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(54) Title: NEW CLASS OF LAUNOCH COMPOSITIONS

(57) Abstract: Cleaning compositions functioning in a unique manner are described. These new compositions provide improved cleaning efficacy for all types of surfaces. In addition, in textile laundry applications these compositions provide superior cleaning efficacy for all types and colors of fabrics, as well as extending the range and types of stains and dirt that commonly can be treated by present day commercial laundry compositions.
NEW CLASS OF LAUNDRY COMPOSITIONS

Field of the Invention:

The present invention relates to cleaning compositions and, more particularly, to a new class of cleaning compositions that treat stains and oily dirt on colored fabrics, textiles, and hard surfaces.

BACKGROUND OF THE INVENTION

Traditionally, cleaning compositions, particularly commercial laundry detergents and soaps available in the marketplace, function as substances that physically remove dirt, soil, and stains from the textile surfaces being cleaned. These commercial detergents and soaps are surface active materials containing surfactants and concentrate at the textile surfaces where the dirt resides. The cleaning surfactants are in equilibrium with like surfactants in the wash cleaning liquid. Simply stated, these surfactants physically incorporate (dissolve) the dirt, oil, or stains in their micelles and then transport them away from the textile surfaces and into the bulk of the cleaning liquid.

The popularity of these commercial soaps and detergents in the marketplace is legendary, and their ability to physically clean textiles is adequate for most common soils and dirt; however, these detergents and soaps are less effective in removing oily soils and/or hydrophobic stains.
Traditionally, a commercial method of chemical cleaning or bleaching is used to remove stains. The actual dirt causing the stain is not physically removed from the surface being cleaned. The dirt is bleached, i.e., chemically altered, to a colorless state.

Typical commercial bleaching agents contain hypochlorites. A hypochlorite is a chemically strong oxidizing agent generally preferred to weaker hydrogen peroxide. Hypochlorite is effective as a stain-removing bleach, but has a major drawback, viz., it indiscriminately bleaches (i.e., discolors) many colored materials, attacking and altering the fabric color. Thus, in cleaning laundry textiles, commercial hypochlorite bleaches can only be used for white clothing. As a result, one has to resort to the chemically less aggressive oxygen based bleaches (e.g., peroxides and peroxy acids) when one wants to clean stained or oil-soiled colored textiles. The results are rarely as satisfying as those obtained from hypochlorite bleaching of white textiles. It should also be noted that the aggressive bleaching nature of hypochlorite weakens the fabric of clothing. Thus, after a number of washings, the treated materials are usually less durable.

The present invention offers a powerful new approach to cleaning in general and, in particular, to cleaning of colored textiles without harming the fabric. It combines the chemical bleaching of hydrogen peroxide at a higher pH level and the uniquely powerful oil-solubilizing terpenes to give a vastly superior and efficacious product.

The new laundry compositions of this invention comprise a source of hydrogen peroxide and hydrophobic solvents and/or
surfactants in a dry formulation. The removal of difficult hydrophobic or oil-based stains from surfaces requires the use of hydrophobic surfactants (usually, but not limited to, nonionic surfactants) and/or hydrophobic solvents. One specific and very effective class of hydrophobic solvents is the terpene hydrocarbons and, more specifically, d-limonene.

The new formulations of this invention are unique because they run counter to current wisdom. Terpene hydrocarbons are never suggested for use alongside hydrogen peroxide. From a chemical composition point of view, terpenes, specifically d-limonene, would not be expected to be stable for extended periods of time in the presence of hydrogen peroxide. To stabilize a composition combining terpene hydrocarbons and hydrogen peroxide and enlist their combined cleaning qualities, this invention uses a "dry" formulation. The dry formulation is also configured to provide a pH that maximizes the bleaching power of the hydrogen peroxide.

Discussion of Related Art:

In United States Patent Nos. 5,602,090, issued to Melikyan et al. on February 11, 1997 for SURFACTANTS BASED AQUEOUS COMPOSITIONS WITH D-LIMONENE AND HYDROGEN PEROXIDE AND METHODS USING THE SAME, and 6,316,399, issued to Arman V. Melikyan on November 13, 2001 for SURFACTANTS BASED AQUEOUS COMPOSITIONS WITH D-LIMONENE AND HYDROGEN PEROXIDE AND METHODS USING THE SAME, compositions are disclosed suggesting the use of the combination of hydrogen peroxide and terpenes. The description relates to a product incorporating hydrogen peroxide and the hydrophobic terpenes in a liquid composition. The function of
this liquid composition is not for the laundering of textiles and fabrics.

