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INTERNATIONAL SEARCHING AUTHORITY

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PCT

WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY

(PCT Rule 43bis.1)

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Applicant's or agent's file reference
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FOR FURTHER ACTION
See paragraph 2 below

International application No.
PCT/US 11/00539

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IPC(8) - A01N 37/16; A01N 25/00; A61K 31/075; A61L 9/00 (2011.01)
USPC - 424/405; 422/28; 422/29; 514/714

Applicant **ENVIRO TECH CHEMICAL SERVICES, INC.**

1. This opinion contains indications relating to the following items:

- Box No. I Basis of the opinion
- Box No. II Priority
- Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- Box No. IV Lack of unity of invention
- Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- Box No. VI Certain documents cited
- Box No. VII Certain defects in the international application
- Box No. VIII Certain observations on the international application

2. **FURTHER ACTION**

If a demand for international preliminary examination is made, this opinion will be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA") except that this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notified the International Bureau under Rule 66.1bis(b) that written opinions of this International Searching Authority will not be so considered.

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of 3 months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.

For further options, see Form PCT/ISA/220.

3. For further details, see notes to Form PCT/ISA/220.

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WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY

PCT/US2011/000539 03 06 2011

International application No.
PCT/US 11/00539

Box No. I Basis of this opinion

1. With regard to the **language**, this opinion has been established on the basis of:
 - the international application in the language in which it was filed.
 - a translation of the international application into _____ which is the language of a translation furnished for the purposes of international search (Rules 12.3(a) and 23.1(b)).
2. This opinion has been established taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91 (Rule 43bis.1(a))
3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, this opinion has been established on the basis of a sequence listing filed or furnished:
 - a. (means)
 - on paper
 - in electronic form
 - b. (time)
 - in the international application as filed
 - together with the international application in electronic form
 - subsequently to this Authority for the purposes of search
4. In addition, in the case that more than one version or copy of a sequence listing has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.
5. Additional comments:

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Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Claims	<u>7-77, 81</u>	YES
	Claims	<u>1-6, 78-80, 82-91</u>	NO
Inventive step (IS)	Claims	<u>NONE</u>	YES
	Claims	<u>1-91</u>	NO
Industrial applicability (IA)	Claims	<u>1-91</u>	YES
	Claims	<u>NONE</u>	NO

2. Citations and explanations:

Claims 1-6, 78-80, and 82-91 lack novelty under PCT Article 33(2) as being anticipated by US 2010/0227000 A1 to Ames et al. (hereinafter "Ames").

Regarding claim 1; Ames discloses a hydrogen peroxide-acetyl precursor solution (para [0007] and [0067]), comprising: (a) aqueous hydrogen peroxide (para [0007] and [0067], with para [0051]); (b) a liquid acetyl precursor that is soluble in aqueous hydrogen peroxide (para [0007] and [0067], with para [0015]); (c) a trace amount of peracetic acid (para [0067]); and (d) water (para [0067]).

Regarding claim 2; claim 1 is anticipated as above. Furthermore, Ames discloses wherein said liquid acetyl precursor is triacetin (para [0007], with para [0015]).

Regarding claim 3; claim 2 is anticipated as above. Furthermore, Ames discloses wherein said aqueous hydrogen peroxide is about 23% to about 40% (para [0013]) and said triacetin is about 20% to about 53% (para [0013]), and further wherein the mole ratio of said hydrogen peroxide to said triacetin is about 2.98: 1 to about 12.84: 1 (para [0013]).

Regarding claim 4; claim 3 is anticipated as above. Furthermore, Ames discloses wherein said aqueous hydrogen peroxide is about 27% (para [0013]) and said triacetin is about 46% (para [0013]), and further wherein said mole ratio of said hydrogen peroxide to said triacetin is about 3.8: 1 (para [0013]).

Regarding claim 5; Ames discloses a method of preparing a hydrogen peroxide-acetyl precursor solution (para [0007] and [0067]), comprising:
(a) introducing a liquid acetyl precursor that is soluble in aqueous hydrogen peroxide (para [0007] and [0067], with para [0015]) to a solution of aqueous hydrogen peroxide (para [0007] and [0067], with para [0051]); and (b) allowing the liquid acetyl precursor and the solution of aqueous hydrogen peroxide to mix to form a hydrogen peroxide-acetyl precursor solution (para [0067]).

Regarding claim 6; claim 5 is anticipated as above. Furthermore, Ames discloses wherein the liquid acetyl precursor is triacetin (para [0007], with para [0015]).

Regarding claim 78; Ames discloses a freely-flowable solid composition, comprising: (a) a liquid acetyl precursor (para [0007], "part A which comprises at least one acetyl donor", with para [0015], "part A... may comprise liquid constituents"); (b) a water-soluble solid source of hydrogen peroxide (para [0007], "a liquid part B in the form of an aqueous composition which comprises... hydrogen peroxide"); and (c) a water-soluble solid source of alkalinity (para [0019], "part A may comprise... inorganic bases," with para [0022], "sodium hydroxide").

Regarding claim 79; claim 78 is anticipated as above. Furthermore, Ames discloses wherein said liquid acetyl precursor is triacetin (para [0007], with para [0015]).

Regarding claim 80; claim 79 is anticipated as above. Furthermore, Ames discloses wherein said triacetin is about 0.99% to about 8.45% (para [0013]).

Regarding claim 82; claim 78 is anticipated as above. Furthermore, Ames discloses wherein said solid source of alkalinity is about 24% to about 44% of the total (para [0013] and [0022]).

