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(54) Title: A CONTROLLED RELEASE CLEANSING TABLET CONTAINING BIOLOGICAL ACTIVES

(57) Abstract: Solid controlled release compositions containing an alkalinity source, a sugar alcohol, and biological actives, including enzymes and/or spores are provided. The compositions provide alkalinity cleaning formulations suitable for cleaning fats, oils, grease and/or other organic waste, including in methods for dosing into a reservoir to generate a use solution from the controlled release composition to clean fats, oils, grease and/or other organic waste. The methods are particularly efficacious in cleaning reservoirs where waste water flows through and needs sustained cleanliness, including a sink, bowl, drain, disposal, tank, fluid line, pipe or combinations thereof, preferably an oil separation tank.



TITLE: A CONTROLLED RELEASE CLEANSING TABLET CONTAINING BIOLOGICAL ACTIVES

TECHNICAL FIELD

[0001] The disclosure relates to solid controlled release compositions containing an alkalinity source, a sugar alcohol, and biological actives, including enzymes and/or spores. The compositions provide alkalinity cleaning formulations suitable for cleaning fats, oils, grease and/or other organic waste, including in methods for dosing into a reservoir to generate a use solution from the controlled release composition to clean fats, oils, grease and/or other organic waste. The methods are suitable for use in cleaning various reservoirs where waste water flows through and needs sustained cleanliness, including a sink, bowl, drain, drain outlet, disposal, tank, toilet bowl, fluid line, pipe or combinations thereof, preferably an oil separation tank.

BACKGROUND

[0002] The background description provided herein gives context for the present disclosure. Work of the presently named inventors, as well as aspects of the description that may not otherwise qualify as prior art at the time of filing, are neither expressly nor impliedly admitted as prior art.

[0003] Sufficient cleaning performance has not been obtained by chemical methodologies alone for various hard to clean surfaces, including reservoirs for oil separation, grease traps, toilets, tanks, drains, pipes, and the like. Moreover, people do not want to manually clean these surfaces as they can become heavily soiled, have unpleasant odors, etc.

[0004] Meanwhile, consumers have a desire to employ biological methodologies for cleaning, for example, from a natural, eco-friendly, sustainability, etc. focus. However, biological solutions can be costly and methods of using these solutions often require an extended contact or treatment time to obtain visible cleaning performance. There is also a challenge in incorporating biological actives into solid compositions. This can be challenging, not only because the compatibility between biological actives and chemical components, but also due to challenges in pressing such actives into stable solids. The state of the art has proposed various complicated solutions, including multi-phased compositions and

other solutions to separate the biological actives within compositions. However, these present formulation and manufacturing challenges that can further increase the cost of products.

[0005] Thus, there exists a need in the art for providing controlled release compositions that can provide biological actives to impact desired cleaning efficacy.

[0006] Other objects, embodiments and advantages of this disclosure will be apparent to one skilled in the art in view of the following disclosure, the drawings, and the appended claims.

SUMMARY

[0007] The following objects, features, advantages, aspects, and/or embodiments, are not exhaustive and do not limit the overall disclosure. No single embodiment need provide each and every object, feature, or advantage. Any of the objects, features, advantages, aspects, and/or embodiments disclosed herein can be integrated with one another, either in full or in part.

[0008] It is a primary object, feature, and/or advantage of the present disclosure to improve on or overcome the deficiencies in the art.

[0009] It is a further object, feature, and/or advantage of the present disclosure to provide solid compositions for cleaning fats, oils, grease and/or other organic waste comprising: an alkali metal alkalinity source; a sugar alcohol and/or a saccharide; and from about 0.01 wt-% to about 4 wt-% of at least one biological active comprising an enzyme composition and/or a spore.

[0010] It is a further object, feature, and/or advantage of the present disclosure to provide solid compositions for cleaning fats, oils, grease and/or other organic waste comprising: from about 30 wt-% to about 60 wt-% of an alkali metal carbonate alkalinity source; from about 10 wt-% to about 30 wt-% of at least one saccharide or sugar alcohol; from about 0.01 wt-% to about 4 wt-% of an enzyme composition comprising a serine endo-peptidase, a cellulase, an AA9 polypeptide having cellulolytic enhancing activity, a hemicellulase, an esterase, an expansin, a laccase, a ligninolytic enzyme, a pectinase, a peroxidase, a protease, a swollenin, or a combination or mixture thereof; and optionally from about 0.1 wt-% to about 2 wt-% of a spore, wherein the solid composition is a dissolvable solid.

[0011] It is still yet a further object, feature, and/or advantage of the present disclosure to provide methods of cleaning fats, oils, grease and/or other organic waste comprising: (a) dosing either the solid cleaning compositions as described herein or a solid cleaning

composition that does not include a biological active, into a reservoir to generate a use solution comprising from about 1 ppm to about 500 ppm of the composition when contacted by water; and (b) cleaning the fats, oils, grease and other organic soils.

[0012] These and/or other objects, features, advantages, aspects, and/or embodiments will become apparent to those skilled in the art after reviewing the following brief and detailed descriptions of the drawings. Furthermore, the present disclosure encompasses aspects and/or embodiments not expressly disclosed but which can be understood from a reading of the present disclosure, including at least: (a) combinations of disclosed aspects and/or embodiments and/or (b) reasonable modifications not shown or described.

[0013] While multiple embodiments are disclosed, still other embodiments will become apparent to those skilled in the art from the following detailed description, which shows and describes illustrative embodiments. Accordingly, the drawings and detailed description are to be regarded as illustrative in nature and not restrictive.

DETAILED DESCRIPTION

[0014] The present disclosure is not to be limited to that described herein, which can vary and are understood by skilled artisans. No features shown or described are essential to permit basic operation of the present disclosure unless otherwise indicated. It has been surprisingly found that the solid controlled release compositions effectively clean fats, oils, grease and/or other organic waste over an extended period of time, such as for at least 12 hours or at least 24 hours.

[0015] It is further to be understood that all terminology used herein is for the purpose of describing particular embodiments only, and is not intended to be limiting in any manner or scope. For example, as used in this specification and the appended claims, the singular forms "a," "an" and "the" can include plural referents unless the content clearly indicates otherwise. Further, all units, prefixes, and symbols may be denoted in its SI accepted form.

[0016] Numeric ranges recited within the specification are inclusive of the numbers defining the range and include each integer within the defined range. Throughout this disclosure, various aspects of this disclosure are presented in a range format. It should be understood that the description in range format is merely for convenience and brevity and should not be construed as an inflexible limitation on the scope of the disclosure. Accordingly, the description of a range should be considered to have specifically disclosed all the possible sub-

ranges, fractions, and individual numerical values within that range. For example, description of a range such as from 1 to 6 should be considered to have specifically disclosed sub-ranges such as from 1 to 3, from 1 to 4, from 1 to 5, from 2 to 4, from 2 to 6, from 3 to 6 etc., as well as individual numbers within that range, for example, 1, 2, 3, 4, 5, and 6, and decimals and fractions, for example, 1.2, 3.8, 1½, and 4¾. This applies regardless of the breadth of the range.

[0017] As used herein, the term “and/or”, e.g., “X and/or Y” shall be understood to mean either “X and Y” or “X or Y” and shall be taken to provide explicit support for both meanings or for either meaning, e.g. A and/or B includes the options i) A, ii) B or iii) A and B.

