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(54) **Title**: A METHOD OF USING 14C MEASUREMENTS TO DETERMINE THE PERCENT NATURAL OF CLEANING COMPOSITIONS

(57) **Abstract**: The present invention relates to a method for measuring the percentage natural of a cleaning composition using radiocarbon dating data. The percentage natural of a cleaning composition is defined as the amount of material that comes from non-petroleum based or derived products. By using radiocarbon data for the entire composition or its individual components one can determine the percentage of materials which are from non-petroleum based or derived products, and calculate the percent Renewable Carbon Index (RCI). The percent RCI can be used to calculate the percent natural of the cleaning composition as defined by the methods of the present invention.

A METHOD OF USING ^{14}C MEASUREMENTS TO DETERMINE THE PERCENT NATURAL OF CLEANING COMPOSITIONS

BY INVENTORS: Sarah Coulter, Gregory van Buskirk, Sumi Cate, Kenneth Vieira, Rebecca Brauch, and David Cole.

BACKGROUND OF THE INVENTION

Field of the Invention

[001] The present invention relates generally to a method of quantifying renewable vs. non-renewable sources of carbon in cleaning compositions to define"percent natural" using carbon dating techniques. The present invention teaches a method of determining the percent natural of a cleaning composition by measuring the amount of carbon from petroleum based or derived products using a radiocarbon (^{14}C) analysis and determining the amount of biorenewable, plant based carbon in the cleaning composition.

Description of the Related Art

[002] In recent years, more and more products are being sold which claim to be "green", "environmentally friendly", "natural", "organic", "sustainable", etc. One of the biggest problems with many of these claims on products is that they are not measurable and/or certified by a regulatory organization that is providing a standardized criteria to determine if these products that claim to be "natural" really are "natural". Unfortunately, without any consistent standard for measuring the nautralness of a product consumers are becoming confused about which products really are "natural" and which ones are merely claiming to be "natural". This phenomenon has been dubbed by some environmental advocates as "greenwashing".

[003] In December 2007, environmental marketing firm TerraChoice released a study called "The Six Sins of Greenwashing™" which asserted that over 99% of 1,018 common consumer products randomly surveyed in the study were guilty of greenwashing. A total of 1,753 environmental claims made, with some products having more than one, and out of the 1,018 studied only one was found not guilty of making a false or misleading green marketing claim.

[004] In the study, the six sins of greenwashing are: (1) Sin of the Hidden Trade-Off: e.g. "Energy-efficient" electronics that contain hazardous materials. 998 products and 57% of all environmental claims committed this Sin; (2) Sin of No Proof: e.g. Shampoos claiming to be "certified organic," but with no verifiable certification. 454 products and 26% of environmental claims committed this Sin; (3) Sin of Vagueness: e.g. Products claiming to be 100% natural when many naturally-occurring substances are hazardous, like arsenic and formaldehyde. This type of claim was seen in 196 products or 11% of environmental claims. (4) Sin of Irrelevance: e.g. Products claiming to be CFC-free, even though CFCs were banned 20 years ago. This type of claim was seen in 78 products and 4% of environmental claims; (5) Sin of Fibbing: e.g. Products falsely claiming to be certified by an internationally recognized environmental standard like EcoLogo, Energy Star or Green Seal. This type of claim was found in 10 products or less than 1% of environmental claims; (6) Sin of Lesser of Two Evils: e.g. Organic cigarettes or "environmentally friendly" pesticides. This type of claim occurred in 17 products or 1% of environmental claims.

[005] Although there are some regulatory agencies, like the EPA and FDA, which provide some regulations and standards for environmentally hazardous substances and food and drugs respectively, there is not a similar agency which covers cleaning products specifically. In addition, none of these agencies have developed clear guidelines for the terms "natural", "green", "environmentally friendly" or the like. There are some organizations, like Green Seal and the Natural Products Association, which provide lists of approved natural components and standards for components based on standardized test methods which measure, toxicity, biodegradability and other factors for demining the naturalness and environmental impact of a given product. They do not provide guidance on issues like, use of "ecohybrids" or "hybrid surfactants" that are comprised of both petroleum and plant based chemtries which is contributes to the ongoing problem of"Green Washing". While these organizations which provide natural seals are helpful, they have a complex criteria based on test methods and ingredient lists and they do not provide a standard simple method and criteria to determine the natural percentage of a given consumer product.

[006] U.S. Pat. Nos. 6,973,362 and 7,096,084 to Long *et al.* teach a method for evaluating chemical components based on their function in the product. The methods taught by Long require first that you identify the function of a given raw material in a product and then apply a set of predetermined criteria based on the function of the raw material to determine the raw materials designated environmental class rating from 1-3 and then it is given an environmental grade. The problem with this method is that it requires an individual, burdensome analysis of each component of a composition to arrive at a final value for the composition as a whole. In addition, it requires that the individual components be analyzed by their function and one or more components in a composition may have multiple functions. Furthermore, this method requires knowledge of all the components, their percentages in the formulation and their functions in a given formulation which would make testing products off the shelf impossible or impractical because that information is not readily available. The end result is that although this method provides a standardized method for measuring the environmental impact of a given chemical formulation it too burdensome and requires too much information about the components and their functions to make it practical for use in testing a wide range of compositions which are available on store shelves.

[007] WO. International Publication Nos. WO2007099294, WO2009024743, and WO2009024747 assigned to Reckitt Benckiser Inc., teach compositions for toilet cleaning and hard surface cleaning which are "environmentally acceptable" but, the application does not clearly define what it means by "environmentally acceptable". The publications merely teach cleaning compositions which do not have high levels of volatile organic componds "VOCs" and exclude certain acids, solvents, chelating agents and thickeners. So while this application teaches certain compositions which may be "environmentally acceptable" it does not establish any criteria or test methods which could be used to determine if other compositions meet this criteria other than those compositions which may have the same exact ingredients taught in the application.

[008] Similarly, U.S. Patent Nos. 5,990,065 and 6.069,122 assigned to Procter & Gamble teach compositions for dishwashing detergents which contain natural surfactants and solvents but, they do not teach a method or criteria of determining

[009] To address the ongoing problem of "greenwashing" and environmental claims on cleaning compositions without any standardized testing or criteria, there is a need for a method determining the naturalness of a cleaning composition which uses established, clear criteria which is not burdensome and can be used on a wide range of commercially available products. The inventive methodology for determining the percent natural of a cleaning composition provides clear, measurable and reproducible criteria which can be defined and replicated for a wide variety of products. The inventive method does not suffer from the problems of the prior art because it does not require specific information about ingredients, percentages and/or the function of those ingredients in the formulation to determine the natural percentage of the composition. It is therefore an object of the present invention to provide a method of determining the natural percentage of a composition that overcomes the disadvantages and shortcomings associated with prior art examples.

SUMMARY OF THE INVENTION

[0010] In accordance with the above objects and those that will be mentioned and will become apparent below, one aspect of the present invention comprises a method for measuring the natural percentage of a cleaning composition comprising the following steps: a. obtaining a sample of a cleaning composition; b. preparing the sample for radiocarbon analysis; c. performing a radiocarbon analysis of the sample and generating a count for radiocarbon in the sample; d. optionally, correcting the count for radiocarbon by accounting for isotopic fractionation and obtaining a corrected radiocarbon count; and e. using the corrected radiocarbon count to calculate the percentage Renewable Carbon Index (RCI).