Regarding claim 83; Ames discloses a method of making a solid composition for bleaching and stain removal (para [0063]), comprising: forming a homogenous freely-flowable solid (para [0063]) by blending a liquid acetyl precursor (para [0007], "part A which comprises at least one acetyl donor", with para [0015], "part A... may comprise liquid constituents"), a water-soluble solid source of hydrogen peroxide (para [0007], "a liquid part B in the form of an aqueous composition which comprises... hydrogen peroxide"), and a water-soluble solid source of alkalinity (para [0019], "part A may comprise... inorganic bases," with para [0022], "sodium hydroxide").

Regarding claim 84; claim 83 is anticipated as above. Furthermore, Ames discloses wherein said liquid acetyl precursor is triacetin (para [0007], with para [0015]).

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Supplemental Box

In case the space in any of the preceding boxes is not sufficient.

Continuation of:
Box V.2. Citations and explanations:

Regarding claim 85; claim 84 is anticipated as above. Furthermore, Ames discloses wherein said triacetin is about 0.99% to about 8.45% (para [0013]).

Regarding claim 86; claim 83 is anticipated as above. Furthermore, Ames discloses wherein the solid source of hydrogen peroxide is about 13% to about 54% (para [0013]).

Regarding claim 87; claim 83 is anticipated as above. Furthermore, Ames discloses wherein the solid source of alkalinity is about 24% to about 44% of the total (para [0013] and [0022]).

Regarding claim 88; claim 83 is anticipated as above. Furthermore, Ames discloses wherein the method further comprises adding a metal chelating agent (para [0024]).

Regarding claim 89; claim 83 is anticipated as above. Furthermore, Ames discloses wherein the method further comprises adding a surfactant (para [0007]).

Regarding claim 90; claim 83 is anticipated as above. Furthermore, Ames discloses wherein the method further comprises adding a compound to sequester water hardness (para [0024], disclosing inclusion of sequestering agents such as EDTA and DTPA).

Regarding claim 91; claim 83 is anticipated as above. Furthermore, Ames discloses wherein the method further comprises adding an inert solid filler (para [0021]).

Claim 81 lacks an inventive step under PCT Article 33(3) as being obvious over Ames.

Regarding claim 81; claim 78 is anticipated as above. Furthermore, Ames teaches wherein said solid source of hydrogen peroxide is about 13% to about 54% of the total (para [0013]). Ames fails to expressly teach wherein said solid source of hydrogen peroxide is sodium percarbonate. However, Ames does teach inorganic percarbonate salts as being a known and routine source of hydrogen peroxide for in-situ generation of peracetic acid for use by those with ordinary skill in the art; such that one with ordinary skill in the art could confirm without undue experimentation the effectiveness of using inorganic percarbonates, such as sodium percarbonate, as the hydrogen peroxide component taught in Ames.

Claims 7-10, 13-20, 23-29, 32-39, 42-56, 59-65, and 68-77 lack an inventive step under PCT Article 33(3) as being obvious over Ames in view of US 2009/0175956 A1 to Buschmann et al. (hereinafter "Buschmann").

Regarding claim 7;

- Ames teaches a method of generating a solution of peracetic acid (para [0063] and [0067]), comprising: (a) providing water (para [0063] and [0067]); (b) introducing a hydrogen peroxide-acetyl precursor solution to the water (para [0063] and [0067]); and (c) mixing the hydrogen peroxide-acetyl precursor solution and the water to form a mixture (para [0063] and [0067]).

- Ames fails to expressly teach wherein the method further comprises: (d) adding an aqueous source of an alkali metal or earth alkali metal hydroxide to the mixture. However, Ames and Buschmann teach this claim limitation as being obvious to one with ordinary skill in the art. Specifically, Ames teaches the inclusion alkali metal hydroxides, such as sodium hydroxide, within the initial mixture composition (para [0019] and [0051], with para [0022] and [0053]). Ames also specifically teaches the use of the alkali metal hydroxide component to raise the pH level of the composition (para [0053]). Ames fails to teach wherein the alkali metal hydroxide is added separately and after the other components. Buschmann teaches a similar method and composition for generating a non-equilibrium peracetic acid composition (para [0027] and [0033]) which comprises combining hydrogen peroxide and an acetyl precursor, such as triacetin, with water (para [0027] and [0033]), along with a pH-adjusting alkali earth metal hydroxide component, such as sodium hydroxide (para [0033]-[0034]).

Buschmann also teaches that peracetic acid solutions are much more stable for "stabilization and storage" at acidic or neutral pH levels of 7.0 or below (para [0037] and [0042]), but also teaches that a "caustic pH" above 10 will accelerate the production of peracetic acid because "the hydrogen peroxide anion is a much better nucleophile than hydrogen peroxide" (para [0033]). The teachings in Buschmann indicate that a peracetic acid composition, such as one comprising hydrogen peroxide reacted with an acetyl donor, can be stabilized in a slow-reacting and non-decomposing state by maintaining a low pH in the composition, wherein the peracetic acid production in the solution can then be significantly accelerated when desired by a drastic increase in pH, such as by the addition of strong bases such as sodium hydroxide. In light of Buschmann, one with ordinary skill in the art could confirm without undue experimentation the effectiveness of adding the aqueous source of an alkali metal hydroxide in a separate and later step than the hydrogen peroxide-acetyl precursor solution.

- Buschmann also teaches wherein the method further comprises: (e) forming a reaction medium comprising a non-equilibrium solution of peracetic acid (para [0033]).

- It would have been obvious to one with ordinary skill in the art to combine the components taught in Buschmann with the method and composition taught in Ames because both references relate to methods and compositions for generating peracetic acid which comprise combining hydrogen peroxide and an acetyl precursor, such as triacetin, with water, along with a pH-adjusting alkali earth metal hydroxide component, such as sodium hydroxide; wherein Buschmann adds specificity to the method and composition by teaching additional components and specific concentrations which can be used to optimize the method and composition taught in Ames. The additional specificity taught in Buschmann improves the applicability, effectiveness, efficiency and marketability of the method and composition taught in Ames.