[0018] It is to be appreciated that certain features that are, for clarity, described herein in the context of separate embodiments, may also be provided in combination in a single embodiment. Conversely, various features that are, for brevity, described in the context of a single embodiment, may also be provided separately or in any sub-combination.

[0019] The methods and compositions of the present disclosure may comprise, consist essentially of, or consist of the components and ingredients of the present disclosure as well as other ingredients described herein. As used herein, “consisting essentially of” means that the methods, systems, apparatuses and compositions may include additional steps, components or ingredients, but only if the additional steps, components or ingredients do not materially alter the basic and novel characteristics of the claimed methods, systems, apparatuses, and compositions.

[0020] Unless defined otherwise, all technical and scientific terms used above have the same meaning as commonly understood by one of ordinary skill in the art to which embodiments of the present disclosure pertain.

[0021] The terms “invention” or “present invention” are not intended to refer to any single embodiment of the particular invention but encompass all possible embodiments as described in the specification and the claims.

[0022] The term “about,” as used herein, refers to variation in the numerical quantity that can occur, for example, through typical measuring techniques and equipment, with respect to any quantifiable variable, including, but not limited to, concentration, mass, volume, time, molecular weight, temperature, pH, molar ratios, log count of bacteria or viruses, and the like. Further, given solid and liquid handling procedures used in the real world, there is certain inadvertent error and variation that is likely through differences in the manufacture, source,

or purity of the ingredients used to make the compositions or carry out the methods and the like. The term “about” also encompasses these variations. Whether or not modified by the term “about,” the claims include equivalents to the quantities.

[0023] The term "actives" or "percent actives" or "percent by weight actives" or "actives concentration" are used interchangeably herein and refers to the concentration of those ingredients involved in cleaning expressed as a percentage minus inert ingredients such as water or salts. It is also sometimes indicated by a percentage in parentheses, for example, “chemical (10%).”

[0024] An "antiredeposition agent" refers to a compound that helps keep soil suspended in water instead of redepositing onto the object being cleaned. Antiredeposition agents are useful in the present compositions, methods and systems to assist in reducing redepositing of the removed soil onto the surface being cleaned.

[0025] As used herein, the term “cleaning” refers to a method used to facilitate or aid in soil removal, bleaching, microbial population reduction, and any combination thereof. As used herein, the term “microorganism” refers to any noncellular or unicellular (including colonial) organism. Microorganisms include all prokaryotes. Microorganisms include bacteria (including cyanobacteria), spores, lichens, fungi, protozoa, virinos, viroids, viruses, phages, and some algae. As used herein, the term “microbe” is synonymous with microorganism.

[0026] The term “configured” describes structure capable of performing a task or adopting a particular configuration. The term “configured” can be used interchangeably with other similar phrases, such as constructed, arranged, adapted, manufactured, and the like.

[0027] Terms characterizing sequential order, a position, and/or an orientation are not limiting and are only referenced according to the views presented.

[0028] As used herein, the term “exemplary” refers to an example, an instance, or an illustration, and does not indicate a most preferred embodiment unless otherwise stated.

[0029] As used herein, the term "free" refers to compositions completely lacking the component or having such a small amount of the component that the component does not affect the performance of the composition. The component may be present as an impurity or as a contaminant and shall be less than 0.1 wt-%. In another embodiment, the amount of the component is less than 0.01 wt-%.

[0030] The term “generally” encompasses both “about” and “substantially.”

[0031] The term “hard surface” refers to a solid, substantially non-flexible surface such as a counter top, tile, floor, wall, panel, window, plumbing fixture, kitchen and bathroom surfaces, and the like. Hard surfaces are not limited by the material; for example, a hard surface can be glass, metal, tile, vinyl, linoleum, composite, wood, plastic, etc. Hard surfaces may include for example, various reservoir surfaces, including a sink, bowl, drain, drain outlet, disposal, tank, toilet bowl, fluid line, pipe, etc.

[0032] As used herein, the term “microorganism” refers to any noncellular or unicellular (including colonial) organism. Microorganisms include all prokaryotes. Microorganisms include bacteria (including cyanobacteria), spores, lichens, fungi, protozoa, virinos, viroids, viruses, phages, and some algae. As used herein, the term “microbe” is synonymous with microorganism.

[0033] As used herein the term "polymer" refers to a molecular complex comprised of a more than ten monomeric units and generally includes, but is not limited to, homopolymers, copolymers, such as for example, block, graft, random and alternating copolymers, terpolymers, and higher "x"mers, further including their analogs, derivatives, combinations, and blends thereof. Furthermore, unless otherwise specifically limited, the term "polymer" shall include all possible isomeric configurations of the molecule, including, but are not limited to isotactic, syndiotactic and random symmetries, and combinations thereof. Furthermore, unless otherwise specifically limited, the term "polymer" shall include all possible geometrical configurations of the molecule.

[0034] As used herein, the term “soil” or “stain” refers to any soil, including, but not limited to, non-polar oily and/or hydrophobic substances which may or may not contain particulate matter such as industrial soils, mineral clays, sand, natural mineral matter, carbon black, graphite, kaolin, environmental dust, and/or food based soils such as blood, proteinaceous soils, starchy soils, fatty soils, cellulosic soils, etc.

[0035] The “scope” of the present disclosure is defined by the appended claims, along with the full scope of equivalents to which such claims are entitled. The scope of the disclosure is further qualified as including any possible modification to any of the aspects and/or embodiments disclosed herein which would result in other embodiments, combinations, subcombinations, or the like that would be obvious to those skilled in the art.

[0036] The term “substantially” refers to a great or significant extent. “Substantially” can thus refer to a plurality, majority, and/or a supermajority of said quantifiable variable, given proper context.

[0037] As used herein, the term “substantially free” refers to compositions completely lacking the component or having such a small amount of the component that the component does not affect the performance of the composition. The component may be present as an impurity or as a contaminant and shall be less than 0.5 wt-%. In another embodiment, the amount of the component is less than 0.1 wt-%.

[0038] The term "weight percent," "wt-%," "percent by weight," "% by weight," and variations thereof, as used herein, refer to the concentration of a substance as the weight of that substance divided by the total weight of the composition and multiplied by 100. It is understood that, as used here, "percent," "%," and the like are intended to be synonymous with "weight percent," "wt-%," etc.

COMPOSITIONS

[0039] According to embodiments, the solid compositions comprise, consist of and/or consist essentially of a homogenous composition of an alkali metal alkalinity source, a sugar alcohol, and at least one biological active comprising an enzyme composition and/or a spore, and optionally additional functional ingredients. Exemplary solid controlled release compositions are shown in Table 1 in weight percentage. While the components may have a percent actives of 100%, it is noted that Table 1 does not recite the percent actives of the components, but rather, recites the total weight percentage of the raw materials (*i.e.* active concentration plus inert ingredients).

[0040] TABLE 1

Material	First Exemplary Range wt.-%	Second Exemplary Range wt.-%	Third Exemplary Range wt.-%
Alkali Metal Alkalinity source(s)	20-80	20-70	30-60
Sugar Alcohol	5-40	10-40	10-30
Biological Active(s)	0.01-15	0.1-10	0.1-6

Additional Functional Ingredients	0-80	0.1-70	1-50
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[0041] In some embodiments, the solid controlled release compositions are homogenous solid compositions. In further embodiments, the solid controlled release compositions are a single phase homogenous solid.

