

A METHOD TO PREPARE BIODEGRADABLE CLEANING COMPOSITION

TECHNICAL FIELD

The present disclosure relates to a method of preparing a cleaning composition, and more particularly to a method of preparing biodegradable cleaning solution.

5 BACKGROUND OF THE INVENTION

Detergents are used as cleaning agents worldwide. Their usage in such large quantities lead to a lot of waste further leading to the environmental pollution.

In this regard, many studies have been conducted over the last three decades encompassing treatment, alternatives to non-biodegradable detergents, and their environmental impact. It has been
10 found that although certain detergents may not be directly toxic, when their concentrations are high in soil, they can act as agents to release toxic pollutants such as polychlorinated biphenyls (PCBs). Further, detergents can pass into wastewater treatment plants and hamper their performance. Detergents are an essential part of human life and are used for different hygienic purposes. Laundry detergent may smell like morning dew but comprises of some very strong chemicals to get rid of the
15 stains and dirt. People experience adverse skin reactions to the ingredients present in standard detergents on a regular basis. Laundry detergents can trigger a condition called contact dermatitis, which results in a red, itchy rash that may be widespread or confined to specific areas like the armpits and groin. Allergies or sensitivities to laundry detergent can develop the first time a person is exposed or after repeated exposures. In a report by NationalEczema.org, 1 in 10 individuals will develop
20 eczema during their lifetime and prevalence peaking in childhood. Furthermore, SLS/SLES is a known skin irritant that is commonly used as a main surfactant in home detergents.

The detergents available in the prior arts does not support the absence of SLES/SLS, formaldehyde, phosphates, EDTA, parabens, phthalates, and CDE/betaine in the formulation. Therefore, there exists a need for a method to prepare biodegradable detergents, which can act as a replacement for
25 the non-biodegradable standard detergents that cause environmental and health issues.

SUMMARY OF THE INVENTION

In one aspect of the present invention, a method (100) to prepare a biodegradable cleaning solution is provided. The method (100) comprises admixing a thickener in a range of 0.1 to 0.7%, a humectant in a range of 2 to 10%, a dispersant polymer in a range of 2 to 5 %, a surfactant in a range of 5 % to
30 30 %, and a preservative in a range of 0.1 to 3% according to a required volume to obtain a solution, at step (102). Adding a pH adjuster in the range of 0.1 to 2% to the solution obtained at step (102) to

adjust the pH in the range of 4 to 6 at step (104) and obtaining the biodegradable cleaning solution, at step (108).

In yet another aspect of the invention, the thickener in the biodegradable cleaning solution is selected from a group comprising, carboxyalkyl celluloses, xanthan gum, guar gum, starch, or a combination thereof.

In another aspect of the invention, the humectant in the biodegradable cleaning solution is selected from a group comprising glycerol, propylene glycol, aloe vera extract, hyaluronic acid, honey, lactic acid, cucumber extract, oat extract, coconut extract, rambutan extract, mangosteen extract, ginger extract, lemongrass extract, panthenol or a combination thereof.

In yet another aspect of the invention, the dispersant polymer in the biodegradable cleaning solution is selected from a group comprising acrylic acid derivatives.

In another aspect of the invention, the pH adjuster in the method to prepare biodegradable cleaning solution is selected from a group comprising citric acid, potassium citrate, sodium citrate or a combination thereof.

In yet another aspect of the invention, the surfactant in the method to prepare biodegradable cleaning solution is selected from a group comprising non-ionic alkyl polyglucosides, anionic sulphonated methyl esters, or a combination thereof.

In yet another aspect of the invention, the preservative in the method to prepare a biodegradable cleaning solution is selected from a group comprising citric acid, ascorbic acid, sodium sorbate, potassium sorbate, calcium sorbate or a combination thereof.

In another aspect of the invention, the biodegradable cleaning solution is used as a disinfectant, a liquid detergent, a household cleaning liquid, a dishwashing liquid, a surface cleaner, a multipurpose cleaning liquid, a detergent pod, or a combination thereof.

In yet another aspect of the invention, all the components comprising the biodegradable cleaning solution are biodegradable, food grade, and/or cosmetic grade.

In another aspect of the invention, the prepared biodegradable cleaning solution excludes parabens, phthalates, phosphates, and sodium laureth sulphate.

In another aspect of the present invention, a method (200) to prepare a biodegradable powder mixture is provided.

In another aspect of the present invention, a method for preparing a biodegradable powder mixture (200) comprising admixing (202) a surfactant in a range of 3 to 18%, an oxidizing agent in a range

of 10 to 20%, a dispersant agent in a range of 1 to 5%, and a bleach activator in a range of 0.5% to 2% according to a required mass to obtain a solution, adding (204) a pH adjuster in a range of 3 to 8% to the solution obtained at step (202) to adjust a pH in a range of 10 to 12, lyophilizing (206) the pH adjusted solution and obtaining (208) the biodegradable powder mixture is provided.

