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(54) Hypochlorite bleaching compositions

Hypochloritbleichmittelzusammensetzungen

Compositions de blanchiment à base d'hypochlorite

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EP-A- 0 079 102 **EP-A- 0 478 086**
EP-A- 0 565 788 **WO-A-88/05461**
US-A- 4 065 545

EP 0 688 857 B1

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DescriptionTechnical field

5 **[0001]** The present invention relates to a liquid bleaching composition which is suitable for laundry applications including hand washing as well as washing with automatic washing machines.

Background of the invention

10 **[0002]** Liquid bleaching compositions are well-known in the art. Amongst the different bleaching compositions available, those relying on bleaching by hypochlorite are often preferred, mainly for performance reasons. Representative of the art is, for example, WO-A-88/05461 which discloses an aqueous composition comprising hypochlorite, sodium carbonate and sodium hydroxide and the use of said composition for removing stains from the fabrics.

15 **[0003]** However, the drawbacks associated with the use of chlorine-based compositions are that said compositions both damage and yellow the fabrics.

[0004] It is therefore an object of the present invention to provide a hypochlorite-containing composition, suitable for use in laundry, whereby fabric safety is improved.

[0005] It is a further object of the present invention to provide a hypochlorite-containing composition, suitable for use in laundry, whereby the fabric whiteness is improved.

20 **[0006]** It has now been found that the previous objects can be met by formulating hypochlorite bleach compositions comprising a periodate, or mixtures thereof. The compositions used in the present invention provide outstanding fabric safety as well as fabric whiteness on the fabrics treated therewith. Indeed, it has been found that for any given composition comprising an alkali metal hypochlorite, adding periodate will improve both the fabric safety and the fabric whiteness on the fabrics treated therewith. In a preferred embodiment of the present invention, the hypochlorite bleach

25 compositions herein further comprise a buffering/precipitation system, e.g. carbonate salts and/or silicate salts.

[0007] A further advantage of the compositions of the present invention is that on top of their fabric safety properties and whitening action said compositions allow also good stain removal.

30 **[0008]** EP-A-0079102 describes coloured aqueous alkalimetal-hypochlorite compositions. 102 discloses periodate as stabilizers in said compositions. Fabric safety or fabric whiteness improvement linked to the hypochlorite-containing composition comprising periodate is not disclosed.

[0009] US-A-4 065 545 relates to the stabilization of aqueous hypochlorite solutions. This patent discloses solutions of hypochlorite comprising up to 0.1% by weight of periodate ions. Optionally said solutions may also contain silicate ions and/or caustic soda and/or sodium carbonate.

35 **[0010]** EP-A-0565788 relates to dishwashing detergent compositions, which are stabilized by iodates. Said iodates react with hypochlorite to periodates. Again fabric safety or fabric whiteness improvement linked to the hypochlorite-containing composition comprising periodate is not disclosed.

40 **[0011]** EP-A- 478086 discloses microemulsion detergent compositions comprising hypochlorite and having a pH of at least 12 Said compositions further comprise amongst other components, sodium carbonate, alkali metal hydroxide and from 0.01% to 0.3% by weight of an alkali metal periodate, such as potassium periodate or sodium periodate. Periodate is included in the microemulsion compositions for its stabilizing effect on hypochlorite. This patent application further discloses that the compositions therein are alipurpose cleaning compositions particularly adapted to the cleaning of hard-surfaces. Laundry application is also mentioned.

45 **[0012]** Actually, the benefits derivable from the use of a periodate in an aqueous bleaching composition comprising hypochlorite for bleaching fabrics, i.e. improved fabric safety and/or fabric whiteness on the fabrics treated therewith, have not been acknowledged in the prior art.

Summary of the invention

50 **[0013]** The present invention encompasses the use of a periodate in a liquid bleaching composition having a pH as is of from 9 to 14 comprising an alkali metal hypochlorite and more than 0.1% by weight of the total composition of said periodate, for bleaching fabrics, whereby fabric safety and/or fabric whiteness are improved.

[0014] In a preferred embodiment, the compositions according to the present invention further comprise a buffering/precipitation system, preferably carbonate salts and/or silicate salts.