[0042] In an embodiment, the solid controlled release compositions do not include distinct or separate components thereof. The solid controlled release compositions are referred to as a single-part or a one-part system. This is beneficial and distinct from prior controlled release compositions which are controlled release as a result of encapsulation, coating or membranes, core-shell structures, distinct layers of components within the solid, separate dosing of components, such as in liquid formulations, or having distinct compartments for physical separation of components (*e.g.* sachets, pouches or the like) and must then be combined with a distinct composition or other composition to provide the desired activity at the controlled release rate.

[0043] The solid compositions are preferably pressed solids, *e.g.* pressed into a solid form. In some embodiments, the composition may be dispensed from the mixture by forming, pressing, casting, extruding, or other suitable means, whereupon the composition is pressed or hardens to a solid form. The structure of the composition may be further characterized according to its hardness, melting point, material distribution, crystal structure, and other like properties according to known methods in the art. Generally, a solid controlled release composition is substantially homogeneous with regard to the distribution of ingredients throughout its mass and is dimensionally stable. As referred to herein, dimensional stability refers to a change in dimension of the solid composition (such as from cracking and/or swelling) greater than 3% as measured in length, height and/or width (depending upon the method of solidification, shape of the solid detergent composition and/or formulation into any type of capsule or other component for dispensing) at the evaluated temperature and time conditions outlined herein and at ambient humidity of the evaluated atmosphere. The average growth numbers in length, height and/or width represent the change in dimension.

[0044] In embodiments, the solid controlled release compositions are designed to release a certain portion or amount of the solid composition over a desired period of time during use. In an exemplary embodiment, the solid controlled release compositions provide a consistent

concentration of the cleaning composition from about 1 ppm to about 500 ppm in a use solution (including all ranges therebetween). Accordingly, a skilled artisan will ascertain from the disclosure that the size of the solid controlled composition can be suited for the volume of a reservoir and/or type and extent of soils contained therein for cleaning to provide controlled release over a period of time, such as on a daily basis (or other increment of time).

[0045] In an embodiment, the solid controlled release compositions provide at least 10 hours, at least 12 hours, at least 15 hours, at least 20 hours, or at least 24 hours of controlled release of the cleaning composition. In an embodiment, the solid controlled release compositions provide at least 10 hours, at least 12 hours, at least 15 hours, at least 20 hours, or at least 24 hours of controlled release of the cleaning composition that is provided in a solid tablet or dosage form that is at least about 50 grams. As one skilled in the art will ascertain, the larger the solid composition is formulated (*e.g.* 50 grams, 100 grams, 250 grams, or larger) an increase in the amount of time the controlled release the solid composition can provided and is included within the scope of the compositions, methods and systems. Without being limited by a particular mechanism of action, in some embodiments about at least a 50 gram tablet size will provide controlled release of the cleaning composition for the desired amount of time.

Alkali Metal Alkalinity Source

[0046] The solid controlled release compositions comprises at least one alkali metal alkalinity source. The source of alkalinity can be any source of alkalinity that is compatible with the other components of the solid detergent composition and are provided in a composition having non-PPE (personal protective equipment) based on the pH of the composition. Exemplary sources of alkalinity include alkali metal carbonates, alkali metal percarbonates, alkali metal bicarbonates, alkali metal silicates, alkali metal metasilicates, alkali metal hydroxides, alkali metal salts, phosphates, amines, and mixtures thereof, preferably alkali metal carbonates and percarbonates, including sodium carbonate, sodium percarbonate, sodium metasilicate, or mixtures thereof.

[0047] In an aspect, wherein the primary or the sole alkalinity source is an alkali metal carbonate, including sodium carbonate or potassium carbonate, the compositions are referred to as "ash-based" compositions. In such preferred ash-based compositions it shall also be understood to optionally further include a secondary and/or tertiary alkalinity source, including for example, additional percarbonates, metasilicates, silicates, bicarbonates and/or sesquicarbonates.

[0048] In some embodiments, the alkalinity source is included in the composition at an amount of at least about 20 wt-% to about 80 wt-%, about 20 wt-% to about 75 wt-%, about 20 wt-% to about 70 wt-%, about 25 wt-% to about 70 wt-%, about 30 wt-% to about 70 wt-%, about 30 wt-% to about 65 wt-%, or about 30 wt-% to about 60 wt-%. In addition, without being limited according to the disclosure, all ranges recited are inclusive of the numbers defining the range and include each integer within the defined range.

[0049] In some embodiments, a primary alkalinity source, such as the alkali metal carbonate, is included in the composition at an amount of at least about 20 wt-% to about 70 wt-%, about 20 wt-% to about 60 wt-%, about 25 wt-% to about 60 wt-%, or about 30 wt-% to about 60 wt-%. In such embodiments, an optional secondary alkalinity source, such as the alkali metal percarbonate, is included in the composition at an amount of at least about 1 wt-% to about 40 wt-%, about 5 wt-% to about 40 wt-%, or about 10 wt-% to about 40 wt-%. Still further, in such embodiments, an optional tertiary alkalinity source, such as the alkali metal metasilicate, is included in the composition at an amount of at least about 0.01 wt-% to about 10 wt-%, about 0.1 wt-% to about 5 wt-%, or about 0.1 wt-% to about 1 wt-%. In addition, without being limited according to the disclosure, all ranges recited are inclusive of the numbers defining the range and include each integer within the defined range.

Sugar Alcohol and/or Saccharide

[0050] The solid controlled release compositions comprises at least one sugar alcohol and/or saccharide. Sugar alcohols can also be referred to as polyols, and can include solid sugar alcohols, including for example sorbitol, xylitol, maltitol, mannitol, erythritol, etc.

[0051] In some embodiments the solid controlled release compositions include a saccharide material. As referred to herein both saccharides and polysaccharides can be included in the solid compositions. In embodiments the compositions can optionally include saccharide materials, including for example carboxymethylcellulose (CMC), hydroxyethylcellulose (HEC), hydroxypropylcellulose (HPC), hydroxypropyl methylcellulose (HPMC), methylcellulose (MC), cellulose sulfate esters, cellulose acetate, cellulose triacetate, polysaccharides containing 3 or more saccharide units, wherein saccharides include, but are not limited to glucose, fructose, lactulose galactose, raffinose, trehalose, sucrose, maltose, turanose, cellobiose, raffinose, melezitose, maltriose, acarbose, stachyose, ribose, arabinose, xylose, lyxose, deoxyribose, psicose, sorbose, tagatose, allose, altrose, mannose, gulose, idose, talose, fucose, fuculose, rhamnose, sedohepulose, octulose, nonulose, erythrose, theose,

amylose, amylopectin, pectin, inulin, modified inulin, potato starch, modified potato starch, corn starch, modified corn starch, wheat starch, modified wheat starch, rice starch, modified rice starch, cellulose, modified cellulose, dextrin, dextran, maltodextrin, cyclodextrin, glycogen and oligiofructose, sodium carboxymethylcellulose, linear sulfonated alpha-(1,4)-linked D-glucose polymers, gamma-cyclodextrin, amylose, modified inulin, potato starch, modified potato starch, corn starch, modified corn starch, wheat starch, modified wheat starch, rice starch, and modified rice starch and the like.