[0011] In accordance with the above objects and those that will be mentioned and will become apparent below, another aspect of the present invention comprises a method for measuring the natural percentage of a cleaning composition comprising the following steps: a. determining the components and the percentages of the

[0012] In accordance with the above objects and those that will be mentioned and will become apparent below, another further aspect of the present invention comprises a various methods for radiocarbon dating including but not limited to: accelerator mass spectrometry (AMS), isotope ratio mass spectrometry (IRMS), methods using a liquid scintillation counter (LSC), performing measurements using benzene synthesis, and using a carbon dioxide cocktail method which measures carbon dioxide absorption. A further aspect of the invention employs the step of obtaining radiocarbon dating information about individual components of a cleaning composition and then using the information about all the individual components to calculate the RCI for the entire cleaning composition.

[0013] Further features and advantages of the present invention will become apparent to those of ordinary skill in the art in view of the detailed description of preferred embodiments below, when considered together with the attached claims.

DETAILED DESCRIPTION OF THE INVENTION

[0014] Before describing the present invention in detail, it is to be understood that this invention is not limited to particularly exemplified systems or process parameters that may, of course, vary. It is also to be understood that the terminology used herein is for the purpose of describing particular embodiments of the invention only, and is not intended to limit the scope of the invention in any manner.

[0015] All publications, patents and patent applications cited herein, whether *supra* or *infra*, are hereby incorporated by reference in their entirety to the same extent as if each individual publication, patent or patent application was specifically and individually indicated to be incorporated by reference.

[0016] It must be noted that, as used in this specification and the appended claims, the singular forms "a," "an" and "the" include plural referents unless the content clearly

[0017] Unless defined otherwise, all technical and scientific terms used herein have the same meaning as commonly understood by one of ordinary skill in the art to which the invention pertains. Although a number of methods and materials similar or equivalent to those described herein can be used in the practice of the present invention, the preferred materials and methods are described herein.

[0018] In the application, effective amounts are generally those amounts listed as the ranges or levels of ingredients in the descriptions, which follow hereto. Unless otherwise stated, amounts listed in percentage ("percent") are in weight percent (based on 100% active) of the cleaning composition alone, not accounting for the substrate weight. Each of the noted cleaner composition components and substrates is discussed in detail below.

[0019] As used herein, the term "substrate" is intended to include any material that is used to clean an article or a surface. Examples of cleaning substrates include, but are not limited to nonwovens, sponges, films and similar materials, which can be attached to a cleaning implement, such as a toilet cleaning device. The substrate material may be a "natural substrate" which can be measured using radiocarbon dating techniques to show that the substrate is comprised of at least 90%, more preferably 95% or 100% natural fibers and/or components. As used herein, "disposable" is used in its ordinary sense to mean an article that is disposed or discarded after a limited number of usage events, preferably less than 25, more preferably less than about 10, and most preferably less than about 2 entire usage events.

[0020] As used herein, "wiping" refers to any shearing action that the substrate undergoes while in contact with a target surface. This includes hand or body motion, substrate-implement motion over a surface, or any perturbation of the substrate via energy sources such as ultrasound, mechanical vibration, electromagnetism, and so forth.

[0021] As used herein, the terms "nonwoven" or "nonwoven web" means a web having a structure of individual fibers or threads which are interlaid, but not in an

[0022] As used herein, the term "polymer" generally includes, but is not limited to, homopolymers, copolymers, such as for example, block, graft, random and alternating copolymers, terpolymers, etc. and blends and modifications thereof. Furthermore, unless otherwise specifically limited, the term "polymer" shall include all possible geometrical configurations of the molecule. These configurations include, but are not limited to isotactic, syndiotactic and random symmetries.

[0023] The term "sponge", as used herein, is meant to mean an elastic, porous material, including, but not limited to, compressed sponges, cellulosic sponges, reconstituted cellulosic sponges, cellulosic materials, foams from high internal phase emulsions, such as those disclosed in U.S. Pat. No. 6,525,106, polyethylene, polypropylene, polyvinyl alcohol, polyurethane, polyether, and polyester sponges, foams and nonwoven materials, and mixtures thereof.

[0024] The term "cleaning composition", as used herein, is meant to mean and include a cleaning formulation having at least one surfactant.

[0025] The term “surfactant”, as used herein, is meant to mean and include a substance or compound that reduces surface tension when dissolved in water or water solutions, or that reduces interfacial tension between two liquids, or between a liquid and a solid. The term “surfactant” thus includes anionic, nonionic, zwiterrionic and/or amphoteric agents.

[0026] The term "comprising", which is synonymous with "including," "containing," or "characterized by," is inclusive or open-ended and does not exclude additional, unrecited elements or method steps. See MPEP 2111.03. See, e.g., *Mars Inc. v. H.J. Heinz Co.*, 377 F.3d 1369, 1376, 71 USPQ2d 1837, 1843 (Fed. Cir. 2004) ("like the term 'comprising,' the terms 'containing' and 'mixture' are open-ended.").*Invitrogen Corp. v. Biocrest Mfg., L.P.*, 327 F.3d 1364, 1368, 66 USPQ2d 1631, 1634 (Fed. Cir. 2003) ("The transition 'comprising' in a method claim indicates that the claim is open-ended and allows for additional steps."); *Genentech, Inc. v. Chiron Corp.*, 112 F.3d

[0027] The term "consisting essentially of" as used herein, limits the scope of a claim to the specified materials or steps "and those that do not materially affect the basic and novel characteristic(s)" of the claimed invention. *In re Herz*, 537 F.2d 549, 551-52, 190 USPQ 461, 463 (CCPA 1976) (emphasis in original). See MPEP 2111. The term "consisting essentially of" as used herein, limits the scope of a claim to the specified materials or steps "and those that do not materially affect the basic and novel characteristic(s)" of the claimed invention. *In re Herz*, 537 F.2d 549, 551-52, 190 USPQ 461, 463 (CCPA 1976) (emphasis in original). See MPEP 2111.03 For the purposes of searching for and applying prior art under 35 U.S.C. 102 and 103, absent a clear indication in the specification or claims of what the basic and novel characteristics actually are, "consisting essentially of" will be construed as equivalent to "comprising." See, e.g., *PPG*, 156 F.3d at 1355, 48 USPQ2d at 1355. See MPEP 2111.03

[0028] The term "natural" as used herein is meant to mean at least 90%, and preferably at least 95%, of the components of the product are derived from plant, animal and mineral based materials. In a "natural" product, less than 10% of the product components are petrochemical based or derived materials, and preferably less than 5% of the product components are petrochemical-based or derived. Petrochemicals are chemical products which are made from raw materials of petroleum. Also, the "natural" product is biodegradable and at least 90% of the components are sourced from renewable resources. Additionally, the "natural" product is minimally toxic to humans and has a LD50>5000 mg/kg. The "natural" product does not contain of any of the following: non-plant based ethoxylated

[0029] The term "ecofriendly" as used herein is meant to mean at least 99% of the components of the product are derived from plant, animal and mineral based materials. In an "ecofriendly" product, less than 1% of the product components are petrochemical based or derived materials. Also, the "ecofriendly" product is biodegradable and at least 99% of the components are sourced from renewable resources. Also, the "ecofriendly" product is biodegradable. Additionally, the "ecofriendly" product is minimally toxic to humans and has a LD50>5000 mg/kg. The "natural" product does not contain of any of the following: non-plant based ethoxylated surfactants, linear alkylbenzene sulfonates ("LAS"), ether sulfates surfactants or nonylphenol ethoxylate (NPE).