55 **[0015]** The present invention further encompasses a method of bleaching fabrics to improve fabric safety and/or fabric whiteness which comprises the step of contacting said fabrics with an aqueous liquid hypochlorite bleach composition having a pH as is of from 9 to 14 and comprising more than 0.1% by weight of the total composition of a periodate, said bleaching composition being in its diluted form and not being in the form of a microemulsion. In a preferred embodiment, the compositions used in said method further comprise a buffering/precipitation system, pref-

erably carbonate salts and/or silicate salts.

Detailed Description of the invention

5 **[0016]** As a first essential ingredient, the compositions used in the present invention comprise an alkali metal hypochlorite. Various forms of alkali metal hypochlorite are commercially available and, although this is not critical for the present invention, it is preferred herein to use sodium hypochlorite. Compositions used in the present invention comprise a bleaching amount of alkali metal hypochlorite, which typically represents from 2% to 10% by weight of the total composition, based on active chlorine, of alkali metal hypochlorite. Preferred compositions herein comprise from 3%
10 to 6%, based on active chlorine, of alkali metal hypochlorite.

[0017] As a second essential ingredient, the compositions used in the present invention comprise a periodate, or mixtures thereof. The periodates may be added as such or may be made in situ by any suitable reactions of appropriate iodine compounds. Accordingly suitable periodates for use in the present compositions include alkali metal periodates such as sodium and potassium periodates. Preferred herein is to use sodium periodate. The compositions used in the
15 present invention comprise more than 0.1 % by weight of the total composition of said periodate, or mixtures thereof, preferably of from 0.11% to 2% and more preferably of from 0.11% to 1.5%.

[0018] We speculate that the periodate ions coming from the dissociation of periodates have an action which allows to improve the fabric safety and the fabric whiteness of fabrics contacted with an aqueous liquid hypochlorite-containing composition comprising said periodates. Indeed, said periodate ions allow to reduce or even eliminate the metal impurities both in said compositions as is and especially in the washing environment. Said metal impurities include heavy
20 metal ions such as Cu, Fe, Ni, Co and the like, and have been found to adversely affect both fabric safety and fabric whiteness. The above mentioned action of periodate ions is sustained by the presence of a buffering/precipitation system as herein after defined. Indeed, said buffering/precipitation system allows to remove from the washing solution magnesium and calcium which would otherwise bind to periodate ions, and thus partially inactivate them. Additionally,
25 said buffering/precipitation system prevents the pH drop in the washing solution to values at which periodate ions become no longer stable and decompose.

[0019] Indeed, we believe that in the washing environment said metal ions catalyze the attack of hypochlorous acid on fabrics with the generation of yellow oxidized species. We further believe that said metal ions are adsorbed per se
30 on oxidized fabrics as colored species and catalyze the degradation of the brighteners adsorbed on fabrics. Also said metal ions stabilize colored pigments of enzymatic stains such as blood and grass. And finally said metal ions catalyze the depolymerisation of cotton fibers which leads to reduced tensile strength of the fabrics, thereby reducing fabrics resistance.

[0020] It is in the alkaline range that the optimum stability and performance of the hypochlorite are obtained. Thus, the compositions used in the present invention have a pH as is of from 9 to 14, preferably of from 9.5 to 13 and more
35 preferably of from 9.5 to 12. Suitable means to achieve such pH value include strong sources of alkalinity. Accordingly, the compositions herein comprise less than 2% by weight of the total composition of a strong source of alkalinity, or mixtures thereof, preferably of from 0.04% to 1.5% and more preferably of from 0.5% to 0.9%. Examples of strong sources of alkalinity are alkali metal hydroxides, such as potassium and/or sodium hydroxide, or alkali metal oxides such as sodium and/or potassium oxide, or mixtures thereof.

[0021] In a preferred embodiment, the compositions of the present invention may further comprise a buffering/precipitation system. Particularly suitable to be used herein are silicate or carbonate salts, or mixtures thereof. Preferred
40 alkali metal salts of silicate and carbonate are sodium silicate and sodium carbonate, both of which are commercially available, or mixtures thereof. Other precipitation/buffering systems could be conveniently used herein such as sodium borate and sodium sesquicarbonate. Actually any buffering/precipitation system having the property of keeping the pH above the value 8 when following a dilution of 0.3 to 1.7 % is suitable to be used in the present invention.
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[0022] In the preferred embodiment, the compositions herein comprise up to 5% by weight of the total composition of a carbonate salt, or mixtures thereof, preferably from 0.1% to 4% and more preferably from 0.1% to 3% and up to 5% by weight of the total composition of a silicate salt, or mixtures thereof, preferably from 0.1% to 4% and more
50 preferably from 0.2% to 3%.