In addition, the liquid composition is not formulated for high pH levels exceeding 9.5, which enhance the bleaching effects of the hydrogen peroxide. These patents teach away from the present invention by using very low pH levels. These low pH levels make the liquid combination of terpenes and hydrogen peroxide stable in solution.

SUMMARY OF THE INVENTION

In accordance with the present invention, there is provided laundry cleaning compositions combining the chemical cleaning (bleaching) ability of hydrogen peroxide with the physical cleaning ability of hydrophobic solvents, like the terpene hydrocarbons, specifically d-limonene. The compositions are dry formulated at a pH level enhancing the capability of the hydrogen peroxide to bleach the fabrics and textiles to which they are applied. The enhancing pH level exceeds approximately 9.5.

It is an object of the present invention to provide a new class of laundry cleaning compositions.

It is another object of this invention to provide formulations containing peroxides and hydrophobic solvents or surfactants in a powdered matrix buffered at a pH greater than about 9, and preferably above pH 10.
DESCRIPTION OF THE PREFERRED EMBODIMENT

Generally speaking, the invention features new and unique compositions providing improved cleaning efficacy for all types and colors of fabrics, as well as extending the range and types of stains and dirt commonly treated by present day commercial laundry compositions.

The compositions of this invention incorporate both hydrogen peroxide and hydrophobic solvents or surfactants like d-limonene in a dry formulation where the pH level exceeds approximately 9.0 in order to maximize the bleaching power of hydrogen peroxide.

A major disadvantage of liquid formulations containing peroxide is their instability. This is particularly true of the liquid composition when hydrogen peroxide is mixed with terpenes. Such liquid combination can only be formulated at a low pH, i.e., less than 8. However, the effectiveness of hydrogen peroxide as a bleaching agent increases dramatically as the pH level rises above 9.5 to 10.

The improved efficacy as a bleaching agent in this elevated pH range is believed to be due to the fact that at this higher pH level there is broader based bleaching. The hydrogen peroxide can bleach not only as an oxidizing/reducing agent, but also as a powerful nucleophilic agent via the hydroperoxide anion. This nucleophilic anion has been found in appreciable quantities at pH levels above 9.5 to 10. The invention utilizes soda ash to boost the pH level of the compositions.
One of the major advantages of the formulations of the present invention is their ability to be directly applied in paste form to fabrics such as clothes and carpets. The dry formulations can be mixed with a little water to form this paste, and the paste can be gently applied to the fabric surface. The high pH level provides excellent bleaching action to stains. Additionally, fatty acid-based stains, which constitute a common source of oily stains in laundry textiles, are more readily removed from surfaces at pH levels above 9.

One of the novel findings of this invention is the fact that the peroxide remains stable over long periods of time at a broad range of temperatures. This is especially surprising, since the presence of any moisture would be expected to lead to rapid decomposition of the hydrogen peroxide source.

Although the formulations described herein are primarily directed to laundry cleaning, these compounds have additional use as cleaners for hard surfaces such as tile, grout, ceramics, porcelain, plastics, fiberglass, carpets, upholstery, concrete, wood decks, etc.

A further surprise is that the terpene odor, more specifically the d-limonene odor, is not reduced or "twisted" over extended periods of time.

Another aspect of this invention is the formulation of compositions containing an encapsulated hydrogen peroxide source. The encapsulation offers greater stability both for the peroxide and the terpene.
Another advantage of compositions disclosed herein is their inherently safer use, transport, and storage compared to their liquid counterparts.

Another unexpected advantage of the compositions of this invention is the effectiveness of the terpenes at temperatures lower than heretofore reported for other hydrophobic solvents.

Another aspect of this invention is improved stain removal on a broad range of stain types, including oil and grease, fruit and vegetable, enzymatic, such as grass and blood, and particulate-based gray and mud/clay stains.

