou amphotère.

11. Composition détergente selon la revendication 10, dans laquelle ladite composition d'adjuvants est présente dans la plage de 5 à 60 % en poids de la composition détergente.

12. Composition détergente selon la revendication 10 ou 11, dans laquelle ledit agent tensioactif est un sel de magnésium d'acide alkylbenzènesulfonique linéaire.

13. Composition détergente selon la revendication 12, dans laquelle la taille de particule dudit sel de magnésium d'acide alkylbenzènesulfonique linéaire est dans la plage de 0,1 à 2 mm.

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

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