[0023] Indeed, said buffering/precipitation system allows buffering of the pH of the present compositions. Indeed, due the such a buffering/precipitation system as defined herein before, the pH of a composition according to the present invention remains constant throughout use, i.e. the pH of a diluted composition is buffered from the moment the dilution is completed and until said hypochlorite bleaching composition is started to be rinsed away from the fabrics to which
55 it has previously been contacted. Also, we speculate that the improvement in fabric safety is optimized by the presence of said buffering/precipitation system, which by its buffering action, reduces the conversion of hypochlorite into hypochlorous acid, a species which we have found to be responsible for the fabric damage. It is also suspected that the buffering of the hypochlorite compositions of the present invention reduces harshness to hands. Also said buffering/precipitation system removes from the wash solution calcium and magnesium.

[0024] The compositions used in the present invention are aqueous liquid bleaching compositions. Accordingly, such compositions comprise typically from 70% to 97% by weight of the total composition of water, preferably from 75% to 96% and more preferably from 78% to 94%.

[0025] The compositions used in the present invention may further comprise optional ingredients such as bleach-stable surfactants, organic or inorganic alkalis, pigments, dyes, optical brighteners, solvents, chelating agents, radical scavengers, perfumes and bleach-stable perfume stabilizers.

[0026] The compositions used in the present invention provide improved fabric safety as well as improved fabric whiteness. By "improved fabric safety" it is meant herein that the damage caused on fabric by using the hypochlorite compositions of the present invention is reduced compared to the damage caused by using the same hypochlorite compositions but without any periodate. By "improved fabric whiteness" it is meant herein that the whiteness on fabric achieved by using the hypochlorite compositions of the present invention is improved compared to the whiteness obtained by using the same hypochlorite compositions but without any periodate.

[0027] The compositions used in the present invention are used in diluted form in laundry application. The expression "use in diluted form" herein includes dilution by the user, which occurs for instance in hand laundry applications, as well as dilution by other means, such as in a washing machine. Typical dilution levels are of from 0.4% to 20% for hand laundry application and 0.1% to 10% in a washing machine.

[0028] The present invention further encompasses a method of bleaching fabrics which comprises the step of contacting said fabrics with an aqueous bleaching composition having a pH as is of from 9 to 14 which comprises an alkali metal hypochlorite, or mixtures thereof and more than 0.1% by weight of the total composition of a periodate, or mixtures thereof, said bleaching composition being in its diluted form and not being in the form of a microemulsion. In a preferred embodiment, the compositions used in said method of bleaching fabrics may further comprise a buffering/precipitation system, preferably carbonate salts and/or silicate salts. Said method according to the present invention improves the fabric safety and/or fabric whiteness.

[0029] More specifically, the method of bleaching fabrics according to the present invention comprises the steps of first contacting said fabrics with an aqueous bleaching composition having a pH as is of from 9 to 14 which comprises an alkali metal hypochlorite, or mixtures thereof and a periodate, or mixtures thereof, then allowing said fabrics to remain in contact with said bleaching composition, for a period of time sufficient to bleach said fabrics, typically 3 to 60 minutes, preferably 5 to 30 minutes, then rinsing said fabrics in water to remove said bleaching composition. If said fabrics are to be washed, i.e. with a conventional composition comprising at least one surface active agent, it is preferred to perform the method herein before said fabrics are washed. Indeed, it has been observed that bleaching said fabrics with the bleaching compositions according to the present invention prior to washing them with a detergent composition provides superior whiteness and stain removal with less energy and detergent than if said fabrics are washed first, then bleached. Accordingly, said method according to the present invention further comprises a subsequent step where said fabrics are washed with a detergent composition comprising at least one surface active agent.

[0030] The present invention will be further illustrated by the following examples.