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Supplemental Box

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Continuation of:
Previous Supplemental Box

Regarding claim 8; claim 7 is obvious as above. Furthermore, Ames teaches wherein the method further comprises, prior to step (b), a step of providing the hydrogen peroxide-acetyl precursor solution (para [0007] and [0067]) comprising: (a) introducing a liquid acetyl precursor that is soluble in aqueous hydrogen peroxide (para [0007] and [0067], with para [0015]) to a solution of aqueous hydrogen peroxide (para [0007] and [0067], with para [0051]); and (b) allowing the liquid acetyl precursor and the solution of aqueous hydrogen peroxide to mix to form a hydrogen peroxide-acetyl precursor solution (para [0067]).

Regarding claim 9; claim 8 is obvious as above. Furthermore, Ames teaches wherein the liquid acetyl precursor is triacetin defining a hydrogen peroxide-triacetin solution (para [0007], with para [0015]).

Regarding claim 10; claim 9 is obvious as above. Furthermore, Ames teaches wherein the hydrogen peroxide-triacetin solution has a mole ratio of hydrogen peroxide to triacetin of about 2.98:1 to about 12.84:1 (para [0013]).

Regarding claim 13; claim 9 is obvious as above. Furthermore, Ames teaches wherein the aqueous source of the alkali metal or earth alkali metal hydroxide is sodium hydroxide (para [0053]).

Regarding claim 14; claim 13 is obvious as above. Furthermore, Ames teaches wherein the sodium hydroxide is about 1.82% to about 7.28% (para [0013]).

Regarding claim 15; claim 7 is obvious as above. Furthermore, Ames teaches wherein step (d) is performed simultaneously with step (b) (para [0022], teaching wherein the alkali metal hydroxide is included in the same mixture component as the acetyl donor).

Regarding claims 16 and 17; claim 7 is obvious as above. Furthermore, Ames teaches wherein the method further comprises allowing the reaction medium sufficient time to maximize the conversion of the hydrogen peroxide and the acetyl precursor into peracetic acid; more specifically wherein about 30 seconds to about five minutes (para [0064]).

Regarding claim 18; claim 17 is obvious as above. Ames and Buschmann fail to expressly teach wherein the method further comprises, after step (e), a step of sampling the reaction medium to determine the time required to maximize the amount of hydrogen peroxide and acetyl precursor that are converted into peracetic acid. However, Ames teaches that activation time of the peracetic acid solution can depend on the temperature of the solution (para [0064]). Buschmann further teaches the the rate of peracetic acid production is dependent on the pH of the solution (para [0039] and [0042]). Combining the teachings in Ames and Buschmann would indicate that optimal reaction times could be determined by measuring various rate-controlling solution properties, such as temperature and pH; such that one with ordinary skill in the art could confirm without undue experimentation the effectiveness of including an additional sampling step measure solution properties and determine the optimal time required to maximize the amount of hydrogen peroxide and acetyl precursor that are converted into peracetic acid.

Regarding claim 19; claim 16 is obvious as above. Furthermore, Buschmann teaches wherein the acetyl precursor is triacetin (para [0027] and [0030]), and the percent of triacetin that is converted into peracetic acid is about 40.9% to about 85.7% (para [0035]).

Regarding claim 20; claim 14 is obvious as above. Furthermore, Ames teaches wherein the mole ratio of the sodium hydroxide to the hydrogen peroxide to the triacetin is about 4.2:3.8:1 (para [0013]).

Regarding claim 23; claim 7 is obvious as above. Furthermore, Ames teaches wherein the peracetic acid solution is for immediate use (para [0064]).

Regarding claim 24; claim 7 is obvious as above. Furthermore, Buschmann teaches wherein the method further comprises, after step (e), a step of adding a source of acid to stabilize the non-equilibrium solution of peracetic acid for storing and using throughout a working day (para [0042]).

Regarding claim 25; claim 7 is obvious as above. Furthermore, Ames teaches wherein the peracetic acid solution is prepared on a site having a point-of-use (para [0064] and [0067]).

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Supplemental Box

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Continuation of:
Previous Supplemental Box

Regarding claim 26;

- Ames teaches a method of generating a solution of peracetic acid for use on site having a point-of-use of peracetic acid (para [0063]-[0064] and [0067]), comprising: (a) providing water on a site (para [0063]-[0064] and [0067]); (b) providing a hydrogen peroxide-acetyl precursor solution on the site having a point-of-use (para [0064] and [0067]); (c) introducing the hydrogen peroxide-acetyl precursor solution to the water (para [0063] and [0067]); and (d) mixing the hydrogen peroxide-acetyl precursor solution and the water to form a mixture (para [0063] and [0067]).