**Specific Formulations:**

Example 1

<table>
<thead>
<tr>
<th>All Purpose Cleaning Additive Product</th>
<th>% by weight</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Soda Ash</strong></td>
<td>10 - 70</td>
</tr>
<tr>
<td>Sodium Perborate or Percarbonate,</td>
<td></td>
</tr>
<tr>
<td>(each as a monohydrate or tetrahydrate)</td>
<td>8 - 60</td>
</tr>
<tr>
<td>Terpene</td>
<td>0.5 - 20</td>
</tr>
<tr>
<td>Fragrance</td>
<td>0.1 - 2.0</td>
</tr>
<tr>
<td><strong>Anionic Surfactant</strong></td>
<td>0.5 - 5.0</td>
</tr>
<tr>
<td><strong>Nonionic Surfactant</strong></td>
<td>0.5 - 5.0</td>
</tr>
<tr>
<td><strong>Chelating Agents</strong></td>
<td>0.2 - 5.0</td>
</tr>
</tbody>
</table>
Example 2

**Laundry Detergent Powder**

<table>
<thead>
<tr>
<th>Component</th>
<th>% by weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Soda Ash</td>
<td>1 - 40</td>
</tr>
<tr>
<td>Sodium Tripolyphosphate</td>
<td>1 - 20</td>
</tr>
<tr>
<td>Anti-Redposition Agents</td>
<td>0 - 2</td>
</tr>
<tr>
<td>Sodium Metasilicate</td>
<td>1 - 10</td>
</tr>
<tr>
<td>Fabric Brightening Agents</td>
<td>0.1 - 2.0</td>
</tr>
<tr>
<td>Terpenes</td>
<td>0.5 - 20</td>
</tr>
<tr>
<td>Fragrances</td>
<td>0.1 - 2.0</td>
</tr>
<tr>
<td>Nonionic Surfactants</td>
<td>0.5 - 5.0</td>
</tr>
<tr>
<td>Anionic Surfactants</td>
<td>0.5 - 5.0</td>
</tr>
<tr>
<td>Amphoteric Surfactants</td>
<td>0.5 - 5.0</td>
</tr>
<tr>
<td>Sodium Perborate or Percarbonate (each as a monohydrate or a tetrahydrate)</td>
<td>8 - 60</td>
</tr>
<tr>
<td>Sodium Hydroxide</td>
<td>1 - 10.0</td>
</tr>
<tr>
<td>Chelating Agents</td>
<td>0.2 - 5.0</td>
</tr>
</tbody>
</table>

The terpenes used in this invention can be selected from a group consisting of: d-limonine, l-limonine, dipentene, α-pinene, β-pinene, and combinations thereof.

Since other modifications and changes varied to fit particular operating requirements and environments will be apparent to those skilled in the art, the invention is not considered limited to the example chosen for purposes of disclosure, and covers all changes and modifications which do not constitute departures from the true spirit and scope of this invention.
Having thus described the invention, what is desired to be protected by Letters Patent is presented in the subsequently appended claims.

What is claimed is:
1. A cleaning composition in the form of a dry powder having a source of hydrogen peroxide and at least one terpene in combination.

2. The cleaning composition in accordance with claim 1, having a pH exceeding 9.0.

3. The cleaning composition in accordance with claim 1, wherein the at least one terpene comprises d-limonene.

4. The cleaning composition in accordance with claim 1, wherein the hydrogen peroxide source comprises sodium perborate tetrahydrate.

5. The cleaning composition in accordance with claim 1, wherein the hydrogen peroxide source comprises sodium perborate monohydrate.

6. The cleaning composition in accordance with claim 1, wherein the hydrogen peroxide source comprises an encapsulated form of sodium perborate.

7. The cleaning composition in accordance with claim 1, wherein the hydrogen peroxide source comprises sodium percarbonate monohydrate.

8. The cleaning composition in accordance with claim 1, wherein the hydrogen peroxide source comprises sodium percarbonate tetrahydrate.

9. The cleaning composition in accordance with claim 1, wherein the hydrogen peroxide source comprises an encapsulated form of sodium percarbonate.
10. The cleaning composition in accordance with claim 1, wherein the terpene is selected from a group of terpenes consisting of: d-limonene, l-limonene, dipentene, -pinene, pinene, and combinations thereof.