Experimental data

[0031] The following compositions are made by mixing the listed ingredients in the listed proportions:

Compositions (weight %)	1	2
Sodium hypochlorite	5.0	5.0
Sodium hydroxide	0.7	0.7
Sodium carbonate	1.0	1.0
Sodium periodate	---	0.5
Water	-----100%-----	
pH	13	13

[0032] Composition 1 is a hypochlorite-containing composition taken as a reference and commercially available. Composition 2 is representative of the present invention, i.e. composition 2 comprises sodium hypochlorite, a buffering/precipitation system (sodium carbonate) and sodium periodate.

[0033] A multicycle test has been carried out. A washing was performed in a glass beaker at 70°C for 45 minutes with a washing solution comprising 12.5 g/l of a composition herein before mentioned. Then the ribbons were added into the washing solution. At the end of each washing cycle the ribbons were rinsed. After 3 washing cycles the damage on the fabrics was evaluated by pulling said ribbons until they broke. The force necessary to break the ribbons was measured with an Instron tensiometer. The lower the force needed to break said ribbons, the more serious is the

damage caused on the fabrics.

[0034] The results obtained were the following:

[0035] 65 Kg of tensile strength for a ribbon taken as a reference, i.e. a ribbon which has not been washed.

[0036] 20 Kg of tensile strength loss for a ribbon after 3 washing cycles when using composition 1, as compared to the ribbon taken as a reference.

[0037] 16 Kg of tensile strength loss for a ribbon after 3 washing cycles when using composition 2, as compared to the ribbon taken as a reference.

Comments:

[0038] The data clearly shows the unexpected safety improvement delivered by the aqueous compositions of the present invention comprising sodium hypochlorite, sodium carbonate and sodium periodate, as compared to a composition of the prior art (composition 1). Indeed, it has been surprisingly observed that after only 3 wash cycles a reduced fabric damage is achieved with the composition of the present invention (composition 2) as compared to the composition of the prior art (composition 1).

Example

[0039] The following example will further illustrate the present invention. The following composition is made by mixing the listed ingredients in the listed proportions:

Composition (weight %)	1
Sodium hypochlorite	5.0
Sodium hydroxide	0.7
Sodium carbonate	1.0
Sodium silicate	1.0
Sodium periodate	0.3
Water up to	100%
pH	13

[0040] Composition 1 allows to obtain outstanding fabric safety as well as outstanding fabric whiteness, when used to bleach fabrics. This composition is suitable to be used in hand washing applications as well as in washing with automatic washing machines.

Claims

1. The use of a periodate in an aqueous liquid bleaching composition having a pH as is of from 9 to 14 comprising an alkali metal hypochlorite and more than 0,1% by weight of the total composition of said periodate for bleaching fabrics, whereby fabric safety and/or fabric whiteness are improved.
2. A method of bleaching fabrics to improve fabric safety and/or fabric whiteness which comprises the step of contacting said fabric with an aqueous liquid bleaching composition having a pH as is of from 9 to 14 comprising an alkali metal hypochlorite and more than 0.1% by weight of the total composition of a periodate, said bleaching composition being in its diluted form and not being in the form of a microemulsion.
3. A method of bleaching fabrics according to claim 2 which, after the step of contacting said fabrics with said bleaching composition, further comprises the steps of:
 - allowing said fabrics to remain in contact with said bleaching composition for a period of time sufficient to bleach said fabrics,
 - then rinsing said fabrics in water to remove said bleaching composition.
4. A method according to claim 3 which further comprises a subsequent step where said fabrics are washed with a

detergent composition comprising at least one surface active agent.

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5. A method or use according to any of the preceding claims wherein said bleaching composition comprises from 2% to 10% by weight of the total composition, based on active chlorine, of hypochlorite, preferably of from 3% to 6%.
 6. A method or use according to any of the preceding claims wherein in said bleaching composition said periodate is an alkali metal periodate, preferably sodium periodate.
 7. A method or use according to any of the preceding claims wherein said bleaching composition comprises from 0.11% to 2% by weight of the total composition of said periodate or mixtures thereof, preferably from 0.11% to 1.5%.
 8. A use or method according to any of the preceding claims wherein said bleaching composition further comprises a buffering/precipitation system.
 9. A use or method according to claim 8 wherein said buffering/precipitation system comprises carbonate salts, silicate salts or mixtures thereof.
 10. A use or method according to claim 9 wherein said bleaching composition comprises up to 5% by weight of the total composition of sodium carbonate, preferably from 0.1% to 4%, more preferably from 0.1% to 3%, and wherein said carbonate salt is preferably sodium carbonate, and up to 5% by weight of the total composition of a silicate salt, preferably from 0.1% to 4%, more preferably from 0.2% to 3% and wherein said silicate salt is preferably sodium silicate.
 11. A method or use according to any of the preceding claims wherein said bleaching composition has a pH as is of from 9.5 to 13 and preferably of from 9.5 to 12.