[0052] In some embodiments, the sugar alcohol and/or saccharide is included in the composition at an amount of at least about 1 wt-% to about 40 wt-%, about 5 wt-% to about 40 wt-%, about 10 wt-% to about 40 wt-%, about 20 wt-% to about 40 wt-%, about 10 wt-% to about 35 wt-%, about 20 wt-% to about 35 wt-%, about 10 wt-% to about 30 wt-%, or about 20 wt-% to about 30 wt-%. In addition, without being limited according to the disclosure, all ranges recited are inclusive of the numbers defining the range and include each integer within the defined range.

Biological Actives

Enzymes

[0053] The solid controlled release compositions comprises at least one biological active. The biological actives comprise an enzyme composition and/or a spore.

[0054] The enzyme composition may comprise one or more enzymes comprising, consisting essentially of, or consisting of serine endo-peptidase, a peptidase, a cellulase, an AA9 polypeptide having cellulolytic enhancing activity, a hemicellulase, an esterase, an expansin, a laccase, a ligninolytic enzyme, a pectinase, a peroxidase, a protease, a swollenin, or a combination or mixture thereof. Preferably, the enzyme composition comprises a cellulase and/or a peptidase, such as a serine endo-peptidase. The cellulase is preferably one or more enzymes comprising, consisting essentially of, or consisting of an endoglucanase, a cellobiohydrolase, a beta-glucosidase, or a combination or mixture thereof. In another aspect, the hemicellulase is preferably one or more enzymes comprising, consisting essentially of, or consisting of an acetylmannan esterase, an acetylxylan esterase, an arabinanase, an arabinofuranosidase, a coumaric acid esterase, a feruloyl esterase, a galactosidase, a glucuronidase, a glucuronoyl esterase, a mannanase, a mannosidase, a xylanase, a xylosidase, or a combination or mixture thereof.

[0055] In an embodiment, the enzyme composition comprises a cellulolytic enzyme composition comprising one or more enzymes comprising, consisting essentially of, or consisting of a cellobiohydrolase, an endoglucanase, a beta glucosidase an AA9 polypeptide having cellulolytic enhancing activity, or a combination or mixture thereof. In a further embodiment, the enzyme composition comprises one or more cellulases and one or more hemicellulases.

[0056] One or more of the enzymes may be wild-type proteins, recombinant proteins, or a combination of wild-type proteins and recombinant proteins. For example, one or more enzymes may be native proteins of a cell, which is used as a host cell to express recombinantly the enzyme composition. The enzyme composition may also be a fermentation broth formulation or a cell composition. The host cell may be any filamentous fungal cell useful in the recombinant production of an enzyme or protein. In an embodiment the enzyme composition is derived from a fungal host cell. In an embodiment the fungal host cell is *Trichoderma reesei*. In one embodiment the enzyme composition is or comprises an expression product of *Trichoderma reesei*.

[0057] In one embodiment the enzyme composition is or comprises a cellulolytic enzyme composition derived from *Trichoderma reesei* comprised of *Trichoderma reesei* enzymes having cellulase activity and effective to degrade cellulose to, at least glucose. In one embodiment the enzyme composition has an endoglucanase, and a cellobiohydrolase. In another embodiment the enzyme composition has an endoglucanase, a cellobiohydrolase, and a beta-glucosidase. In a further embodiment the enzyme composition further comprises *A. niger* beta-glucosidase. In a still further embodiment, the enzyme composition has an endoglucanase, a cellobiohydrolase, a beta-glucosidase and an AA9 polypeptide having cellulolytic enhancing activity.

[0058] In another embodiment the enzyme composition is a cellulolytic enzyme composition comprising an AA9, a beta-glucosidase, a CBHI, and a CBHII. In a further embodiment the cellulolytic enzyme composition further comprises a xylanase and/or a xylosidase. In a further embodiment, the cellulolytic enzyme composition is a cellulolytic enzyme composition derived from *Trichoderma reesei* further comprising a *Penicillium sp. (emersonii)* AA9 (GH61) polypeptide having cellulolytic enhancing activity, an *Aspergillus fumigatus* beta-glucosidase variant, an *Aspergillus fumigatus* cellobiohydrolase I, and an *Aspergillus fumigatus* cellobiohydrolase II. In a still further embodiment, the cellulolytic

enzyme composition further comprises an *Aspergillus fumigatus* xylanase, and an *Aspergillus fumigatus* beta-xylosidase. For example, the enzyme composition is a composition described in WO 2013/028928.

[0059] In an embodiment the enzyme composition is or comprises a commercial enzyme preparation. Examples of commercial enzyme preparations suitable for use in the compositions include, but are not limited to, SAVINASE EVITY® 12T (Novozymes), CAREZYME® PREMIUM 5000T (Novozymes), ACCELLERASE® (Danisco US Inc.), ACCELLERASE® XY (Danisco US Inc.), ACCELLERASE® XC (Danisco US Inc.), ACCELLERASE® TRIO (Danisco US Inc.), ALTERNA FUEL 100P (Dyadic), ALTERNA FUEL 200P (Dyadic), CELLIC® CTec (Novozymes A/S), CELLIC® CTec2 (Novozymes A/S), CELLIC® Ctec3 (Novozymes A/S), CELLIC® HTec (Novozymes A/S), CELLIC® HTec2 (Novozymes A/S), CELLIC® HTec3 (Novozymes A/S), CELLUCLAST® (Novozymes A/S), CELLUCLAST CONCENTRATED BG® (Novozymes A/S), CELLUCLEAN CLASSIC 700T® (Novozymes A/S), CELLUZYME™ (Novozymes A/S), CEREFLO® (Novo Nordisk A/S), DEPOL™ 333P (Biocatalysts Limit, Wales, UK), DEPOL™ 740L (Biocatalysts Limit, Wales, UK), DEPOL™ 762P (Biocatalysts Limit, Wales, UK), DRAIN EASE FLOW™ (Novozymes A/S), ECOPULP® TX-200A (Roal Oy LLC), FIBREZYME® LBR (Dyadic International, Inc.), FIBREZYME® LDI (Dyadic International, Inc.), LAM IN EX® (Danisco US Inc.), HSP 6000 Xylanase (DSM), MULTI FECT® Xylanase (Danisco US Inc.), PULPZYME® HC (Novozymes A/S), ROHAMENT® 7069 W (AB Enzymes), SHEARZYME™ (Novozymes A/S), SPEZYME® CP (Danisco US Inc.), ULTRAFLO® (Novozymes A/S), VISCOSTAR™ 150L (Dyadic International, Inc.), or VISCOZYME® (Novozymes A/S).

[0060] In embodiments and without limiting the scope of the description of the biological agent, any combination or any single enzyme can be provided as an enzyme composition.