- Ames fails to expressly teach wherein the method further comprises: (e) providing an aqueous source of an alkali metal or earth alkali metal hydroxide on the site having the point-of-use; and (f) adding the aqueous source of an alkali metal or earth alkali metal hydroxide to the mixture. However, Ames and Buschmann teach this claim limitation as being obvious to one with ordinary skill in the art. Specifically, Ames teaches the inclusion alkali metal hydroxides, such as sodium hydroxide, within the initial mixture composition (para [0019] and [0051], with para [0022] and [0053]). Ames also specifically teaches the use of the alkali metal hydroxide component to raise the pH level of the composition (para [0053]). Ames fails to teach wherein the alkali metal hydroxide is added separately and after the other components. Buschmann teaches a similar method and composition for generating a non-equilibrium peracetic acid composition (para [0027] and [0033]) which comprises combining hydrogen peroxide and an acetyl precursor, such as triacetin, with water (para [0027] and [0033]), along with a pH-adjusting alkali earth metal hydroxide component, such as sodium hydroxide (para [0033]-[0034]). Buschmann also teaches that peracetic acid solutions are much more stable for "stabilization and storage" at acidic or neutral pH levels of 7.0 or below (para [0037] and [0042]), but also teaches that a "caustic pH" above 10 will accelerate the production of peracetic acid because "the hydrogen peroxide anion is a much better nucleophile than hydrogen peroxide" (para [0033]). The teachings in Buschmann indicate that a peracetic acid composition, such as one comprising hydrogen peroxide reacted with an acetyl donor, can be stabilized in a slow-reacting and non-decomposing state by maintaining a low pH in the composition, wherein the peracetic acid production in the solution can then be significantly accelerated when desired by a drastic increase in pH, such as by the addition of strong bases such as sodium hydroxide. In light of Buschmann, one with ordinary skill in the art could confirm without undue experimentation the effectiveness of adding the aqueous source of an alkali metal hydroxide in a separate and later step than the hydrogen peroxide-acetyl precursor solution.

- Buschmann also teaches wherein the method further comprises: (g) forming a reaction medium comprising a non-equilibrium solution of peracetic acid for use at the point-of-use of peracetic acid (para [0033]).

- It would have been obvious to one with ordinary skill in the art to combine the components taught in Buschmann with the method and composition taught in Ames because both references relate to methods and compositions for generating peracetic acid which comprise combining hydrogen peroxide and an acetyl precursor, such as triacetin, with water, along with a pH-adjusting alkali earth metal hydroxide component, such as sodium hydroxide; wherein Buschmann adds specificity to the method and composition by teaching additional components and specific concentrations which can be used to optimize the method and composition taught in Ames. The additional specificity taught in Buschmann improves the applicability, effectiveness, efficiency and marketability of the method and composition taught in Ames.

Regarding claim 27; claim 26 is obvious as above. Furthermore, Ames teaches wherein the method further comprises, prior to step (b), a step of providing the hydrogen peroxide-acetyl precursor solution (para [0007] and [0067]) comprising: (a) introducing a liquid acetyl precursor that is soluble in aqueous hydrogen peroxide (para [0007] and [0067], with para [0015]) to a solution of aqueous hydrogen peroxide (para [0007] and [0067], with para [0051]); and (b) allowing the liquid acetyl precursor and the solution of aqueous hydrogen peroxide to mix to form a hydrogen peroxide-acetyl precursor solution (para [0067]).

Regarding claim 28; claim 8 is obvious as above. Furthermore, Ames teaches wherein the liquid acetyl precursor is triacetin defining a hydrogen peroxide-triacetin solution (para [0007], with para [0015]).

Regarding claim 29; claim 28 is obvious as above. Furthermore, Ames teaches wherein the hydrogen peroxide-triacetin solution has a mole ratio of hydrogen peroxide to triacetin of about 2.98:1 to about 12.84:1 (para [0013]).

Regarding claim 32; claim 28 is obvious as above. Furthermore, Ames teaches wherein the aqueous source of the alkali metal or earth alkali metal hydroxide is sodium hydroxide (para [0053]).

Regarding claim 33; claim 32 is obvious as above. Furthermore, Ames teaches wherein the sodium hydroxide is about 1.82% to about 7.28% (para [0013]).

Regarding claim 34; claim 26 is obvious as above. Furthermore, Ames teaches wherein step (d) is performed simultaneously with step (b) (para [0066]).

Regarding claims 35 and 36; claim 26 is obvious as above. Furthermore, Ames teaches wherein the method further comprises allowing the reaction medium sufficient time to maximize the conversion of the hydrogen peroxide and the acetyl precursor into peracetic acid; more specifically wherein about 30 seconds to about five minutes (para [0064]).

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Supplemental Box

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Continuation of:
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Regarding claim 37; claim 36 is obvious as above. Ames and Buschmann fail to expressly teach wherein the method further comprises, after step (e), a step of sampling the reaction medium to determine the time required to maximize the amount of hydrogen peroxide and acetyl precursor that are converted into peracetic acid. However, Ames teaches that activation time of the peracetic acid solution can depend on the temperature of the solution (para [0064]). Buschmann further teaches the rate of peracetic acid production is dependent on the pH of the solution (para [0039] and [0042]). Combining the teachings in Ames and Buschmann would indicate that optimal reaction times could be determined by measuring various rate-controlling solution properties, such as temperature and pH; such that one with ordinary skill in the art could confirm without undue experimentation the effectiveness of including an additional sampling step measure solution properties and determine the optimal time required to maximize the amount of hydrogen peroxide and acetyl precursor that are converted into peracetic acid.

Regarding claim 38; claim 35 is obvious as above. Furthermore, Buschmann teaches wherein the acetyl precursor is triacetin (para [0027] and [0030]), and the percent of triacetin that is converted into peracetic acid is about 40.9% to about 85.7% (para [0035]).

Regarding claim 39; claim 33 is obvious as above. Furthermore, Ames teaches wherein the mole ratio of the sodium hydroxide to the hydrogen peroxide to the triacetin is about 4.2:3.8:1 (para [0013]).

Regarding claim 42; claim 26 is obvious as above. Furthermore, Ames teaches wherein the peracetic acid solution is for immediate use (para [0064]).