[0030] The term "renewable resources" as used herein is meant to mean a natural resource which is replenished by natural processes at a rate which is greater than or equal to the rate of consumption by humans. Plant-based and animal-based ingredients are considered materials that are renewable resources.

[0031] The term "sustainable" as used herein refers to product or components which are made from renewable resources which mean that the source of the materials grows back quickly and can be harvested with minimal harm to the environment.

[0032] The terms "biodegradable" and "compostable" as used herein is meant to mean microbial degradation of carbon containing materials. Biodegradable materials include those materials which biodegrade when composted under typical compost conditions. Compostable materials will degrade under typical household or municipal compost conditions. Compost conditions may vary, but typical compost conditions usually require: shredded or small pieces of organic wastes, a good location which is monitored for the right temperature and right amount of sunlight and wind, nitrogen to accelerate the decomposition process unless there is sufficient nitrogen in the composting waste materials, air and water in the correct amounts. Compostable materials require typical composting conditions to properly degrade. Compostable

[0033] The "biodegradable" or "compostable" material must be tested under a recognized protocol and with tested methods of established regulatory bodies such as: EPA, EPA- TSCA, OECD, MITI or other similar or equivalent organizations in the US or internationally. According to the present invention, materials which are biodegradable or biodegradable under typical compost conditions are at least 95% natural and biodegradable when composted. Suitable non-limiting examples of test methods for biodegradation include: OECD methods in the 301-305 series. Generally, all "biodegradable" material must meet the following limitations:

removal of dissolved organic carbon >70%;
biological oxygen demand (BOD) >60%;
% of BOD of theoretical oxygen demand >60%;
% CO2 evolution of theoretical >60%.

Overview of Radiocarbon Analyses

[0034] Radiocarbon dating and analysis is a commonly used process to date carbon-based artifacts and remains within the field of archeology. More recently, radiocarbon dating has been used for testing a variety of different products including but not limited to: personal care products, wipes, lubicrants plastics, cleaning products, gardening products, etc. In an article, entitled "Determining the Modern Carbon Content of Biobased Products Using Radiocarbon Analysis", by Glenn A. Norton and Steven L. Devlin, from Iowa State University, published by Bioresoruce Technology 97 (2006) 2084-2090, the article in it entirely is herein incorporated by reference. Although this article describes a process for using radiocarbon analyses for determining the amount of modern carbon content in a given product, it does not link this measurement to criteria for determining the percent natural or the percent Renewable Carbon Index (RCI) of a cleaning composition, as described by the present invention.

[0035] The article on determining modern carbon content describes the process of radiocarbon dating for the determination of biobased content in a formulation.

[0036] Using the ^{14}C analysis and calculation one can determine the amount of carbon in a material from fossil carbon, which is coal, oil or petroleum-based carbon. By measuring the amount of radioactive carbon in a sample the amount of modern carbon or biobased carbon can be determined. The Renewable Carbon Index (RCI) is a measure of the percent of modern or biobased carbon in a composition. Renewable carbon is appropriately defined as Carbon derived from recently living plant or animal organisms. The Renewable Carbon Index (RCI) only refers to the element, carbon, in the molecule or compound. Therefore, it is an index of the ratio of new, modern, biobased carbon to "old", typically petrochemical-based carbon. RCI does not refer to any other elements (H,N,O,S, etc.) that may be present in a compound. One complication in the calculation of %RCI is that inorganic carbon, such as that from the carbonates, would likely be measured as "old" carbon, even though we would define it as being from a "natural" mineral source. However, laboratories do have ways to deal with this complication experimentally and can account for mineral based carbon. .Materials with 100% modern carbon or biobased carbon have no fossil carbon or petroleum based carbon and is considered carbon from renewable resources.

[0037] The radioactive carbon dating analysis maybe performed using ASTM 6866-05, which is therein incorporated by reference. The ASTM 6866-05 method describes

Renewable Carbon Index

[0038] The process of assigning an environmental rating is well documented in the patent literature, as discussed in the background of the invention in the discussion of U.S. Pat. Nos. 6,973,362 and 7,096,084. However, the method of calculating the "percent natural" based on a calculation of Renewable Carbon Index (RCI) has not previously been disclosed by the prior art. In addition, the definition of "natural" as having at least 90% by weight or more of the product containing non-petroleum based or derived contents. Under this definition of "natural", the non-petroleum based or derived carbon is the same as saying the amount of biorenewable, plant based carbon. The percent natural calculation, based on radioactive carbon dating measurements is simple and contributes to the commercial success of a cleaning composition product because it addresses a long felt unresolved need for cleaning products that have a high percent natural content that can be easily measured with a simple, reproducible method.

[0039] Potential raw material ingredients for "natural" cleaning products, according to the present invention, are evaluated based on percent "natural" calculations defined

[0040] RCI values are determined analytically through carbon dating processes. The carbon atom contains 12 electrons and 12 protons. The neutrons in a carbon molecule vary, leading to a typical distribution of ^{12}C, ^{13}C and ^{14}C species or isotopes. The distribution or ratio of isotopes can change over time. A living thing exchanges ^{14}C with its environment as long as it lives: plants consume atmospheric carbon dioxide through photosynthesis and animals ingest living plants so the ratio of ^{12}C to ^{14}C radioisotope remains constant throughout a species' lifetime. However after a species dies, it is no longer exchanging ^{14}C and the concentration of ^{14}C declines at a fixed rate. Over a long period of time (e.g. 60,000 years), the ratio of ^{12}C to ^{14}C is very different. By measuring the concentration of ^{12}C, ^{13}C and ^{14}C species or isotopes in a raw material, one can calculate how much "old" carbon there is (petrochemical-based carbon) compared with how much "new" carbon there is (plant-based carbon).

[0041] Carbon dating typically involves a liquid scintillation counter, although an accelerated mass spectrometer can also be used. Although actual carbon dating has been known to have some uncertainty, using an accelerated mass spectrometer the plant or animal based carbon content of a product can be determined with only 1 to

[0042] The RCI percentage for a cleaning composition may be determined by doing a radiocarbon analysis for the composition as a whole or by doing radiocarbon analysis for individual components of the composition and using those individual RCI numbers for components to calculate the overall RCI for the composition. After obtaining the radiocarbon data, the entire cleaning composition or raw material ingredients or components for natural cleaning products are evaluated based on percent "natural" calculations defined by RCI or Renewable Carbon Index. The percentage RCI is determined by measuring the counts from the byproducts of the radioactive decay of radiocarbon or by measuring the $^{14}C/^{12}C$ ratio and correcting the data for isotopic fractionation, if appropriate, and then comparing this data relative to that of an appropriate reference standard, likely one that is known to be 100% modern carbon.