5 BRIEF DESCRIPTION OF DRAWINGS

The drawing/s mentioned herein disclose exemplary embodiments of the claimed disclosure. Other objects, features, and advantages of the present disclosure will be apparent from the following description when read with reference to the accompanying drawing.

Figure 1 illustrates a flowchart that depicts a method (100) to prepare a biodegradable cleaning solution, according to an embodiment herein provided as an example; and

Figure 2 illustrates a flowchart that depicts a method (200) to prepare a biodegradable powder mixture, according to an embodiment herein provided as an example; and

Figure 3 illustrates a graphical comparison between the spectral analysis of a sodium lauryl sulphate standard and the biodegradable cleaning solution obtained from method (100), according to an embodiment herein provided as an example; and

Figure 4 illustrates the effect on skin by a standard dishwashing liquid (A) and the biodegradable cleaning solution (B) used as a dishwashing liquid, according to an embodiment herein provided as an example. To facilitate understanding, like reference numerals have been used, where possible to designate like elements common to the figures.

20 DETAILED DESCRIPTION OF THE INVENTION

This section is intended to provide explanation and description of various possible embodiments of the present invention. The embodiments used herein, and the various features and advantageous details thereof are explained more fully with reference to non-limiting embodiments illustrated in the accompanying drawing/s and detailed in the following description. The examples used herein are intended only to facilitate understanding of ways in which the embodiments may be practiced and to enable the person skilled in the art to practice the embodiments used herein. Also, the examples/embodiments described herein should not be construed as limiting the scope of the embodiments herein.

As mentioned above, there is a need to develop a cleaning composition or a cleaning solution that is non-toxic, eco-friendly, biodegradable, and does not cause skin problems and irritability.

The present method (100) overcomes those limitations by providing a biodegradable cleaning composition or a cleaning solution that can be used in multiple spheres of human life, does not cause skin irritability or health conditions is eco-friendly and does not contain any chemicals that include sodium laureth sulphate (SLS also known as SLES), parabens, phosphates, and phthalates.

- 5 In an embodiment herein, the present disclosure provides a method (100) to prepare a biodegradable cleaning solution. The method (100) involves:

admixing (102) a thickener in a range of 0.1 to 0.7%, a humectant in a range of 2 to 10%, a dispersant polymer in a range of 2 to 5 %, a surfactant in a range of 5% to 30 %, and a preservative in a range of 0.1 to 3% according to a required volume to obtain a solution,

- 10 adding (104) a pH adjuster in the range of 0.1 to 2% to the solution obtained at step (102) to adjust the pH in the range of 4 to 6 and,

obtaining (108) the biodegradable cleaning solution.

- 15 In another embodiment, the thickener in the method (100) to obtain a biodegradable cleaning solution is selected from a group comprising carboxyalkyl celluloses, guar gum, xanthan gum, starch, or a combination thereof.

In another embodiment, the humectant in the method (100) to obtain a biodegradable cleaning solution is selected from a group comprising glycerol, propylene glycol, aloe vera extract, hyaluronic acid, honey, lactic acid, cucumber extract, oat extract, coconut extract, rambutan extract, mangosteen extract, ginger extract, lemongrass extract, panthenol or a combination thereof.

- 20 In another embodiment, the dispersant polymer in the method to obtain a biodegradable cleaning solution is selected from a group comprising acrylic acid derivatives.

In another embodiment, the pH adjuster in the method to obtain a biodegradable cleaning solution is selected from a group comprising citric acid, potassium citrate, sodium citrate or a combination thereof.

- 25 In another embodiment, surfactant in the method to obtain a biodegradable cleaning solution is selected from a group comprising non-ionic alkyl polyglucosides, anionic sulphonated methyl esters or a combination thereof.

- 30 In another embodiment, preservative in the method (100) to obtain the biodegradable cleaning solution is selected from a group comprising citric acid, ascorbic acid, sodium sorbate, potassium sorbate, calcium sorbate or a combination thereof.

In yet another embodiment, the biodegradable cleaning solution obtained from the method (100) is used as a disinfectant, a liquid detergent, a dishwashing liquid, a surface cleaner, a multipurpose cleaning liquid, a household cleaning liquid, a detergent pod, or a combination thereof.

5 In another embodiment, all the components comprising the biodegradable cleaning solution obtained from the method are biodegradable, food grade, and /or cosmetic grade.

In yet another embodiment, the biodegradable cleaning solution obtained from the method excludes parabens, phthalates, phosphates, and sodium laureth sulphate.

In yet another embodiment, the biodegradable cleaning composition or biodegradable cleaning solution is up to 95% biodegradable in 28 days.