Regarding claim 43; claim 26 is obvious as above. Furthermore, Buschmann teaches wherein the method further comprises, after step (e), a step of adding a source of acid to stabilize the non-equilibrium solution of peracetic acid for storing and using throughout a working day (para [0042]).

Regarding claim 44; claim 26 is obvious as above. Furthermore, Ames teaches wherein the peracetic acid solution is prepared on a site having a point-of-use (para [0064] and [0067]).

Regarding claim 45; claim 7 is obvious as above. Furthermore, Buschmann teaches wherein the peracetic acid made by the method of claim 7 is in a non-equilibrium solution for use as a disinfectant or sanitizer (para [0023]).

Regarding claim 46; claim 45 is obvious as above. Furthermore, Ames teaches wherein the solution is for clean-in-place pipeline and equipment cleaning (para [0069]).

Regarding claim 47; claim 45 is obvious as above. Furthermore, Buschmann teaches wherein the solution is for use in washing fruits and vegetables (para [0031]).

Regarding claim 48; claim 45 is obvious as above. Furthermore, Buschmann teaches wherein the solution is for use in the treatment of meat, poultry, and seafood (para [0031]).

Regarding claim 49;

- Ames teaches a method for sanitizing a surface (para [0069]), which comprises generating a solution of peracetic acid (para [0007] and [0067]) comprising: (a) peracetic acid (para [0007] and [0067]), (b) hydrogen peroxide (para [0007] and [0067]), (c) triacetin (para [0007] and [0067], with para [0017]), (e) a source of an alkali metal or earth alkali metal hydroxide (para [0007], [0051] and [0053]), and (f) water (para [0007] and [0067]).

- Ames fails to expressly teach further claim limitations which are taught by Buschmann, including wherein the solution further comprises (d) 1,2,3-propanetriol (para [0023] and [0030], "glycerol"); and wherein the solution is a non-equilibrium solution (para [0023]).

- It would have been obvious to one with ordinary skill in the art to combine the components taught in Buschmann with the method and composition taught in Ames because both references relate to methods and compositions for generating peracetic acid which comprise combining hydrogen peroxide and an acetyl precursor, such as triacetin, with water, along with a pH-adjusting alkali earth metal hydroxide component, such as sodium hydroxide; wherein Buschmann adds specificity to the method and composition by teaching additional components and specific concentrations which can be used to optimize the method and composition taught in Ames. The additional specificity taught in Buschmann improves the applicability, effectiveness, efficiency and marketability of the method and composition taught in Ames.

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Supplemental Box

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Regarding claim 50;

- Ames teaches a solution of peracetic acid (para [0007] and [0067]) comprising: (a) peracetic acid (para [0007] and [0067]), (b) hydrogen peroxide (para [0007] and [0067]), (c) triacetin (para [0007] and [0067], with para [0017]), (e) an aqueous source of an alkali metal or earth alkali metal hydroxide (para [0007], [0051] and [0053]), and (f) water (para [0007] and [0067]).

- Ames fails to expressly teach further claim limitations which are taught by Buschmann, including wherein the solution further comprises (d) 1,2,3-propanetriol (para [0023] and [0030], "glycerol"); and wherein the solution is a non-equilibrium solution (para [0023]).

- It would have been obvious to one with ordinary skill in the art to combine the components taught in Buschmann with the method and composition taught in Ames because both references relate to methods and compositions for generating peracetic acid which comprise combining hydrogen peroxide and an acetyl precursor, such as triacetin, with water, along with a pH-adjusting alkali earth metal hydroxide component, such as sodium hydroxide; wherein Buschmann adds specificity to the method and composition by teaching additional components and specific concentrations which can be used to optimize the method and composition taught in Ames. The additional specificity taught in Buschmann improves the applicability, effectiveness, efficiency and marketability of the method and composition taught in Ames.

Regarding claim 51; claim 50 is obvious as above. Furthermore, Buschmann teaches wherein said solution has a pH of about 11.2 to about 13.37 (para [0034]).

Regarding claim 52; claim 50 is obvious as above. Furthermore, Ames teaches wherein said peracetic acid is about 1 % to about 7.1 % (para [0067]).

Regarding claim 53;

- Ames teaches a method of generating a solution of peracetic acid (para [0063] and [0067]), comprising: (a) providing water (para [0063] and [0067]); (b) introducing a liquid acetyl precursor that is soluble in aqueous hydrogen peroxide (para [0007] and [0067], with para [0017]) and aqueous hydrogen peroxide (para [0007] and [0067]) to the water (para [0063] and [0067]); and (c) mixing the liquid acetyl precursor and the aqueous hydrogen peroxide with the water to form a mixture (para [0063] and [0067]).

- Ames fails to expressly teach wherein the method further comprises: (d) adding an aqueous source of an alkali metal or earth alkali metal hydroxide to the mixture. However, Ames and Buschmann teach this claim limitation as being obvious to one with ordinary skill in the art. Specifically, Ames teaches the inclusion alkali metal hydroxides, such as sodium hydroxide, within the initial mixture composition (para [0019] and [0051], with para [0022] and [0053]). Ames also specifically teaches the use of the alkali metal hydroxide component to raise the pH level of the composition (para [0053]). Ames fails to teach wherein the alkali metal hydroxide is added separately and after the other components. Buschmann teaches a similar method and composition for generating a non-equilibrium peracetic acid composition (para [0027] and [0033]) which comprises combining hydrogen peroxide and an acetyl precursor, such as triacetin, with water (para [0027] and [0033]), along with a pH-adjusting alkali earth metal hydroxide component, such as sodium hydroxide (para [0033]-[0034]).