Table I. Examples of Natural Cleaning Compositions

Ingredients in Cleaning Compositions	Natural Glass Cleaner	Natural All-Purpose Cleaner	Natural Dishwashing Liquid
Essential Oils	X	X	X
Corn-based Ethanol	X	X	X
Colorants/ Dyes	X	X	X
Soda Ash	X		
Glycerine	X	X	
Biodegradable preservatives		X	X
Coconut-based cleaning agent (nonionic surfactant: alkyl polyglucoside)	X	X	X
Coconut-based cleaning agent (anionic surfactant: sodium lauryl sulfate and cocodimethyl amine oxide)			X
Citric Acid			X
% Natural	99%±1	99%±1	99%±1

* the X in the boxes above shows that this ingredient is found the natural cleaning composition.

[0043] In Table I, these are illustrative examples, of types of natural cleaning compositions which would meet the % natural definition identified in this description. The sample formulations in Table I, which are presented which have a natural percentage of greater than 90%, preferably greater than 95% or greater than 99% in some examples. The % Natural figures in Table I were generated using information

[0044] In Tables II and III below, the % RCI data was generated using radiocarbon dating technology. The Renewable Carbon Index (RCI) only refers to the element, carbon, in the molecule or compound. Therefore, it is an index of the ratio of new, modern, biobased carbon to "old", typically petrochemical-based carbon. RCI does not refer to any other elements (H, N, O, S, etc.) that may be present in a compound. The radiocarbon dataing process also includes inorganic carbon, such as that from the carbonates, would likely be measured as "old" carbon, even though we would define it as being from a "natural" mineral source. However, this inconsistency in the % "old" carbon which is actually from a "natural" mineral source can be accounted for by laboratories doing the radiocarbon dating analysis to achieve an accurate % RCI. For the calculation of % natural, water is assumed to be 100% natural.

Table II- Comparative Data to Table I Using ^{14}C Measurements

Cleaning Composition	% RCI based on ^{14}C Measurements and Stable Isotope Data	% Natural based on ^{14}C Measurements and Stable Isotope Data (% for hydrated samples)
GreenWorks™ Natural Dishwashing Liquid	94% ± 3%	98 %* ± 3%
Kirkland Signature™ Liquid Dish Soap	61% ± 3%	90%* ± 3%

Table III. Comparative Data to Table II Using ^{14}C Measurements

Cleaning Composition	% RCI based on ^{14}C Measurements and Stable Isotope Data	% Natural based on ^{14}C Measurements and Stable Isotope Data (% for hydrated samples)
GreenWorks™ Natural Glass Cleaner	93% ± 3%	100 %* ± 3%
GreenWorks™ Natural All-Purpose Cleaner	91% ± 3%	100%* ± 3%

* This number was calculated to include the water content in the product as natural. It assumes that % RCI based on ^{14}C Measurements and Stable Isotope Data is also the % natural of the actives, meaning the non-water components, in the formula. The water content of Kirkland Dishwashing Liquid was determined by measuring the residue on evaporation and assumes that all material lost via evaporation during the measurement was water.

[0045] Both the % RCI data and the % natural data is shown in Tables II and III because the % RCI number shows the amount of renewable carbon or modern carbon in the actives of a formulation and the % natural corresponds to the finished product as it is sold. These two measure show that a product may have a high % natural but a much lower %RCI because the product contains a high percentage of water, which is considered to be 100% natural. For example a product with 90% water may be 90% natural even though all its ingredients are all petrochemical-based and come from non-renewable carbon. So one can see that even if the formulation has a high percentage of water the actives of the formulation will not show a high %RCI number if the formulation contains peterochemically-based or derived ingredients. In Table II, The GreenWorks™ Dishwashing Liquid has both a high %RCI and a high % Natural rating, while the Kirkland Signature™ Liquid Dish Soap has a much lower % RCI rating and a high % Natural. The data shows that the GreenWorks™ Dishwashing Liquid is achieving its high % RCI and high % Natural rating by having a percentage of modern carbon or renewable carbon. In contrast, the Kirkland Signature™ Liquid Dish Soap has a lower % RCI, about 61%, because there is a relatively high level of peterochemically based carbon, but it still has a relatively % Natural rating of about

Suitable Cleaning Compositions Containing at least 90% RCI

[0046] Suitable cleaning compositions which contain at least 90% RCI may comprise components selected from the following: alkyl polyglucoside surfactants, one or more additional surfactants selected from: anionic, cationic, ampholytic, amphoteric and zwitterionic surfactants and mixtures thereof, fatty acids, solvents, buffering and pH adjusting agents, organic acids and additional adjuncts, natural substrates and cleaning tools, as described in the sections below.

Alkylpolyglucosides

[0047] Suitable non-ionic low residue surfactants are the alkylpolysaccharides that are disclosed in U.S. Pat. No. 5,776,872 to Giret *et al.*; U.S. Pat. No. 5,883,059 to Furman *et al.*; U.S. Pat. No. 5,883,062 to Addison *et al.*; and U.S. Pat. No. 5,906,973 to Ouzounis *et al.* Suitable alkyl polyglucosides for use herein are also disclosed in U.S. Pat. No. 4,565,647 to Llenado describing alkylpolyglucosides having a hydrophobic group containing from about 6 to about 30 carbon atoms, or from about 10 to about 16 carbon atoms and polysaccharide, e.g. , a polyglycoside, hydrophilic group containing from about 1.3 to about 10, or from about 1.3 to about 3, or from about 1.3 to about 2.7 saccharide units. Optionally, there can be a polyalkyleneoxide chain joining the hydrophobic moiety and the polysaccharide moiety. A suitable alkyleneoxide is ethylene oxide. Typical hydrophobic groups include alkyl groups, either saturated or unsaturated, branched or unbranched containing from about 8 to about 18, or from about 10 to about 16, carbon atoms. Suitably, the alkyl group can contain up to about 3 hydroxy groups and/or the polyalkyleneoxide chain can contain up to about 10, or less than about 5, alkyleneoxide moieties. Suitable alkyl poly-saccharides are octyl, nonyldecyl, undecyldodecyl, tridecyl, tetradecyl, pentadecyl, hexadecyl, heptadecyl, and octadecyl, di-, tri-, tetra-, penta-, and hexaglucosides, galactosides, lactosides, glucoses, fructosides, fructoses and/or galactoses. Suitable mixtures include coconut alkyl, di-, tri-, tetra-, and pentaglucosides and tallow alkyl tetra-, penta-, and hexaglucosides.