SPORES

[0061] The solid controlled release compositions comprises at least one biological active. The biological actives comprise an enzyme composition and/or a spore. Spores refer to microbial preparations that are spore forming, which may include additional ingredients for delivery of the spores, *e.g.* stabilizers, surfactants, etc. The spores are nonpathogenic and in preferred embodiments are Type 1 Class 1 non-pathogenic microorganisms (Centers for Disease Control classification, CDC, 1993). Spore forming microbial organisms can also be

referred to as bacteria that demonstrate sporulation. Beneficially, the nonpathogenic bacteria forming spores are able to multiply and dissolve the various soils, including grease, fat and various organic soils. The spore forming microbial preparations (*i.e.* spores) are able to form spores and survive in unfavorable conditions as they are resistant to environmental conditions, including for example, pH, temperature and nutrients, allowing them to survive in conditions that would normally destroy them. Thereafter the spores become active and viable in conditions favorable for their growth.

[0062] The spore forming microbial preparations can include, for example, lipase, amylase, and protease. In embodiments, the spore forming microbial preparations are enzyme producing. In the various embodiments, the spores produce natural enzymes that are able to consume or devour the various soils and wastes, *e.g.* converting them into harmless carbon dioxide and water.

[0063] In an embodiment the spores are or comprise a commercial spore preparation. Examples of commercial spore preparations suitable for use in the compositions include, but are not limited to, Deep Clean Multi Spore (Novozymes).

[0064] In some embodiments, the at least one biological active is included in the composition at an amount of at least about 0.01 wt-% to about 15 wt-%, about 0.01 wt-% to about 10 wt-%, about 0.1 wt-% to about 10 wt-%, about 0.1 wt-% to about 6 wt-%, about 0.1 wt-% to about 5 wt-%, or about 0.1 wt-% to about 4 wt-%. In addition, without being limited according to the disclosure, all ranges recited are inclusive of the numbers defining the range and include each integer within the defined range.

[0065] In some embodiments, more than one biological active is included in the composition, and the first biological active is included in the composition at an amount of at least about 0.01 wt-% to about 4 wt-%, about 0.1 wt-% to about 4 wt-%, or about 0.1 wt-% to about 2 wt-%, the second biological active is included in the composition at an amount of at least about 0.01 wt-% to about 4 wt-%, about 0.1 wt-% to about 4 wt-%, or about 0.1 wt-% to about 2 wt-%, and optionally the third biological active is included in the composition at an amount of at least about 0.01 wt-% to about 4 wt-%, about 0.1 wt-% to about 4 wt-%, or about 0.1 wt-% to about 2 wt-%. In exemplary embodiments, the first and second biological actives comprise an enzyme and the third biological active comprises a spore. In addition, without being limited according to the disclosure, all ranges recited are inclusive of the numbers defining the range and include each integer within the defined range.

Additional Functional Ingredients

[0066] The components of the solid controlled release composition can further be combined with various functional components suitable for uses disclosed herein. In some embodiments, the solid controlled release compositions including the alkalinity source, sugar alcohol, and biological active(s) make up a large amount, or even substantially all of the total weight of the compositions. For example, in some embodiments few or no additional functional ingredients are disposed therein.

[0067] In other embodiments, additional functional ingredients may be included in the solid controlled release compositions. The functional ingredients provide desired properties and functionalities to the compositions. For the purpose of this application, the term "functional ingredient" includes a material that when dispersed or dissolved in a use and/or concentrate solution, such as an aqueous solution, provides a beneficial property in a particular use. Some particular examples of functional materials are discussed in more detail below, although the particular materials discussed are given by way of example only, and that a broad variety of other functional ingredients may be used. For example, many of the functional materials discussed below relate to materials used in cleaning. However, other embodiments may include functional ingredients for use in other applications.

[0068] In embodiments, the solid controlled release compositions are phosphorus free.

[0069] In embodiments, the solid controlled release compositions are free of retarding agents to slow the dissolution properties of the solid composition.

[0070] In some embodiments, the solid controlled release compositions may include water conditioning polymers and/or chelating agents, stabilizing agents, metal protectants, defoaming agents, anti-redeposition agents, bleaching agents, solubility modifiers, dispersants, optical brighteners, stabilizing agents, corrosion inhibitors, additional enzymes, aesthetic enhancing agents, additional rheology and/or solubility modifiers or thickeners, hydrotropes or couplers, buffers, solvents, additional cleaning agents and the like.

[0071] These additional ingredients can be pre-formulated with the solid controlled release compositions or added to the use solution before, after, or substantially simultaneously with the addition of the solid controlled release compositions, preferably formulated into the single phase homogenous solid compositions. Additionally, the compositions can be used in conjunction with one or more conventional cleaning and/or degreasing agents.

[0072] According to embodiments of the disclosure, the various additional functional ingredients may be provided in a composition in the amount from about 0 wt-% and about 80 wt-%, from about 0 wt-% and about 75 wt-%, from about 0 wt-% and about 70 wt-%, from about 0.01 wt-% and about 70 wt-%, from about 0.1 wt-% and about 60 wt-%, from about 0.1 wt-% and about 50 wt-%, from about 1 wt-% and about 50 wt-%, from about 1 wt-% and about 40 wt-%, or from about 1 wt-% and about 30 wt-%. In addition, without being limited according to the disclosure, all ranges recited are inclusive of the numbers defining the range and include each integer within the defined range.

[0073] **Water conditioning Polymers, Chelants**

[0074] The solid controlled release compositions can include one or more water conditioning polymers and/or chelants. The solid controlled release compositions can include one or more chelants, also called builders or sequestering agents, including, but not limited to: condensed phosphates, alkali metal carbonates, phosphonates, aminocarboxylic acids, and/or polycarboxylic acids. In general, a chelating agent is a molecule capable of coordinating (*i.e.*, binding) the metal ions commonly found in natural water to prevent the metal ions from interfering with the action of the other ingredients of a solid cleaning composition. Preferable levels of addition for builders that can also be chelating or sequestering agents are between about 0.1% to about 20% by weight, about 1% to about 20% by weight, or about 1% to about 100% by weight. In addition, without being limited according to the disclosure, all ranges recited are inclusive of the numbers defining the range and include each integer within the defined range.

[0075] Examples of suitable chelants include aminocarboxylates. Suitable aminocarboxylates include, for example, N-hydroxyethylaminodiacetic acid, ethylenediaminetetraacetic acid (EDTA), methylglycinediacetic acid (MGDA), hydroxyethylenediaminetetraacetic acid, diethylenetriaminepentaacetic acid, N-hydroxyethyl-ethylenediaminetriacetic acid (HEDTA), glutamic acid N,N-diacetic acid (GLDA), diethylenetriaminepentaacetic acid (DTPA), and other similar acids having an amino group with a carboxylic acid substituent. Beneficially, the aminocarboxylates provide a strong cleaning performance while employing chelants that are substantially free of NTA-containing compounds, making the compositions more environmentally acceptable. Useful aminocarboxylic acid materials containing little or no NTA include, but are not limited to: N-hydroxyethylaminodiacetic acid, ethylenediaminetetraacetic acid (EDTA),

hydroxyethylenediaminetetraacetic acid, diethylenetriaminepentaacetic acid, N-hydroxyethyl-ethylenediaminetriacetic acid (HEDTA), diethylenetriaminepentaacetic acid (DTPA), methylglycinediacetic acid (MGDA), glutamic acid-N,N-diacetic acid (GLDA), ethylenediaminesuccinic acid (EDDS), 2-hydroxyethyliminodiacetic acid (HEIDA), iminodisuccinic acid (IDS), 3-hydroxy-2'-iminodisuccinic acid (HIDS) and other similar acids or salts thereof having an amino group with a carboxylic acid substituent.