Buschmann also teaches that peracetic acid solutions are much more stable for "stabilization and storage" at acidic or neutral pH levels of 7.0 or below (para [0037] and [0042]), but also teaches that a "caustic pH" above 10 will accelerate the production of peracetic acid because "the hydrogen peroxide anion is a much better nucleophile than hydrogen peroxide" (para [0033]). The teachings in Buschmann indicate that a peracetic acid composition, such as one comprising hydrogen peroxide reacted with an acetyl donor, can be stabilized in a slow-reacting and non-decomposing state by maintaining a low pH in the composition, wherein the peracetic acid production in the solution can then be significantly accelerated when desired by a drastic increase in pH, such as by the addition of strong bases such as sodium hydroxide. In light of Buschmann, one with ordinary skill in the art could confirm without undue experimentation the effectiveness of adding the aqueous source of an alkali metal hydroxide in a separate and later step than the hydrogen peroxide-acetyl precursor solution.

- Buschmann also teaches wherein the method further comprises: (e) forming a reaction medium comprising a non-equilibrium solution of peracetic acid (para [0033]).

- It would have been obvious to one with ordinary skill in the art to combine the components taught in Buschmann with the method and composition taught in Ames because both references relate to methods and compositions for generating peracetic acid which comprise combining hydrogen peroxide and an acetyl precursor, such as triacetin, with water, along with a pH-adjusting alkali earth metal hydroxide component, such as sodium hydroxide; wherein Buschmann adds specificity to the method and composition by teaching additional components and specific concentrations which can be used to optimize the method and composition taught in Ames. The additional specificity taught in Buschmann improves the applicability, effectiveness, efficiency and marketability of the method and composition taught in Ames.

Regarding claim 54; claim 53 is obvious as above. Furthermore, Ames teaches wherein the liquid acetyl precursor is triacetin defining a hydrogen peroxide-triacetin solution (para [0007], with para [0015]).

Regarding claims 55 and 56; claim 53 is obvious as above. Ames and Buschmann fail to expressly teach wherein the liquid acetyl precursor and the aqueous hydrogen peroxide are introduced simultaneously, or introduced sequentially with either one first. However, combining solution components simultaneously or sequentially are both known and routine methods of forming a mixture of components to those with ordinary skill in the art; wherein one with ordinary skill in the art could confirm without undue experimentation the effectiveness of introducing the components taught in Ames and Buschmann either simultaneously or sequentially.

Regarding claim 59; claim 54 is obvious as above. Furthermore, Ames teaches wherein the aqueous source of the alkali metal or earth alkali metal hydroxide is sodium hydroxide (para [0053]).

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Regarding claim 60; claim 59 is obvious as above. Furthermore, Ames teaches wherein the sodium hydroxide is about 1.82% to about 7.28% (para [0013]).

Regarding claim 61; claim 53 is obvious as above. Furthermore, Ames teaches wherein step (d) is performed simultaneously with step (b) (para [0022], teaching wherein the alkali metal hydroxide is included in the same mixture component as the acetyl donor).

Regarding claims 62 and 63; claim 53 is obvious as above. Furthermore, Ames teaches wherein the method further comprises allowing the reaction medium sufficient time to maximize the conversion of the hydrogen peroxide and the acetyl precursor into peracetic acid; more specifically wherein about 30 seconds to about five minutes (para [0064]).

Regarding claim 64; claim 63 is obvious as above. Furthermore, Buschmann teaches wherein the acetyl precursor is triacetin (para [0027] and [0030]), and the percent of triacetin that is converted into peracetic acid is about 40.9% to about 85.7% (para [0035]).

Regarding claim 65; claim 60 is obvious as above. Furthermore, Ames teaches wherein the mole ratio of the sodium hydroxide to the hydrogen peroxide to the triacetin is about 4.2:3.8:1 (para [0013]).

Regarding claim 68;

- Ames teaches a method of generating a solution of peracetic acid on a site having a point-of-use (para [0063]-[0064] and [0067]), comprising: (a) providing water on a site (para [0063]-[0064] and [0067]); (b) providing a liquid acetyl precursor that is soluble in aqueous hydrogen peroxide (para [0007] and [0067], with para [0017]) and aqueous hydrogen peroxide (para [0007] and [0067]) on the site having a point-of-use (para [0064] and [0067]); (c) introducing the liquid acetyl precursor and the aqueous hydrogen peroxide to the water (para [0063] and [0067]); and (d) mixing the aqueous hydrogen peroxide and the liquid acetyl precursor solution with the water to form a mixture (para [0063] and [0067]).

- Ames fails to expressly teach wherein the method further comprises: (e) providing an aqueous source of an alkali metal or earth alkali metal hydroxide on the site having the point-of-use; and (f) adding the aqueous source of an alkali metal or earth alkali metal hydroxide to the mixture. However, Ames and Buschmann teach this claim limitation as being obvious to one with ordinary skill in the art. Specifically, Ames teaches the inclusion alkali metal hydroxides, such as sodium hydroxide, within the initial mixture composition (para [0019] and [0051], with para [0022] and [0053]). Ames also specifically teaches the use of the alkali metal hydroxide component to raise the pH level of the composition (para [0053]). Ames fails to teach wherein the alkali metal hydroxide is added separately and after the other components. Buschmann teaches a similar method and composition for generating a non-equilibrium peracetic acid composition (para [0027] and [0033]) which comprises combining hydrogen peroxide and an acetyl precursor, such as triacetin, with water (para [0027] and [0033]), along with a pH-adjusting alkali earth metal hydroxide component, such as sodium hydroxide (para [0033]-[0034]). Buschmann also teaches that peracetic acid solutions are much more stable for "stabilization and storage" at acidic or neutral pH levels of 7.0 or below (para [0037] and [0042]), but also teaches that a "caustic pH" above 10 will accelerate the production of peracetic acid because "the hydrogen peroxide anion is a much better nucleophile than hydrogen peroxide" (para [0033]). The teachings in Buschmann indicate that a peracetic acid composition, such as one comprising hydrogen peroxide reacted with an acetyl donor, can be stabilized in a slow-reacting and non-decomposing state by maintaining a low pH in the composition, wherein the peracetic acid production in the solution can then be significantly accelerated when desired by a drastic increase in pH, such as by the addition of strong bases such as sodium hydroxide. In light of Buschmann, one with ordinary skill in the art could confirm without undue experimentation the effectiveness of adding the aqueous source of an alkali metal hydroxide in a separate and later step than the hydrogen peroxide-acetyl precursor solution.