[0048] Suitable alkylpolyglycosides (or alkylpolyglucosides) have the formula:

$$R^2\,O(C_nH_{2n}O)_t(\text{glucosyl})_x$$

wherein R^2 is selected from the group consisting of alkyl, alkylphenyl, hydroxyalkyl, hydroxyalkylphenyl, and mixtures thereof in which the alkyl groups contain from about 10 to about 18, preferably from about 12 to about 14, carbon atoms; n is about 2 or about 3, preferably about 2; t is from 0 to about 10, preferably 0; and x is from about 1.3 to about 10, preferably from about 1.3 to about 3, most preferably from about 1.3 to about 2.7. The glycosyl is preferably derived from glucose. To prepare these compounds, the alcohol or alkylpolyethoxy alcohol is formed first and then reacted with glucose, or a source of glucose, to form the glucoside (attachment at the 1-position). The additional glycosyl units can then be attached between their 1-position and the preceding glycosyl units 2-, 3-, 4-and/or 6-position, preferably predominantly the 2-position.

[0049] A group of alkyl glycoside surfactants suitable for use in the practice of this invention may be represented by Formula I below:

$$RO\text{-}(R^2\,O)_y\text{-}(G)_x\,Z_b \qquad \text{Formula I}$$

wherein R is a monovalent organic radical containing from about 6 to about 30 (preferably from about 8 to about 18) carbon atoms; R^2 is a divalent hydrocarbon radical containing from about 2 to about 4 carbon atoms; O is an oxygen atom; y is a number which has an average value from about 0 to about 1 and is preferably 0; G is a moiety derived from a reducing saccharide containing 5 or 6 carbon atoms; and x is a number having an average value from about 1 to 5 (preferably from 1.1 to 2); Z is O_2M^1, O_2CR^3, $O(CH_2)$, CO_2M^1, OSO_3M^1, or $O(CH_2)SO_3M^1$; R^3 is $(CH_2)CO_2M^1$ or $CH{=}CHCO_2M^1$; (with the proviso that Z can be O_2M^1 only if Z is in place of a primary hydroxyl group in which the primary hydroxyl-bearing carbon atom, - CH_2OH, is oxidized to form a - CO_2M^1 group); b is a number from 0 to 3x+1 preferably an average of from 0.5 to 2 per glycosal group; p is 1 to 10, M^1 is H^+ or an organic or inorganic cation, such as, for example, an alkali metal, ammonium, monoethanolamine, or calcium. As defined in Formula I, R is generally the residue of a fatty alcohol having from about 8 to 30 or 8 to 18 carbon atoms. Suitable

alkylglycosides include, for example, Glucopon® 215 (a C_8-C_{10} alkyl polyglucoside available from Cognis Corporation), APG 325® (a C_9-C_{11} alkyl polyglycoside available from Cognis Corporation), APG 625® (a C_{10}-C_{16} alkyl polyglycoside available from Cognis Corporation), Dow Triton® CG110 (a C_8-C_{10} alkyl polyglycoside available from Dow Chemical Company), AG6202® (a C_8 alkyl polyglycoside available from Akzo Nobel), AG6206® (a C_6 alkyl polyglycoside available from Akzo Nobel) and Alkadet 15® (a C_8-C_{10} alkyl polyglycoside available from Huntsman Corporation). A C8 to C10 alkylpoly-glucoside includes alkylpolyglucosides wherein the alkyl group is substantially C8 alkyl, substantially C10 alkyl, or a mixture of substantially C8 and C10 alkyl. The C8 to C10 alkylpolyglucoside contains substantially no C9 alkyl or C11 alkyl groups. Suitably, the alkyl polyglycoside is present in the liquid cleaning composition in an amount ranging from about 0.01 to about 5 weight percent, or 0.1 to 5.0 weight percent, or 0.1 to 4.0 weight percent, 0.1 to 3.0 weight percent, or 0.1 to 2.0 weight percent, 0.1 to 1.0 weight, or 0.1 to 0.5 weight percent.

Additional Surfactants

[0050] The cleaning composition may contain one or more additional surfactants selected from anionic, cationic, ampholytic, amphoteric and zwitterionic surfactants and mixtures thereof. A typical listing of anionic, ampholytic, and zwitterionic classes, and species of these surfactants, is given in U.S. Pat. No. 3,929,678 to Laughlin and Heuring. A list of suitable cationic surfactants is given in U.S. Pat. No. 4,259,217 to Murphy. Where present, anionic, ampholytic, amphotenic and zwitteronic surfactants are generally used in combination with one or more nonionic surfactants. The surfactants may be present at a level of from about 0% to 50%, or from about 0.001% to 10%, or from about 0.1% to 2% by weight, or are absent.

[0051] Suitable nonionic surfactants can be found in U.S. Pat. No. 3,929,678 to Laughlin *et al.* Essentially any alkoxylated nonionic surfactants from plant sources are suitable herein, for instance, ethoxylated and propoxylated nonionic surfactants. Alkoxylated surfactants can be selected from the classes of the nonionic condensates of alkyl phenols, nonionic ethoxylated alcohols, nonionic ethoxylated/propoxylated fatty alcohols, nonionic ethoxylate/propoxylate condensates with renewable propylene

Solvents

[0052] In one aspect of the invention the composition includes volatile solvents that are substantially soluble in water. In one embodiment, combinations of very volatile solvents and slightly volatile solvents are suitable. While not intended to be bound by theory, the very volatile solvents may volatilize off after application and not form multiple phases that can lead to enhanced filming and streaking. The less volatile

Builder/Buffer

[0053] The cleaning composition may include a builder or buffer, which increase the effectiveness of the surfactant. The builder or buffer can also function as a softener and/or a sequestering agent in the cleaning composition. A variety of builders or buffers can be used and they include, but are not limited to, phosphate-silicate compounds, zeolites, alkali metal, ammonium and substituted ammonium poly-acetates, trialkali salts of nitrilotriacetic acid, carboxylates, polycarboxylates, carbonates, bicarbonates, polyphosphates, aminopolycarboxylates, polyhydroxy-sulfonates, and starch derivatives.

[0054] Builders or buffers can also include polyacetates and polycarboxylates. The polyacetate and polycarboxylate compounds include, but are not limited to, sodium, potassium, lithium, ammonium, and substituted ammonium salts of ethylenediamine tetraacetic acid, ethylenediamine triacetic acid, ethylenediamine tetrapropionic acid, diethylenetriamine pentaacetic acid, nitrilotriacetic acid, oxydisuccinic acid, iminodisuccinic acid, mellitic acid, polyacrylic acid or polymethacrylic acid and copolymers, benzene polycarboxylic acids, gluconic acid, sulfamic acid, oxalic acid, phosphoric acid, phosphonic acid, organic phosphonic acids, acetic acid, and citric acid. These builders or buffers can also exist either partially or totally in the hydrogen ion form.

[0055] The builder agent can include sodium and/or potassium salts of EDTA and substituted ammonium salts. The substituted ammonium salts include, but are not

[0056] Buffering and pH adjusting agents, when used, include, but are not limited to, organic acids, mineral acids, alkali metal and alkaline earth salts of silicate, metasilicate, polysilicate, borate, hydroxide, carbonate, carbamate, ammonia, hydroxide. Preferred buffering agents for compositions of this invention are nitrogen-containing materials. Some examples are amino acids such as lysine or lower alcohol amines like tri-ethanolamine. Other suitable buffers include ammonium carbamate, citric acid, acetic acid. Mixtures of any of the above are also acceptable. Useful inorganic buffers/alkalinity sources include ammonia, the alkali metal carbonates and alkali metal phosphates, e.g., sodium carbonate, sodium polyphosphate. For additional buffers see WO 95/07971, which is incorporated herein by reference. Other preferred pH adjusting agents include sodium or potassium hydroxide.