[0076] Examples of condensed phosphates include, but are not limited to: sodium and potassium orthophosphate, sodium and potassium pyrophosphate, sodium tripolyphosphate, and sodium hexametaphosphate. A condensed phosphate may also assist, to a limited extent, in solidification of the detergent composition by fixing the free water present in the detergent composition as water of hydration. In some embodiments, the compositions include a phosphonate. Examples of phosphonates include, but are not limited to: phosphinosuccinic acid oligomer (PSO) described in US patents 8,871,699 and 9,255,242; 2-phosphinobutane-1,2,4-tricarboxylic acid (PBTC), 1-hydroxyethane-1,1-diphosphonic acid, $\text{CH}_2\text{C}(\text{OH})[\text{PO}(\text{OH})_2]_2$; aminotri(methylenephosphonic acid), $\text{N}[\text{CH}_2\text{PO}(\text{OH})_2]_3$; aminotri(methylenephosphonate), sodium salt (ATMP), $\text{N}[\text{CH}_2\text{PO}(\text{ONa})_2]_3$; 2-hydroxyethyliminobis(methylenephosphonic acid), $\text{HOCH}_2\text{CH}_2\text{N}[\text{CH}_2\text{PO}(\text{OH})_2]_2$; diethylenetriaminepenta(methylenephosphonic acid), $(\text{HO})_2\text{POCH}_2\text{N}[\text{CH}_2\text{CH}_2\text{N}[\text{CH}_2\text{PO}(\text{OH})_2]_2]_2$; diethylenetriaminepenta(methylenephosphonate), sodium salt (DTPMP), $\text{C}_9\text{H}_{(28-x)}\text{N}_3\text{Na}_x\text{O}_{15}\text{P}_5$ ($x=7$); hexamethylenediamine(tetramethylenephosphonate), potassium salt, $\text{C}_{10}\text{H}_{(28-x)}\text{N}_2\text{K}_x\text{O}_{12}\text{P}_4$ ($x=6$); bis(hexamethylene)triamine(pentamethylenephosphonic acid), $(\text{HO})_2\text{POCH}_2\text{N}[(\text{CH}_2)_2\text{N}[\text{CH}_2\text{PO}(\text{OH})_2]_2]_2$; monoethanolamine phosphonate (MEAP); diglycolamine phosphonate (DGAP) and phosphorus acid, H_3PO_3 . Preferred phosphonates are PBTC, HEDP, ATMP and DTPMP. A neutralized or alkali phosphonate, or a combination of the phosphonate with an alkali source prior to being added into the mixture such that there is little or no heat or gas generated by a neutralization reaction when the phosphonate is added is preferred. In one embodiment, however, the composition is phosphorous-free. Suitable amounts of the phosphonates include between about 0% and about 20% by weight of the composition, between about 0.1% and about 20%, or between about 1% and about 10% by weight of the composition. In addition, without being limited

according to the disclosure, all ranges recited are inclusive of the numbers defining the range and include each integer within the defined range.

[0077] Additional water conditioning polymers can also be referred to as non-phosphorus containing builders. Additional water conditioning polymers may include, but are not limited to: polycarboxylates, polycarboxylic acid polymers, acrylic polymers, or acrylic acid polymers.

[0078] Exemplary polycarboxylates or carboxylates that can be used as builders and/or water conditioning polymers include, but are not limited to: those having pendant carboxylate ($\text{--CO}_2\text{--}$) groups such as polyacrylic acid homopolymers, polymaleic acid homopolymers, maleic/olefin copolymers, sulfonated copolymers or terpolymers, acrylic/maleic copolymers or terpolymers polymethacrylic acid homopolymers, polymethacrylic acid copolymers or terpolymers, acrylic acid-methacrylic acid copolymers, hydrolyzed polyacrylamides, hydrolyzed polymethacrylamides, hydrolyzed polyamide-methacrylamide copolymers, hydrolyzed polyacrylonitriles, hydrolyzed polymethacrylonitriles, hydrolyzed acrylonitrile-methacrylonitrile copolymers and combinations thereof. For a further discussion of chelating agents/sequestrants, see Kirk-Othmer, Encyclopedia of Chemical Technology, Third Edition, volume 5, pages 339-366 and volume 23, pages 319-320, the disclosure of which is incorporated by reference herein.

[0079] In embodiments, the water conditioning polymer is a polycarboxylic acid polymer comprising at least one acrylic acid polymer, at least one maleic acid polymer or combinations thereof. Suitable amounts of the polymers include between about 0% and about 20% by weight of the composition, between about 0.1% and about 20%, or between about 1% and about 10% by weight of the composition. In addition, without being limited according to the disclosure, all ranges recited are inclusive of the numbers defining the range and include each integer within the defined range.

[0080] Stabilizing Agents and Binders

[0081] The solid controlled release compositions can include one or more stabilizing agents or binders for the compositions. As referred to herein, the stabilizing agents can function to aid in binding or solidification of the solid controlled release compositions. The stabilizing agents can further provide benefits of lubrication or act as a lubricant in producing the compositions. Exemplary stabilizing agents and binders comprise polyethylene glycols, polyvinyl alcohols, PVP, gelatin, stearates, and the like.

[0082] Suitable amounts of the stabilizing agents include between about 0% and about 20% by weight of the composition, between about 0.01% and about 20%, or between about 0.1% and about 20% by weight of the composition. In addition, without being limited according to the disclosure, all ranges recited are inclusive of the numbers defining the range and include each integer within the defined range.

[0083] METHODS OF USE

[0084] The solid controlled release compositions are suited for cleaning hard surfaces and objects having fats, oils, grease and/or other organic waste. The solid controlled release compositions are efficacious in cleaning and removing soils from such surfaces and objects without the need for significant use of or any mechanical cleaning efforts. In a particular embodiment, the solid controlled release compositions are efficacious in removing fats, oils, grease and/or other organic waste from a surface that has waste water flowing through and needs sustained cleanliness.

[0085] The methods of cleaning fats, oils, grease and/or other organic waste from surfaces or objects comprises: (a) dosing a solid composition into a reservoir to generate a use solution comprising from about 1 ppm to about 500 ppm of the composition when contacted by water, and (b) cleaning the fats, oils, grease and other organic soils. In some embodiments the organic soils are bacterial deposits.

[0086] As referred to according to the methods steps the solid composition is a controlled release product and is either (i) the solid composition as described herein or (ii) a solid cleaning composition as described herein that does not include (*i.e.* excludes) a biological active.

[0087] In an embodiment, the reservoir is a hard surface, including for example, a sink, bowl, drain, drain outlet, disposal, tank, toilet bowl, fluid line, pipe or combination thereof. In a further embodiment, the tank is an oil separation tank. Each of these embodiments reservoir has waste water flowing through it or over it and needs sustained cleanliness from various soils. The methods beneficially, reduce or eliminate the need for mechanical cleaning efforts, such as by a person or machine to apply force, contact and/or any means to mechanically remove such fats, oils, grease and/or other organic waste.