Revendications

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1. Utilisation d'un periodate dans une composition de blanchiment liquide aqueuse ayant un pH, telle quelle, de 9 à 14, comprenant un hypochlorite de métal alcalin et plus de 0,1 % en poids, par rapport à la composition totale, dudit periodate, pour le blanchiment de tissus, en conséquence de quoi la protection des tissus et/ou la blancheur des tissus sont améliorées.
 2. Procédé de blanchiment de tissus pour améliorer la protection des tissus et/ou la blancheur des tissus, qui comprend l'étape consistant à mettre ledit tissu en contact avec une composition de blanchiment liquide aqueuse ayant un pH, telle quelle, de 9 à 14, comprenant un hypochlorite de métal alcalin et plus de 0,1 % en poids, par rapport à la composition totale, d'un periodate, ladite composition de blanchiment étant sous sa forme diluée et n'étant pas sous la forme d'une micro-émulsion.
 3. Procédé de blanchiment de tissus selon la revendication 2 qui, après l'étape de mise en contact desdits tissus avec ladite composition de blanchiment, comprend en outre les étapes consistant à :
 - laisser lesdits tissus rester en contact avec ladite composition de blanchiment pendant une période de temps suffisante pour blanchir lesdits tissus,
 - puis rincer lesdits tissus dans de l'eau pour éliminer ladite composition de blanchiment.
 4. Procédé selon la revendication 3, qui comprend en outre une étape suivante dans laquelle lesdits tissus sont lavés avec une composition détergente comprenant au moins un agent tensioactif.
 5. Procédé ou utilisation selon l'une quelconque des revendications précédentes, dans lequel ladite composition de blanchiment comprend de 2 % à 10 % et de préférence de 3 % à 6 % en poids, par rapport à la composition totale et sur la base du chlore actif, d'hypochlorite.
 6. Procédé ou utilisation selon l'une quelconque des revendications précédentes, dans lequel, dans ladite composition de blanchiment. ledit periodate est un periodate de métal alcalin, de préférence le periodate de sodium.
 7. Procédé ou utilisation selon l'une quelconque des revendications précédentes, dans lequel ladite composition de

blanchiment comprend de 0,11 % à 2 % et de préférence de 0,11 % à 1,5 % en poids, par rapport à la composition totale, dudit periodate ou de mélanges de tels periodates.

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8. Utilisation ou procédé selon l'une quelconque des revendications précédentes, dans lequel ladite composition de blanchiment comprend en outre un système de tampon/précipitation.
9. Utilisation ou procédé selon la revendication 8, dans lequel ledit système de tampon/précipitation comprend des sels carbonates, des sels silicates ou des mélanges de ceux-ci.
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10. Utilisation ou procédé selon la revendication 9, dans lequel ladite composition de blanchiment comprend jusqu'à 5 %, de préférence de 0,11 % à 4 %, mieux encore de 0,1 % à 3 % en poids, par rapport à la composition totale, de carbonate de sodium. et dans lequel ledit sel carbonate est de préférence du carbonate de sodium, et jusqu'à 5 %, de préférence de 0,11 % à 4 %, et mieux encore de 0,2 % à 3 % en poids, par rapport à la composition totale, d'un sel silicate, et dans lequel ledit sel silicate est de préférence du silicate de sodium.
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11. Procédé ou utilisation selon l'une quelconque des revendications précédentes, dans lequel ladite composition de blanchiment a un pH, telle quelle, de 9,5 à 13 et de préférence de 9,5 à 12.