[0057] When employed, the builder, buffer, or pH adjusting agent comprises at least about 0.001% and typically about 0.01-5%, or 0.1-1% or 0.1-0.5% by weight of the cleaning composition.

Glycerol

[0058] The cleaning compositions may optionally contain glycerol, or glycerin. The glycerol may be natural, for example from the saponification of fats in soap manufacture, or synthetic, for example by the oxidation and hydrolysis of allyl alcohol. The glycerol may be crude or highly purified. The glycerol can serve to compatibilize the alkyl polyglucoside, the ethanol and the fragrance (i.e., lemon oil or d-limonene). Proper compatibilization of these components in suitable ratios, such as demonstrated in the examples below, allow these limited components to perform as well as complex formulated conventional synthetic cleaning compositions. Glycerol is an effective way of solubilizing the fragrance at the lower surfactant levels without increasing filming or streaking. Suitably, the glycerol is present in the cleaning composition in an amount ranging from about 0.01 to about 2 weight percent, or 0.05

Organic Acid

[0059] The cleaning composition may optionally contain an organic acid. An organic acid is an organic compound with acidic compounds. The most common organic acids include but are not limited to, carboxylic acids and sulfonic acids. Organic acids are weak acids that usually do not completely dissociate in water.

[0060] In a preferred embodiment, one aspect of the invention is a 2-hydroxycarboxylic acid or mixture of 2-hydroxycarboxylic acids. Examples of 2-hydroxycarboxylic acids include, but are not limited to, tartaric acid, citric acid, malic acid, mandelic acid, oxalic acid, glycolic acid, and lactic acid. 2-Hydroxycarboxylic acids also include polymeric forms of 2-hydroxycarboxylic acid, such as polylactic acid. Since other organic builders are not substantially present, significant amounts of 2-hydroxy-carboxylic acids are required. Suitable compositions comprise 2-hydroxycarboxylic acids in concentrations of 0.01 to 50% by weight, or 0.01 to 20% by weight, or 0.01 to 10% by weight, or 0.01 to 5.0% by weight, or 0.01 to 4.0% by weight, or 0.01 to 3.0% by weight, or 0.01 to 2.0% by weight, or 0.01 to 1.0% by weight, or 0.01 to 0.5% by weight or 0.01 to 0.1% by weight, or 0.01 to 0.05% by weight, or 0.001 to 1.0% by weight.

Fatty Acids

[0061] The cleaning composition can optionally contain fatty acids. A fatty acid is a carboxylic acid that is often with a long unbranched aliphatic tail (chain), which is saturated or unsaturated. Fatty acids are aliphatic monocarboxylic acids, derived from, or contained in esterified form in an animal or vegetable fat, oil or wax. Natural fatty acids commonly have a chain of 4 to 28 carbons (usually unbranched and even numbered), which may be saturated or unsaturated. Saturated fatty acids do not contain any double bonds or other functional groups along the chain. The term "saturated" refers to hydrogen, in that all carbons (apart from the carboxylic acid [-COOH] group) contain as many hydrogens as possible. In contrast to saturated fatty

Additional adjuncts

[0062] The cleaning compositions optionally contain one or more of the following adjuncts: stain and soil repellants, lubricants, odor control agents, anti-foaming agent, perfumes, fragrances and fragrance release agents, and bleaching agents. In one embodiment of the invention, the composition is free of any fragrance or dyes. Other adjuncts include, but are not limited to, acids, electrolytes, dyes and/or colorants, solubilizing materials, stabilizers, thickeners, defoamers, hydrotropes, cloud point modifiers, preservatives, and other polymers. The solubilizing materials, when used, include, but are not limited to, hydrotropes (e.g. water soluble salts of low molecular weight organic acids such as the sodium and/or potassium salts of toluene, cumene, and xylene sulfonic acid). The acids, when used, include, but are not limited to, organic hydroxy acids, citric acids, keto acid, and the like. Electrolytes, when used, include, calcium, sodium and potassium chloride. Thickeners, when used, include, but are not limited to, polyacrylic acid, xanthan gum, calcium carbonate, aluminum oxide, alginates, guar gum, clays, methyl, ethyl, and/or propyl hydroxycelluloses. Defoamers, when used, include, but are not limited to, silicones, aminosilicones, silicone blends, and/or silicone/ hydrocarbon blends. Bleaching agents, when used, include, but are not limited to, peracids, hypohalite sources, hydrogen peroxide, and/or sources of hydrogen peroxide. An exemplary anti-foaming agent is an

[0063] Preservatives, when used, include, but are not limited to, mildewstat or bacteriostat, methyl, ethyl and propyl parabens, short chain organic acids (e.g. acetic, lactic and/or glycolic acids), bisguanidine compounds (e.g. Dantagard® and/or Glydant®) and/or short chain alcohols (e.g. ethanol and/or IPA). The mildewstat or bacteriostat includes, but is not limited to, mildewstats (including non-isothiazolone compounds) include Kathon GC®, a 5-chloro-2-methyl-4-isothiazolin-3-one, KATHON ICP®, a 2-methyl-4-isothiazolin-3-one, and a blend thereof, and KATHON 886®, a 5-chloro-2-methyl-4-isothiazolin-3-one, all available from Rohm and Haas Company; BRONOPOL®, a 2-bromo-2-nitropropane 1, 3 diol, from Boots Company Ltd., PROXEL CRL®, a propyl-p-hydroxybenzoate, from ICI PLC; NIPASOL M®, an o-phenyl-phenol, Na^+ salt, from Nipa Laboratories Ltd., DOWICIDE A®, a 1,2-Benzoisothiazolin-3-one, from Dow Chemical Co., and IRGASAN DP 200®, a 2,4,4'-trichloro-2-hydroxydiphenylether, from Ciba-Geigy A.G.

Water

[0064] When the composition is an aqueous composition, water can be, along with the solvent, a predominant ingredient. The water can be present at a level of less than 99.9%, or less than about 99%, or less than about 95%. The water can be tap water, soft water, or deionized water. Where the cleaning composition is concentrated or thickened or viscous solution, the water may be present in the composition at a concentration of less than about 85 wt.% or less than about 80 wt .% or less than about 75%.

pH

[0065] The composition of the cleaning composition of the present invention can have a range of pHs. In one embodiment, the pH of the cleaning composition has a pH of 10.0 or less, 9.0 or less, or 8.0 or less, or 7.0 or less, or 6.0 or less, or 5.0 or less or 4.0 or less. In another embodiment, the pH of the cleaning composition has a pH of

Substrate

[0066] The cleaning composition may be part of a cleaning substrate. A wide variety of materials can be used as the cleaning substrate. The substrate should have sufficient wet strength, abrasivity, loft and porosity. Examples of suitable substrates include, nonwoven substrates, wovens substrates, hydroentangled substrates, foams and sponges. Any of these substrates may be water-insoluble, water-dispersible, or water-soluble. In one embodiment, the wipe weight is between 1 and 300 gsm, 1 and 200 gsm, 1 and 100 gsm, 10 and 100 gsm, 25 and 75 gsm, 30 and 60 gsm and 50 and 60 gsm.