[0088] Exemplary industries in which the methods of the present disclosure can be applied include, but are not limited to: the food and beverage industry, food service industry (*e.g.* restaurants), healthcare industry, oil processing industry, industrial agriculture and ethanol

processing industry, pharmaceutical manufacturing industry, and various others having hard surfaces, objects and reservoirs where waste water flowing through and needs sustained cleanliness and/or where cleaning compositions also require mechanical force to clean and remove soils. In a still further embodiment, consumer markets including household applications can benefit from the methods of the present disclosure, such as for cleaning household drains.

[0089] In some aspects, the methods of using the solid controlled release compositions include dosing a solid composition into a reservoir to generate a use solution comprising from about 1 ppm to about 500 ppm of the composition when contacted by water. In embodiments the solid compositions are controlled release such that the solid composition dissolves over time to continually provide a use solution concentration between about 1 ppm to about 500 ppm, about 10 ppm to about 500 ppm, about 1 ppm to about 400 ppm, about 10 ppm to about 400 ppm, about 1 ppm to about 300 ppm, about 10 ppm to about 300 ppm, about 1 ppm to about 200 ppm, about 10 ppm to about 200 ppm, and including all ranges therebetween.

[0090] The dosing step can be any known method of applying or contacting the compositions to the surface, object or reservoir. In some embodiment, a single solid controlled release composition can be manually added to a reservoir. In such embodiment, the composition can be added to a reservoir that is either empty or already has water contained therein. For example, dosing can include immersing the solid composition into a reservoir already containing a volume of water or adding the solid composition into a reservoir before a volume of water is added. Dosing can be manual or by machine.

[0091] In embodiments, the solid composition dissolves over a period of time of at least about 12 hours, or at least about 24 hours, to maintain the use solution having a concentration from about 1 ppm to about 500 ppm of the composition.

[0092] In embodiments, the solid composition dissolves over a period of time to provide a pH of the use solution between about 8 to about 12.

[0093] In embodiments, the solid composition can be dosed every 12 hours, every 24 hours, or once per day. The dosing rate of the solid composition will vary depending upon the reservoir, the extent of the fats, oils, grease and/or other organic waste on the surfaces, and further volume and rate of waste water passing there through. One skilled in the art will readily be able to determine the dosing rate for a particular reservoir based on the size (grams

to kilograms) of the solid composition and these factors to ensure sufficient removal of the fats, oils, grease and/or other organic waste for desired cleanliness.

[0094] In embodiments of the methods, the water generating the use solution has a temperature between about 10°C and about 100°C. In preferred embodiments, the water generating the use solution has an ambient temperature.

[0095] In some embodiments, the methods can optionally comprise a rinsing step. The rinsing step can comprise water, at ambient and/or at elevated temperatures, *e.g.* about 70°C to about 100°C.

[0096] Beneficially, the methods remove fats, oils, grease and/or other organic waste on the surfaces, and moreover they reduce clogging by dissolving organic waste buildup, fouling, odor, oils and other accumulation on hard surfaces. Still further, the methods reduce the frequency of grease trap pump outs. Still further, depending upon the location of the reservoir within a particular facility, the methods can further beneficially reduce fruit flies and other unwanted pests around the surface. Still further, the cleaning methods reduce or eliminate the need for mechanical cleaning.

[0097] As a still further benefit, the methods reduce use of water (*i.e.* water consumption) compared to conventional cleaning methods. In some embodiments, the methods reduce water usage by at least about 10 L/day to about 40 L/day.

[0098] EXAMPLES

[0099] Embodiments of the present disclosure are further defined in the following non-limiting Examples. It should be understood that these Examples, while indicating certain embodiments of the disclosure, are given by way of illustration only. From the above discussion and these Examples, one skilled in the art can ascertain the essential characteristics of this disclosure, and without departing from the spirit and scope thereof, can make various changes and modifications of the embodiments of the disclosure to adapt it to various usages and conditions. Thus, various modifications of the embodiments of the disclosure, in addition to those shown and described herein, will be apparent to those skilled in the art from the foregoing description. Such modifications are also intended to fall within the scope of the appended claims.

[0100] The following solid controlled release composition in Table 2 was evaluated in the Examples formulated as a 60 gram pressed tablet.

[0101] TABLE 2

Material	wt.-%
First Alkali Metal Carbonate Alkalinity source	30-60
Secondary Alkali Metal Alkalinity sources	10-40
Sugar Alcohol	10-30
Biological Active(s)	0.1-6
Additional Functional Ingredients	1-50

EXAMPLE 1

[0102] Commercially available cleaning compositions (liquids and solids) were evaluated for cleaning efficacy in locations having disposal from a coffee maker compared to a kitchen waste disposer (in an effort to gauge comparison of soil removal requirements from a commercial / industrial site compared to a consumer site. Initial screening of these diverse applications of use illustrated that a robust cleaning composition is required for commercial applications, such as those having oil separation tanks compared to a consumer application. In particular, it was identified that a controlled release product was most desirable to provide all day, lasting cleaning efficacy against fats, oils, grease and/or other organic waste. It was further identified that the cleaning efficacy must include ability to remove clogs, odor and clean all surfaces, including the inner surface of pipes.

[0103] Based on the initial screening, the solid controlled release composition was compared to commercially-available consumer products that are sold as powders and tablets. The tablets used as Control were three commercially-available consumer products known to be effective to removes odor-causing residues. For the dosing, 3 tablets were used. The cleaning component is a surfactant. The products provided outstanding visual effect but were not functional in soil removal.

[0104] An oil separation tank was used as the test site to compare efficacy of the solid controlled release composition to the commercially-available consumer product. The drain outlet was blocked with a cloth. Each solid composition was added (on separate evaluation trials) to the reservoir and hot tap water (45°C) was added to the reservoir to flush the composition until the volume reached above the composition and the sink reservoir was immersed. Then the composition was allowed to dissolve for 15 minutes and the reservoir

was evaluated (upper and lower sides and the drain itself) using an endoscope to assess cleaning of the drain itself (*i.e.* soils in the drain) compared to the pre-cleaning condition of the drain.

[0105] The Control (commercially-available consumer product) did not result in any visual cleaning effect in the drain, whereas significant cleaning efficacy to remove soils was observed from the drain with the solid controlled release composition. Notably the Control had strong visual or olfactory effects, including abundant foam and a pleasant aroma but hardly have cleaning effect.

EXAMPLE 2

[0106] An additional evaluation of the solid controlled release composition was conducted in an oil separation tank to assess the controlled release efficacy. A single 60 gram pressed tablet was added to a reservoir of an oil separation tank and allowed to dissolve and release composition to provide the desired concentration range of 1 ppm to 500 ppm over time in a use solution. Waste water was allowed to flow through the oil separation tank as in normal use conditions for a period of 17 hours. Throughout the cleaning process the slow and consistent dissolution of the composition provided sustained and commercially-acceptable cleaning performance to remove fats, oils, grease and/or other organic waste.