20 **Patentansprüche**

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1. Verwendung von einem Periodat in einer wäßrigen, flüssigen, bleichenden Zusammensetzung, welche als solche einen pH-Wert von 9 bis 14 besitzt, die ein Alkalimetallhypochlorit und mehr als 0,1 Gew.-% der Gesamtzusammensetzung von dem genannten Periodat umfaßt, zum Bleichen von Geweben, wodurch die Sicherheit gegenüber dem Gewebe und/oder die Gewebeweiße verbessert werden.
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2. Verfahren zum Bleichen von Geweben zur Verbesserung der Sicherheit gegenüber dem Gewebe und/oder der Gewebeweiße, welches den Schritt des In-Kontakt-Bringens des genannten Gewebes mit einer wäßrigen, flüssigen, bleichenden Zusammensetzung umfaßt, welche Zusammensetzung als solche einen pH-Wert von 9 bis 14 besitzt, die ein Alkalimetallhypochlorit und mehr als 0,1 Gew.-% der Gesamtzusammensetzung von einem Periodat umfaßt, wobei die genannte bleichende Zusammensetzung in ihrer verdünnten Form und nicht in der Form einer Mikroemulsion vorliegt.
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3. Verfahren zum Bleichen von Geweben nach Anspruch 2, welches nach dem Schritt des In-Kontakt-Bringens der genannten Gewebe mit der genannten bleichenden Zusammensetzung ferner die Schritte:
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- In-Kontakt-Belassen der genannten Gewebe mit der genannten bleichenden Zusammensetzung während einer Zeitspanne, die ausreichend ist, um die genannten Gewebe zu bleichen,
 - anschließend Spülen der genannten Gewebe in Wasser zur Entfernung der genannten bleichenden Zusammensetzung
- umfaßt.
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4. Verfahren nach Anspruch 3, welches ferner einen darauf folgenden Schritt umfaßt, worin die genannten Gewebe mit einer Detergenzzusammensetzung gewaschen werden, welche mindestens ein grenzflächenaktives Mittel umfaßt.
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5. Verfahren oder Verwendung nach einem der vorstehenden Ansprüche, worin die genannte bleichende Zusammensetzung 2 Gew.-% bis 10 Gew.-% der Gesamtzusammensetzung, bezogen auf aktives Chlor, an Hypochlorit, vorzugsweise von 3 Gew.-% bis 6 Gew.-% umfaßt.
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6. Verfahren oder Verwendung nach einem der vorstehenden Ansprüche, worin in der genannten bleichenden Zusammensetzung das genannte Periodat ein Alkalimetallperiodat, vorzugsweise Natriumperiodat ist.
7. Verfahren oder Verwendung nach einem der vorstehenden Ansprüche, worin die genannte bleichende Zusammensetzung 0,11 Gew.-% bis 2 Gew.-% der Gesamtzusammensetzung von dem genannten Periodat oder von Gemischen hievon, vorzugsweise von 0,11% bis 1,5%, umfaßt.

EP 0 688 857 B1

8. Verwendung oder Verfahren nach einem der vorstehenden Ansprüche, worin die genannte bleichende Zusammensetzung ferner ein Puffer/Fällungs-System umfaßt.
- 5 9. Verwendung oder Verfahren nach Anspruch 8, worin das genannte Puffer/Fällungs-System Carbonatsalze, Silicatsalze oder Gemische hiervon umfaßt.
- 10 10. Verwendung oder Verfahren nach Anspruch 9, worin die genannte bleichende Zusammensetzung bis zu 5 Gew.-% der Gesamtzusammensetzung an Natriumcarbonat, vorzugsweise 0,1 Gew.-% bis 4 Gew.-%, stärker bevorzugt 0,1 Gew.-% bis 3 Gew.-% umfaßt, und das genannte Carbonatsalz vorzugsweise Natriumcarbonat ist, und bis zu 5 Gew.-% der Gesamtzusammensetzung von einem Silicatsalz, vorzugsweise 0,1 Gew.-% bis 4 Gew.-%, stärker bevorzugt von 0,2 Gew.-% bis 3 Gew.-% umfaßt, und worin das genannte Silicatsalz vorzugsweise Natriumsilicat ist.
- 15 11. Verfahren oder Verwendung nach einem der vorstehenden Ansprüche, worin die genannte bleichende Zusammensetzung als solche einen pH-Wert von 9,5 bis 13 und vorzugsweise von 9,5 bis 12 aufweist.

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