[0067] In one embodiment, the cleaning composition is loaded onto the substrate such that there is at least a 2:1 loading ratio of cleaning composition by weight to substrate material by weight. The loading ratio may be anywhere in the range of 2:1 to about 11:1, preferably about 3:1 to about 5:1. The absorbption capacity of the substrate is at least 5 g/g, or at least 8 g/g or at leat 10 g/g. The thickness of the nonwoven substrate material is about 0.1 to about 1.0 mm, or about 0.2 to about 0.8mm, 0.4 to about 0.6 mm. The substrate material may be patterned by a variety of different processes, including but not limited to, embossing, calendaring, tufting, crimping, and any other suitable processes to provide texture to the nonwoven substrate.

[0068] In one embodiment, the cleaning pad of the present invention comprises a nonwoven substrate or web. The substrate is composed of nonwoven fibers or paper. The term nonwoven is to be defined according to the commonly known definition provided by the "Nonwoven Fabrics Handbook" published by the Association of the Nonwoven Fabric Industry. A paper substrate is defined by EDANA (note 1 of ISO 9092-EN 29092) as a substrate comprising more than 50% by mass of its fibrous content is made up of fibers (excluding chemically digested vegetable fibers) with a length to diameter ratio of greater than 300, and more preferably also has density of less than 0.040 g/cm ^{3}. In one embodiment of the invention, the nonwoven substrate does not include woven fabric or cloth or sponge. In another embodiment of the

[0069] The substrate can be partially or fully permeable to water. The substrate can be flexible and the substrate can be resilient, meaning that once applied external pressure has been removed the substrate regains its original shape. In one embodiment of the invention the substrate has a machine direction tensile strength of at least 10 N/5cm, or at least 20 N/5cm, or at least 50 N/5cm. In this embodiment of the invention, the cross direction tensile strength is at least 5 N/5cm, or at least 7 N/5cm, or at least 10 N/5cm.

[0070] Methods of making nonwovens are well known in the art. Generally, these nonwovens can be made by air-laying, water-laying, meltblowing, coforming, spunbonding, or carding processes in which the fibers or filaments are first cut to desired lengths from long strands, passed into a water stream or an air stream, and then deposited onto a screen through which the fiber- laden air or water is passed. The air-laying process is described in U.S. Pat. Pub. No. 2003/0036741 to Abba *et al.* and U.S. Pat. Pub. No. 2003/0118825 to Melius *et al.* The resulting layer, regardless of its method of production or composition, is then subjected to at least one of several types of bonding operations to anchor the individual fibers together to form a self-sustaining substrate. In the present invention the nonwoven substrate can be prepared by a variety of processes including, but not limited to, air-entanglement, hydroentanglement, thermal bonding, and combinations of these processes.

[0071] Additionally, the first layer and the second layer, as well as additional layers, when present, can be bonded to one another in order to maintain the integrity of the article. The layers can be heat spot bonded together or using heat generated by ultrasonic sound waves. The bonding may be arranged such that geometric shapes and patterns, e.g. diamonds, circles, squares, etc. are created on the exterior surfaces of the layers and the resulting article. The layers may be hydroentagled together to form integrated layers or material.

[0072] The cleaning substrates can be provided dry, pre-moistened, or impregnated with cleaning composition, but dry-to-the-touch. In one aspect, dry cleaning substrates can be provided with dry or substantially dry cleaning or disinfecting

[0073] The substrate can include both natural and synthetic fibers. The substrate can also include water-soluble fibers or water-dispersible fibers, from polymers described herein. The substrate can be composed of suitable unmodified and/or modified naturally occurring fibers including cotton, Esparto grass, bagasse, hemp, flax, silk, wool, wood pulp, chemically modified wood pulp, jute, ethyl cellulose, and/or cellulose acetate. Various pulp fibers can be utilized including, but not limited to, thermomechanical pulp fibers, chemi-thermomechanical pulp fibers, chemi-mechanical pulp fibers, refiner mechanical pulp fibers, stone groundwood pulp fibers, peroxide mechanical pulp fibers and so forth. In one embodiment of the invention, the substrate comprises only natural modified an unmodified cellulose fibers. At least 95% of the fibers in the material are biodegrable under typical composting conditions; preferably 98% or 100% of the fibers are biodegrable under compost conditions. In one embodiment, the modified natural fibers are selected from the group consisting of: mercerized cotton, viscose rayon, cuprammonium rayon, lyocell rayon, fortisan

[0074] Suitable synthetic fibers can comprise fibers of one, or more, of polyvinyl chloride, polyvinyl fluoride, polytetrafluoroethylene, polyvinylidene chloride, polyacrylics such as ORLON®, polyvinyl acetate, Rayon®, polyethylvinyl acetate, non-soluble or soluble polyvinyl alcohol, polyolefins such as polyethylene (e.g., PULPEX®) and polypropylene, polyamides such as nylon, polyesters such as DACRON® or KODEL®, polyurethanes, polystyrenes, and the like, including fibers comprising polymers containing more than one monomer. In one embodiment of the invention the synthetic fibers are limited to less than 10% of the nonwoven material, or less than 5% of the nonwoven material, or less than 1% of the nonwoven material.

[0075] The cleaning substrate of this invention may be a multilayer laminate and may be formed by a number of different techniques including but not limited to using adhesive, needle punching, ultrasonic bonding, thermal calendaring and through-air bonding. Such a multilayer laminate may be an embodiment wherein some of the layers are spunbond and some meltblown such as a spunbond/meltblown/spunbond (SMS) laminate as disclosed in U.S. Pat. No. 4,041,203 to Brock *et al.* and U.S. Pat. No. 5,169,706 to Collier, *et al.*, each hereby incorporated by reference. The SMS laminate may be made by sequentially depositing onto a moving conveyor belt or forming wire first a spunbond web layer, then a meltblown web layer and last another spunbond layer and then bonding the laminate in a manner described above. Alternatively, the three web layers may be made individually, collected in rolls and combined in a separate bonding step.

[0076] The substrate may also contain superabsorbent materials. A wide variety of high absorbency materials (also known as superabsorbent materials) are known to

Cleaning Implement

[0077] In an embodiment of the invention, the cleaning composition may be used with a cleaning implement. In an embodiment of the invention, the cleaning implement comprises the tool assembly disclosed in Co-pending Application No. 10/678,033, entitled "Cleaning Tool with Gripping Assembly for a Disposable Scrubbing Head", filed Sept. 30, 2003. In another embodiment of the invention, the cleaning implement comprises the tool assembly disclosed in Co-pending Application No. 10/602,478, entitled "Cleaning Tool with Gripping Assembly for a Disposable Scrubbing Head", filed June 23, 2003. In another embodiment of the invention, the cleaning implement comprises the tool assembly disclosed in Co-pending Application No. 10/766,179, entitled "Interchangeable Tool Heads", filed January 27, 2004. In another embodiment of the invention, the cleaning implement comprises the tool assembly disclosed in Co-pending Application No. 10/817,606, entitled "Ergonomic Cleaning Pad", filed April 1, 2004. In another embodiment of the invention, the cleaning implement comprises the tool assembly disclosed in Co-pending Application No. 10/850,213, entitled "Locking, Segmented Cleaning Implement Handle", filed May 19, 2004.