- Buschmann also teaches wherein the method further comprises: (g) forming a reaction medium comprising a non-equilibrium solution of peracetic acid for use at the point-of-use (para [0033]).

- It would have been obvious to one with ordinary skill in the art to combine the components taught in Buschmann with the method and composition taught in Ames because both references relate to methods and compositions for generating peracetic acid which comprise combining hydrogen peroxide and an acetyl precursor, such as triacetin, with water, along with a pH-adjusting alkali earth metal hydroxide component, such as sodium hydroxide; wherein Buschmann adds specificity to the method and composition by teaching additional components and specific concentrations which can be used to optimize the method and composition taught in Ames. The additional specificity taught in Buschmann improves the applicability, effectiveness, efficiency and marketability of the method and composition taught in Ames.

Regarding claim 69; claim 68 is obvious as above. Furthermore, Ames teaches wherein the liquid acetyl precursor is triacetin (para [0007], with para [0015]).

Regarding claim 70; claim 68 is obvious as above. Furthermore, Ames teaches wherein the aqueous source of the alkali metal or earth alkali metal hydroxide is sodium hydroxide (para [0053]).

Regarding claim 71; claim 70 is obvious as above. Furthermore, Ames teaches wherein the sodium hydroxide is about 1.82% to about 7.28% (para [0013]).

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Regarding claims 72 and 73; claim 68 is obvious as above. Furthermore, Ames teaches wherein the method further comprises allowing the reaction medium sufficient time to maximize the conversion of the hydrogen peroxide and the acetyl precursor into peracetic acid; more specifically wherein about 30 seconds to about five minutes (para [0064]).

Regarding claim 74; claim 68 is obvious as above. Ames and Buschmann fail to expressly teach wherein the method further comprises, after step (g), a step of sampling the reaction medium to determine the time required to maximize the amount of hydrogen peroxide and acetyl precursor that are converted into peracetic acid. However, Ames teaches that activation time of the peracetic acid solution can depend on the temperature of the solution (para [0064]). Buschmann further teaches the the rate of peracetic acid production is dependent on the pH of the solution (para [0039] and [0042]). Combining the teachings in Ames and Buschmann would indicate that optimal reaction times could be determined by measuring various rate-controlling solution properties, such as temperature and pH; such that one with ordinary skill in the art could confirm without undue experimentation the effectiveness of including an additional sampling step measure solution properties and determine the optimal time required to maximize the amount of hydrogen peroxide and acetyl precursor that are converted into peracetic acid.

Regarding claim 75; claim 72 is obvious as above. Furthermore, Buschmann teaches wherein the acetyl precursor is triacetin (para [0027] and [0030]), and the percent of triacetin that is converted into peracetic acid is about 40.9% to about 85.7% (para [0035]).

Regarding claim 76; claim 71 is obvious as above. Furthermore, Ames teaches wherein the mole ratio of the sodium hydroxide to the hydrogen peroxide to the triacetin is about 4.2:3.8:1 (para [0013]).

Regarding claim 77;

- Ames teaches an on site peracetic acid generation system (para [0013], [0064] and [0067]), comprising: (a) a first container comprising a first solution (para [0013] and [0067]) wherein said first solution comprises: (i) aqueous hydrogen peroxide (para [0007] and [0067]); (ii) a liquid acetyl precursor that is soluble in said aqueous hydrogen peroxide (para [0007] and [0067], with para [0017]); (iii) a trace amount of peracetic acid (para [0067]); and (iv) water (para [0007] and [0067]); and (b) a second container comprising a second solution (para [0013]).

- Ames fails to expressly teach wherein the second solution comprises: (i) an aqueous source of an alkali metal or earth alkali metal hydroxide. However, Ames and Buschmann teach this claim limitation as being obvious to one with ordinary skill in the art. Specifically, Ames teaches the inclusion alkali metal hydroxides, such as sodium hydroxide, within the initial mixture composition (para [0019] and [0051], with para [0022] and [0053]). Ames also specifically teaches the use of the alkali metal hydroxide component to raise the pH level of the composition (para [0053]). Ames fails to teach wherein the alkali metal hydroxide is added separately from other components. Buschmann teaches a similar method and composition for generating a non-equilibrium peracetic acid composition (para [0027] and [0033]) which comprises combining hydrogen peroxide and an acetyl precursor, such as triacetin, with water (para [0027] and [0033]), along with a pH-adjusting alkali earth metal hydroxide component, such as sodium hydroxide (para [0033]-[0034]). Buschmann also teaches that peracetic acid solutions are much more stable for "stabilization and storage" at acidic or neutral pH levels of 7.0 or below (para [0037] and [0042]), but also teaches that a "caustic pH" above 10 will accelerate the production of peracetic acid because "the hydrogen peroxide anion is a much better nucleophile than hydrogen peroxide" (para [0033]). The teachings in Buschmann indicate that a peracetic acid composition, such as one comprising hydrogen peroxide reacted with an acetyl donor, can be stabilized in a slow-reacting and non-decomposing state by maintaining a low pH in the composition, wherein the peracetic acid production in the solution can then be significantly accelerated when desired by a drastic increase in pH, such as by the addition of strong bases such as sodium hydroxide. In light of Buschmann, one with ordinary skill in the art could confirm without undue experimentation the effectiveness of including the aqueous source of an alkali metal hydroxide in a separate container from the hydrogen peroxide - acetyl precursor mixture, specifically when the system is used for on site generation of point-of-use peracetic acid solutions.