10 In one embodiment of the invention, a method (200) for preparing a powder mixture or a biodegradable powder mixture is provided. Said method (200) comprises, admixing (202) a surfactant in a range of 3 to 18%, an oxidizing agent in a range of 10 to 20%, a dispersant agent in a range of 1 to 5%, and a bleach activator in a range of 0.5% to 2% according to a required mass to obtain a solution, adding (204) a pH adjuster in a range of 3 to 8% to the solution obtained at step
15 (202) to adjust a pH in a range of 10 to 12, lyophilizing (206) the pH adjusted solution and obtaining (208) the biodegradable powder mixture.

In another embodiment, the dispersant agent in the method (200) to obtain a biodegradable cleaning mixture is selected from a group comprising acrylic acid derivatives.

20 In another embodiment, the pH adjuster in the method (200) to obtain a biodegradable cleaning mixture is selected from a group comprising citric acid, potassium citrate, sodium citrate or a combination thereof.

In another embodiment, oxidizing agents in the method (200) are selected from a group comprising sodium percarbonate, hydrogen peroxide, enzymes, or a combination thereof.

25 In another embodiment, bleach activator in the method (200) are selected from a group comprising decanoyloxybenzoic acid, TAED, or a combination thereof.

In another embodiment, surfactant in the method (200) to obtain a biodegradable cleaning mixture is selected from a group comprising non-ionic alkyl polyglucosides, anionic sulphonated methyl esters or a combination thereof.

30 In another embodiment, all the components comprising the biodegradable cleaning mixture obtained from the method (200) are biodegradable, food grade, and /or cosmetic grade.

In yet another embodiment, the biodegradable cleaning mixture obtained from the method (200) excludes parabens, phthalates, phosphates, and sodium laureth sulphate.

In yet another embodiment, the present invention provides a biodegradable cleaning composition selected from the group consisting of solution, a powder mixture, a gel composition, a solid block composition, a tablet composition, an aerosol composition, a liquid detergent, a dishwashing liquid, a surface cleaner, a multipurpose cleaning liquid, a household cleaning liquid, a detergent pod. In another embodiment, said biodegradable cleaning composition of the present invention is for use as spray, for use as a surface sterilizer, or for use in wet wipes for non-living objects.

EXAMPLES

Example 1: The biodegradable detergent was prepared using the components as below:

Component	Chemical	Dosage
Thickener	carboxyalkyl celluloses, starch, guar gum, xanthan gum and combinations thereof	0.1 to 0.7%
Humectant	Glycerol, propylene glycol and combinations thereof	2% to 10%
Dispersant Polymer	Acrylic acid derivatives	2% to 5%
pH adjuster	Citric acid, potassium citrate, sodium citrate and combinations thereof	0.1% to 2%
Surfactants	Non-ionic alkyl polyglucosides, anionic sulphonated methyl esters and combinations thereof	5% to 30%
Preservative	Citric acid, ascorbic acid, sodium sorbate, potassium sorbate, calcium sorbate or a combination thereof.	0.1% to 3%
Solvent	Filler/Carrier such as water	49.3% to 90.7%

The detergent was prepared by admixing a 0.3 % of thickener, 3 % of a humectant, 3.5 % dispersant polymer, and 12 % of surfactant and 0.3% of preservative in 1000 ml volume to obtain a solution. The same was followed by adding a pH adjuster to adjust the pH in the range of 4 to 6 to obtain the biodegradable cleaning solution.

Example 2: The biodegradability test OECD 301 D (closed bottle) carried out for the biodegradable cleaning solution and the results thereof, according to an exemplary embodiment herein:

Formula for calculating Ready Biodegradability (%) = (BOD of sample / COD of sample) x 100

{standard parameters- Sample is considered to be biodegradable if it achieves ≤ 60 % in 28 days}

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Table 2:

TEST PARAMETER		UNIT	METHOD USED	RESULTS
Biodegradability	Day 0	%	OECD 301D: Closed Bottle	-
	Day 4			47.8
	Day 8			54.6
	Day 12			61.7
	Day 16			71.4
	Day 20			80.7
	Day 24			86.4
	Day 28			95.5

Results- The prepared detergent was 95.5% biodegradable in 28 days, hence eco-friendly in nature.

Example 3: In an example provided, a spectral analysis was conducted to compare a standard sodium lauryl sulphate with the biodegradable cleaning solution. The result of said spectral analysis conducted is shown in FIG.2 of the drawings wherein it has been observed that the prepared detergent achieved only 31.69% similarity with Sodium Laureth Sulfate standard, thereby confirming that the prepared sample detergent of the present invention does not contain SLES.

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Compared with	% Matching
Sodium Laureth Sulfate	31.69

This testing was done using MS1079:1987 method; using Hyamine solution to titrate and determine SLES content.