11. The cleaning composition in accordance with claim 1, wherein the hydrogen peroxide source includes sodium persulfate encapsulated within said dry powder.

12. A cleaning composition in the form of a dry powder having in combination, a peroxide source and at least one terpene, said combination having a pH exceeding 9.0.

13. The cleaning composition in accordance with claim 12, wherein the cleaning composition comprises a laundry cleaning formulation.

14. The cleaning composition in accordance with claim 12, wherein the terpene comprises d-limonene.

15. The cleaning composition in accordance with claim 12, wherein the hydrogen peroxide source comprises sodium perborate tetrahydrate.

16. The cleaning composition in accordance with claim 12, wherein the hydrogen peroxide source comprises sodium perborate monohydrate.

17. The cleaning composition in accordance with claim 12, wherein the hydrogen peroxide source comprises an encapsulated form of sodium perborate.
18. The cleaning composition in accordance with claim 12, wherein the hydrogen peroxide source comprises sodium percarbonate monohydrate.

19. The cleaning composition in accordance with claim 12, wherein the hydrogen peroxide source comprises sodium percarbonate tetrahydrate.

20. The cleaning composition in accordance with claim 12, wherein the hydrogen peroxide source comprises an encapsulated form of sodium percarbonate.

21. The cleaning composition in accordance with claim 9, wherein the terpene is selected from a group of terpenes consisting of: d-limonene, l-limonene, dipentene, -pinene, -pinene, and combinations thereof.

22. A cleaning composition in dry powder form comprising a hydrogen peroxide source, and a hydrophobic solvent or surfactant in combination, and wherein said cleaning composition has a pH exceeding 9.0.

23. The cleaning composition in accordance with claim 22, wherein the cleaning composition comprises a laundry cleaning formulation.

24. The cleaning composition in accordance with claim 22, wherein the hydrophobic solvent comprises a terpene.

25. The cleaning composition in accordance with claim 24, wherein the terpene comprises d-limonene.
26. The cleaning composition in accordance with claim 22, wherein the hydrogen peroxide source comprises sodium perborate tetrahydrate.

27. The cleaning composition in accordance with claim 22, wherein the hydrogen peroxide source comprises sodium perborate monohydrate.

28. The cleaning composition in accordance with claim 22, wherein the hydrogen peroxide source comprises an encapsulated form of sodium perborate.

29. The cleaning composition in accordance with claim 22, wherein the hydrogen peroxide source comprises sodium percarbonate monohydrate.

30. The cleaning composition in accordance with claim 22, wherein the hydrogen peroxide source comprises sodium percarbonate tetrahydrate.

31. The cleaning composition in accordance with claim 22, wherein the hydrogen peroxide source comprises an encapsulated form of sodium percarbonate.

32. The cleaning composition in accordance with claim 22, wherein the terpene is selected from a group of terpenes consisting of: d-limonene, l-limonene, dipentene, -pinene, -pinene, and combinations thereof.
33. A cleaning composition comprising in weight percentage:

<table>
<thead>
<tr>
<th>Ingredient</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Soda Ash</td>
<td>10 - 70</td>
</tr>
<tr>
<td>Sodium Perborate or Sodium Percarbonate</td>
<td>8 - 60</td>
</tr>
<tr>
<td>Terpene</td>
<td>0.5 - 20</td>
</tr>
</tbody>
</table>

34. A powdered detergent composition comprising in weight percentage:

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<table>
<thead>
<tr>
<th>Ingredient</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Soda Ash</td>
<td>1 - 40</td>
</tr>
<tr>
<td>Water Softening Agent</td>
<td>1 - 20</td>
</tr>
<tr>
<td>Anti-Redeposition Agent</td>
<td>0 - 2</td>
</tr>
<tr>
<td>Terpene</td>
<td>0.5 - 20</td>
</tr>
<tr>
<td>Sodium Perborate or Percarbonate</td>
<td>8 - 60</td>
</tr>
<tr>
<td>Nonionic Surfactant</td>
<td>0.5 - 5.0</td>
</tr>
<tr>
<td>Anionic Surfactant</td>
<td>0.5 - 5.0</td>
</tr>
</tbody>
</table>
```