- Ames further teaches wherein the second container can comprise: (ii) means for mixing the first solution, water, and the second solution to generate a non-equilibrium peracetic acid solution (para [0063]).

- Buschmann also teaches wherein the system forms a non-equilibrium solution of peracetic acid (para [0033]).

- It would have been obvious to one with ordinary skill in the art to combine the components taught in Buschmann with the system and composition taught in Ames because both references relate to systems and compositions for generating peracetic acid which comprise combining hydrogen peroxide and an acetyl precursor, such as triacetin, with water, along with a pH-adjusting alkali earth metal hydroxide component, such as sodium hydroxide; wherein Buschmann adds specificity to the system and composition by teaching additional components and specific concentrations which can be used to optimize the system and composition taught in Ames. The additional specificity taught in Buschmann improves the applicability, effectiveness, efficiency and marketability of the system and composition taught in Ames.

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Claims 11, 12, 21, 22, 30, 31, 40, 41, 57, 58, 66, and 67 lack an inventive step under PCT Article 33(3) as being obvious over Ames in view of Buschmann, and in further view of WO 2001/046519 A1 to Withenshaw et al. (hereinafter "Withenshaw").

Regarding claims 11, 30 and 57; claims 7, 26 and 53 are obvious as above.

- Ames and Buschmann fail to expressly teach further claim limitations which are taught by Withenshaw, including wherein the provided water is an aqueous stream (pg 4, ln 27-28 and pg 8, ln 27-28).
- It would have been obvious to one with ordinary skill in the art to combine the components taught in Withenshaw with the method and composition taught in Ames and Buschmann because all three references relate to methods and compositions for generating peracetic acid which comprise combining hydrogen peroxide and an acetyl precursor, such as triacetin, with water, along with a pH-adjusting alkali earth metal hydroxide component, such as sodium hydroxide; wherein Withenshaw adds specificity to the method and composition by teaching additional components, processing steps, and specific concentrations which can be used to optimize the system and composition taught in Ames and Buschmann. The additional specificity taught in Withenshaw improves the applicability, effectiveness, efficiency and marketability of the method and composition taught in Ames and Buschmann.

Regarding claims 12, 31 and 58; claims 7, 26 and 53 are obvious as above.

- Ames and Buschmann fail to expressly teach further claim limitations which are taught by Withenshaw, including wherein the provided water is contained in a mixing tank or other vessel (pg 8, ln 14-15).
- It would have been obvious to one with ordinary skill in the art to combine the components taught in Withenshaw with the method and composition taught in Ames and Buschmann because all three references relate to methods and compositions for generating peracetic acid which comprise combining hydrogen peroxide and an acetyl precursor, such as triacetin, with water, along with a pH-adjusting alkali earth metal hydroxide component, such as sodium hydroxide; wherein Withenshaw adds specificity to the method and composition by teaching additional components, processing steps, and specific concentrations which can be used to optimize the system and composition taught in Ames and Buschmann. The additional specificity taught in Withenshaw improves the applicability, effectiveness, efficiency and marketability of the method and composition taught in Ames and Buschmann.

Regarding claims 21, 40 and 66; claims 7, 26 and 53 are obvious as above.

- Ames and Buschmann fail to expressly teach further claim limitations which are taught by Withenshaw, including wherein steps (a) through (e) are performed on a continuous basis (pg 3, ln 6-7).
- It would have been obvious to one with ordinary skill in the art to combine the components taught in Withenshaw with the method and composition taught in Ames and Buschmann because all three references relate to methods and compositions for generating peracetic acid which comprise combining hydrogen peroxide and an acetyl precursor, such as triacetin, with water, along with a pH-adjusting alkali earth metal hydroxide component, such as sodium hydroxide; wherein Withenshaw adds specificity to the method and composition by teaching additional components, processing steps, and specific concentrations which can be used to optimize the system and composition taught in Ames and Buschmann. The additional specificity taught in Withenshaw improves the applicability, effectiveness, efficiency and marketability of the method and composition taught in Ames and Buschmann.

Regarding claims 22, 41 and 67; claims 7, 26 and 53 are obvious as above.

- Ames and Buschmann fail to expressly teach further claim limitations which are taught by Withenshaw, including wherein steps (a) through (e) are performed on an intermittent basis (pg 5, ln 2, "semi-batch operation", with pg 8, ln 14).
- It would have been obvious to one with ordinary skill in the art to combine the components taught in Withenshaw with the method and composition taught in Ames and Buschmann because all three references relate to methods and compositions for generating peracetic acid which comprise combining hydrogen peroxide and an acetyl precursor, such as triacetin, with water, along with a pH-adjusting alkali earth metal hydroxide component, such as sodium hydroxide; wherein Withenshaw adds specificity to the method and composition by teaching additional components, processing steps, and specific concentrations which can be used to optimize the system and composition taught in Ames and Buschmann. The additional specificity taught in Withenshaw improves the applicability, effectiveness, efficiency and marketability of the method and composition taught in Ames and Buschmann.

Claims 1-91 have industrial applicability as defined by PCT Article 33(4) because the subject matter can be made or used by industry.