Wipes Dispenser System

[0078] Suitable wipes dispenser systems include both individually packaged disinfectant wipes and bulk packaged one or more disinfectant wipes or other suitable disinfecting articles. The dispenser system suitably comprises a sealable container, which is substantially impervious to both liquid and/or gas. The term "container", refers to, but is not limited to, a packet containing one or more individual wipes and bulk dispensers, such as canisters, tubs and jars, which dispense one disinfectant wipe at a time, and further feature suitable means to reseal the bulk dispenser between uses to preserve the integrity of the disinfecting articles. One example is a cylindrical canister dispenser that hosts a roll of individual wipes, separated by perforations to permit the tearing off of individual wipes for use. Such dispenser is conveniently gripped by the user and held in position while the user removes a wipe. Suitable dispensers feature a resealable dispensing cap and orifice (See, e.g., Chong, U.S. Pat. No. 6,554,156, of common assignment and incorporated herein by reference thereto) that dispenses individual wipes from a roll and retains the next wipe in a ready-to-dispense position, yet allows sealing of the dispensing cap to close the container against the environment when not in use. A further example, within the scope of the present invention, is to package individual wipes in a non-linked manner, in a dispenser permitting their removal one at a time, as is the case with many wipe/dispenser combinations known in the art.

[0079] Wipe dispensers are convenient items that provide moistened sheets or wipes for a variety of uses. Typically, wipes are formulated for specific purposes that include infant wipes, personal care wipes, dishwashing wipes, hard surface treatment wipes, disinfectant wipes, cosmetic or sanitary wipes, hand wipes, wipes used in car cleaning, household or institutional cleaning or maintenance, computer cleaning and maintenance and any other area in which a flexible substrate having a useful liquid treatment composition has application.

Directions for use

[0080] In one embodiment, the directions include wiping the surface clean with the wipe and letting air dry. In one embodiment, the directions include wiping the surface, using enough wipes for the treated surface to remain visibly wet for 30

[0081] Without departing from the spirit and scope of this invention, one of ordinary skill can make various changes and modifications to the invention to adapt it to various usages and conditions. As such, these changes and modifications are properly, equitably, and intended to be, within the full range of equivalence of the following claims.

1. A method for measuring the natural percentage of a cleaning composition comprising the following steps:

obtaining a sample of a cleaning composition;

preparating the sample for radiocarbon analysis

performing a radiocarbon analysis of the sample and generating a count for radiocarbon in the sample;

optionally, correcting the count for radiocarbon by accounting for isotopic fractionation and obtaining a corrected radiocarbon count; and

using the corrected radiocarbon count to calculate the percentage Renewable Carbon Index (RCI).

2. The method of claim 1, wherein the radiocarbon analysis comprises performing measurements using accelerator mass spectrometry (AMS).

3. The method of claim 1, wherein the radiocarbon analysis comprises performing measurements using isotope ratio mass spectrometry (IRMS).

4. The method of claim 1, wherein the radiocarbon analysis comprises methods using a liquid scintillation counter (LSC).

5. The method of claim 4, wherein the method using a LSC comprises performing measurements using benzene synthesis.

6. The method of claim 4, wherein the method using a LSC comprises using a carbon dioxide cocktail method which measures carbon dioxide absorption.

7. The method of claim 1, wherein the calculation of the percentage RCI is performed by determining the amount of new carbon using the corrected radiocarbon count and dividing the new carbon count over the total carbon count.

8. The method of claim 1, wherein the percentage RCI is determined with an uncertainty of 1% to 2%.

9. The method of claim 1, wherein the percentage RCI is determined with an uncertainty of 0.1 to 0.5%.

10. The method of claim 1, wherein the percentage RCI is determined with an uncertainty of up to 3.0%.

11. A method for measuring the natural percentage of a cleaning composition comprising the following steps:

determining the components and the percentages of the components in a cleaning composition;

calculating the percentage Renewable Carbon Index (RCI) using radiocarbon data for each component of the cleaning composition;

using the percentage RCI for each component and the percentage of each component in the cleaning composition to calculate the overall percentage RCI for the entire cleaning composition.

12. The method of claim 11, wherein the percentage RCI is calculated using radiocarbon analysis.

13. The method of claim 12, wherein the percentage RCI is corrected by accounting for isotopic fractionation.

14. The method of claim 12, wherein the radiocarbon analysis comprises performing measurements using accelerator mass spectrometry (AMS).

15. The method of claim 12, wherein the radiocarbon analysis comprises performing measurements using isotope ratio mass spectrometry (IRMS).

16. The method of claim 12, wherein the radiocarbon analysis comprises methods using a liquid scintillation counter (LSC).

17. The method of claim 16, wherein the method using a LSC comprises performing measurements using benzene synthesis.

18. The method of claim 16, wherein the method using a LSC comprises using a carbon dioxide cocktail method which measures carbon dioxide absorption.

19. The method of claim 11, wherein the calculation of the percentage RCI is performed by determining the amount of new carbon using the corrected radiocarbon count and dividing the new carbon count over the total carbon count.

20. The method of claim 12, wherein the the percentage natural is calaculated by accounting for water in the formulation and assuing that the water is 100% natural.

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US 10/34251

A. CLASSIFICATION OF SUBJECT MATTER
IPC(8) - G01N 23/00 (2010.01)
USPC - 436/57, 804
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC: G01N 23/00 (2010.01)
USPC: 436/57, 804

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
PubWEST, Google Scholar
Search Terms: determine, calculate, measure, 14c, carbon 14, carbon date, renewable, carbon dioxide absorption, liquid scintillation counter, accelerator mass spectrometry, isotope ratio mass spectrometry, biobased, percent, plant, surfactant

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X --- Y	Noakes et al., 'A Comparison of Analytical Methods for the Certification of Biobased Products', LSC [online] 2005, pages 259-271, retrieved from the internet at URL <http://www.lsc-international.org/conf/pfiles/lsc2005_259.pdf>, pg 260, para 6; pg 261, para 2-3, pg 261, pg 262, para 1 to pg 263, para 1; pg 270, para 1; Table 1	1, 2, 4-10 ------- 3, 11-20
Y	Duncan et al., 'Metrics to Support Informed Decisionmaking for Consumers of Biobased Products' USDA, Agriculture Information Bulletin, No. 803; October 2008; pg 5, para 3	3, 15
Y	US 7,096,084 B2 (LONG et al.), 22 Aug. 2006 (22.08.2006), Tables I and II, col 9, ln 10-16	11-20
A	US 2007/0213247 A1 (FENYVESI et al.), 13 Sep. 2007 (13.09.2007), para [0030], [0043], [0047], [0052]-[0053]	1-20

☐ Further documents are listed in the continuation of Box C. ☐

* Special categories of cited documents:
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Date of the actual completion of the international search	Date of mailing of the international search report
21 Jun 2010 (21.06.2010)	09 JUL 2010

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