Example 4: High pressure liquid chromatography (HPLC) and OF063 method and results thereof to test for the absence of parabens, phosphates, and phthalates from the biological cleaning solution, according to an exemplary embodiment herein.

Test Description	Method	LOR	Unit	Result
Miscellaneous Organics				
Methyl paraben	HPLC	1	mg/kg	ND
Propyl paraben	HPLC	1	mg/kg	ND
Ethyl paraben	HPLC	1	mg/kg	ND
Butyl paraben	HPLC	1	mg/kg	ND
Iso-Butylparaben	HPLC	1	mg/kg	ND
Additives				
Phosphate	OF069.AOA C996.3	0.0001	%	0.0012
Phthalate Esters				
Bis(2-ethylhexyl)phthalate (DEHP)	OF063	1	mg/kg	ND
Di-iso-decylphthalate (DIDP)	OF063	10	mg/kg	ND
Di-iso-nonylphthalate (DINP)	OF063	10	mg/kg	ND
Di-n-octylphthalate (DNOP)	OF063	1	mg/kg	ND
Di-n-butyl phthalate (DBP)	OF063	1	mg/kg	ND
Butyl benzyl phthalate (BBP)	OF063	1	mg/kg	ND

- 5 Results: Presence of parabens and phthalates were found to be lower than Limit of Reporting (LOR) thus was considered as Not Detected (ND), therefore concluded to be absent from the prepared detergent. Only traces of phosphate were detected, signifying that no additional phosphates were present in the prepared detergent sample.

10 While the disclosure has been presented with respect to certain specific embodiments, it will be appreciated that many modifications and changes may be made by those skilled in the art without departing from the spirit and scope of the disclosure. It is intended, therefore, by the appended claims to cover all such modifications and changes as fall within the true spirit and scope of the disclosure.

CLAIMS

1. A method (100) to prepare a biodegradable cleaning solution, the method (100) comprising:
 - a) admixing (102) a thickener in a range of 0.1 to 0.7%, a humectant in a range of 2 to 10 %, a dispersant polymer in a range of 2 to 5 %, a surfactant in a range of 5% to 30 %, and a preservative in a range of 0.1 to 3% according to a required volume to obtain a solution;
 - b) adding (104) a pH adjuster in the range of 0.1 to 2% to the solution obtained at step (102) to adjust the pH in the range of 4 to 6; and
 - c) obtaining (108) the biodegradable cleaning solution.
2. The method (100) as claimed in claim 1, wherein the thickener is selected from a group comprising carboxyalkyl celluloses, starch, guar gum, xanthan gum or a combination thereof.
3. The method (100) as claimed in claim 1, wherein the humectant is selected from a group comprising glycerol, propylene glycol, aloe vera extract, hyaluronic acid, honey, lactic acid, cucumber extract, oat extract, coconut extract, rambutan extract, mangosteen extract, ginger extract, lemongrass extract, panthenol or a combination thereof.
4. The method (100) as claimed in claim 1, wherein the dispersant polymer is selected from a group comprising acrylic acid derivatives.
5. The method (100) as claimed in claim 1, wherein the pH adjuster is selected from a group comprising citric acid, potassium citrate, sodium citrate or a combination thereof.
6. The method (100) as claimed in claim 1, wherein the surfactant is selected from a group comprising non-ionic alkyl polyglucosides, anionic sulphonated methyl esters or a combination thereof.
7. The method (100) as claimed in claim 1, wherein the preservative is selected from a group comprising citric acid, ascorbic acid, sodium sorbate, potassium sorbate, calcium sorbate or a combination thereof.
8. The method (100) as claimed in claim 1, wherein the biodegradable cleaning solution is used as a disinfectant, a liquid detergent, a dishwashing liquid, a surface cleaner, a multipurpose cleaning liquid, a detergent pod, a household cleaning liquid, or a combination thereof.
9. The method (100) as claimed in claim 1, wherein all components are biodegradable, food grade, and /or cosmetic grade.

10. The method (100) as claimed in claim 1, wherein the biodegradable cleaning solution excludes parabens, phthalates, phosphates, and sodium laureth sulphate.

11. A method (200) to prepare a biodegradable powder mixture, the method (200) comprising:

- 5 a) admixing (202) a surfactant in a range of 3 to 18%, an oxidizing agent in a range of 10 to 20%, a dispersant agent in a range of 1 to 5%, and a bleach activator in a range of 0.5% to 2% according to a required mass to obtain a solution;
- b) adding (204) a pH adjuster in a range of 3 to 8% to the solution obtained at step (202) to adjust a pH in a range of 10 to 12;
- c) lyophilizing (206) the pH adjusted solution; and
- 10 d) obtaining (208) a lyophilized biodegradable powder.