[0107] It is to be understood that while the invention has been described in conjunction with the detailed description thereof, the foregoing description is intended to illustrate, and not limit the scope of the invention, which is defined by the scope of the appended claims. Other embodiments, advantages, and modifications are within the scope of the following claims. Any reference to accompanying drawings which form a part hereof, are shown, by way of illustration only. It is understood that other embodiments may be utilized and structural changes may be made without departing from the scope of the present disclosure. All publications discussed and/or referenced herein are incorporated herein in their entirety. The features disclosed in the foregoing description, or the following claims, or the accompanying drawings, expressed in their specific forms or in terms of a means for performing the disclosed function, or a method or process for attaining the disclosed result, as appropriate, may, separately, or in any combination of such features, be utilized for realizing the invention in diverse forms thereof.

CLAIMS

What is claimed is:

1. A solid composition for cleaning fats, oils, grease and/or other organic waste comprising:
an alkali metal alkalinity source;
a sugar alcohol and/or at least one saccharide; and
from about 0.01 wt-% to about 4 wt-% of at least one biological active comprising an enzyme composition and/or a nonpathogenic spore.
2. The composition of claim 1, wherein the enzyme composition comprises a serine endo-peptidase, a cellulase, an AA9 polypeptide having cellulolytic enhancing activity, a hemicellulase, an esterase, an expansin, a laccase, a ligninolytic enzyme, a pectinase, a peroxidase, a protease, a swollenin, or a combination or mixture thereof.
3. The composition of any one of claims 1 or 2, wherein the sugar alcohol comprises sorbitol and wherein the alkali metal alkalinity source comprises an alkali metal carbonate .
4. The composition of any one of claims 1-3, wherein the sugar alcohol comprises from about 10 wt-% to about 30 wt-% of the composition and wherein the alkali metal alkalinity source comprises from about 30 wt-% to about 60 wt-% of the composition.
5. The composition of any one of claims 1-4, further comprising an alkali metal percarbonate and/or an alkali metal metasilicate.
6. The composition of any one of claim 5, wherein the alkali metal percarbonate comprises from about 10 wt-% to about 40 wt-% of the composition and/or wherein the alkali metal metasilicate comprises from about 0.1 wt-% to about 1 wt-% of the composition.
7. The composition of any one of claims 1-6, further comprising at least one polycarboxylic acid polymer.

8. The composition of claim 7, wherein the at least one polycarboxylic acid polymer comprises at least one acrylic acid polymer, at least one maleic acid polymer or combinations thereof.
9. The composition of any one of claims 7 or 8, wherein the at least one polycarboxylic acid polymer comprises from about 1 wt-% to about 10 wt-% of the composition.
10. The composition of any one of claims 1-9, further comprising a stabilizing agent in a concentration from about 0.01 wt-% to about 20 wt-%.
11. The composition of any one of claims 1-10, further comprising a chelant, an additional enzyme, lubricant, metal protectant, a surfactant, a thickening agent, or a mixture thereof.
12. A solid composition for cleaning fats, oils, grease and/or other organic waste comprising:
from about 30 wt-% to about 60 wt-% of an alkali metal carbonate alkalinity source;
from about 10 wt-% to about 30 wt-% of at least one sugar alcohol and/or saccharide;
from about 0.01 wt-% to about 4 wt-% of an enzyme composition comprising a serine endo-peptidase, a cellulase, an AA9 polypeptide having cellulolytic enhancing activity, a hemicellulase, an esterase, an expansin, a laccase, a ligninolytic enzyme, a pectinase, a peroxidase, a protease, a swollenin, or a combination or mixture thereof; and
optionally from about 0.1 wt-% to about 2 wt-% of a nonpathogenic spore,
wherein the solid composition is a dissolvable solid.
13. The composition of claim 12, wherein the enzyme composition comprises a serine endo-peptidase and a cellulase.
14. The composition of any one of claims 12 or 13, wherein the enzyme composition comprises from about 0.1 wt-% to about 4 wt-%, or from about 0.1 wt-% to about 2 wt-% of the composition.

15. The composition of any one of claims 12-14, wherein the sugar alcohol comprises sorbitol.
16. The composition of any one of claims 12-15, further comprising an alkali metal percarbonate comprising from about 10 wt-% to about 40 wt-% of the composition.
17. The composition of any one of claims 12-16, further comprising at least one polycarboxylic acid polymer comprising an acrylic acid polymer comprising from about 1 wt-% to about 10 wt-% of the composition.
18. The composition of any one of claims 12-17, further comprising at least one stabilizing agent or binder comprising from about 0.01 wt-% to about 20 wt-% of the composition.
19. The composition of any one of claims 12-18, further comprising a chelant, an additional enzyme, lubricant, metal protectant, a surfactant, a thickening agent, or a mixture thereof.
20. A method of cleaning fats, oils, grease and/or other organic waste comprising:
 - (a) dosing either (i) the solid composition of any one of claims 1-19 or (ii) a solid cleaning composition according to any one of claims 1-19 that does not include a biological active, into a reservoir to generate a use solution comprising from about 1 ppm to about 500 ppm of the composition when contacted by water, wherein the solid composition is a controlled release product; and
 - (b) cleaning the fats, oils, grease and/or other organic soils.
21. The method of claim 20, wherein the reservoir is a sink, bowl, drain, drain outlet, disposal, tank, toilet bowl, fluid line, pipe, or combination thereof.
22. The method of claim 21, wherein the tank is an oil separation tank.

23. The method of any one of claims 20-22, wherein the solid composition dissolves over a period of time of at least about 12 hours, or at least about 24 hours, to maintain the use solution having a concentration from about 1 ppm to about 500 ppm of the composition and/or a pH between about 8 to about 12.
24. The method of any one of claims 20-23, wherein the dosing is one per 12 hours, or once per day.
25. The method of any one of claims 20-24, further comprising a rinsing step.
26. The method of any one of claims 20-25, wherein the water generating the use solution has a temperature between about 10 °C and about 100 °C or an ambient temperature.
27. The method of any one of claims 20-26, wherein the methods reduce clogging by dissolving organic waste buildup, fouling, odor, oils and other accumulation on hard surfaces, reducing fruit flies and other unwanted pests around the surface, and/or need for mechanical cleaning.
28. The method of any one of claims 20-27, wherein the organic soils are bacterial deposits.
29. The method of any one of claims 20-28, wherein the cleaning of the fats, oils, grease and/or other organic soils occurs on an continuous basis while waste water passes through the reservoir to continue to generate the use solution.

INTERNATIONAL SEARCH REPORT

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A. CLASSIFICATION OF SUBJECT MATTER

INV. **C11D3/386 C11D11/00 C11D17/00 C11D7/12 C11D7/26**
ADD.

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)

C11D

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)

EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

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X	US 4 670 178 A (HUTH STANLEY W [US] ET AL) 2 June 1987 (1987-06-02) example 1 -----	1-4, 10-12, 14,15, 18,19
X	WO 01/96522 A1 (PROCTER & GAMBLE [US]) 20 December 2001 (2001-12-20) example I page 3, 3rd paragraph page 8, 5th and 6th paragraph page 39, 1st to 4th paragraph -----	1-11,13, 16,17, 20,25,26
Y	JP H04 23898 A (SANIIDA KK) 28 January 1992 (1992-01-28) page 731, last paragraph ----- -/--	20-29

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

☒ See patent family annex.

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Date of the actual completion of the international search

13 April 2023

Date of mailing of the international search report

20/04/2023

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INTERNATIONAL SEARCH REPORT

International application No
PCT/CN2022/134965

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

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