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(54) ANTIMICROBIAL HARD SURFACE CLEANING COMPOSITION

(57) An antimicrobial liquid hard surface cleaning composition comprising an antimicrobial agent, surfactant system and phosphonochelant to provide cleaning and shine.

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Description

FIELD OF THE INVENTION

[0001] Antimicrobial hard surface cleaning compositions providing improved shine.

BACKGROUND OF THE INVENTION

[0002] Hard surface cleaning compositions are used for cleaning and treating hard surfaces. Preferably, the hard surface cleaning composition is formulated to be an "all purpose" hard surface cleaning composition. That is, the hard surface cleaning composition is formulated to be suitable for cleaning as many different kinds of surfaces as possible.

[0003] For treating surfaces where high levels of hygiene is desired, such as toilets, bathrooms, and surfaces that small infants can come into contact with, it is desirable that the hard surface cleaning composition comprises an antimicrobial agent such as a quaternary ammonium compound. However, such antimicrobial agents inhibit the cleaning efficacy of surfactants and other detergency ingredients, leading to less than ideal cleaning and less than ideal shine.

[0004] For such antimicrobial hard surface cleaning compositions, the loss in grease cleaning efficacy is particularly marked, since the antimicrobial agent can interact with the micellisation of the surfactant system. In order to improve grease cleaning, hard surface cleaning compositions can be formulated with amphoteric surfactants or amine oxide surfactants. However, even with the addition of such surfactants, the level of surface shine after treatment with the antimicrobial hard surface cleaning composition is typically less than desired. This can leave the user with an impression that the treated surface is less clean than desired.

[0005] Therefore, a need remains for an antimicrobial liquid hard surface cleaning composition which provides both good grease cleaning and improved shine.

[0006] US 6268324 B1 and US 6630434 B2 (Ecolab) relate to aqueous cleaning compositions providing increasing viscosity upon dilution. US 4,784,774 (B.F Goodrich Company) relates to antiscalant admixtures of a homopolymer of maleic acid or a copolymer and a phosphonoalkane carboxylic acid for reducing scaling in an aqueous system. WO2009/078867 A1 relates to degreasing compositions of surfactant-based products containing anionic and nonionic surfactants, one or more sequestering agents, a glycol solvent for the preparation of liquid cleaning compositions. US2010/0331227 relates to hydrogen peroxide cleaning and sanitizing solutions consisting of distilled water, hydrogen peroxide, a surfactant, a hydrogen peroxide stabilizer, a chelating agent, and corrosion inhibitors. US6218349 relates to a composition suitable for removing proteinaceous material comprising water, an emulsifier, a chelating agent, one or more mineral acids, and a surfactant. WO 2013/055863 relates to chlorinated and non-chlorinated alkaline cleaning compositions for removal of proteinaceous and fatty soils at low temperature. WO 2012/028203 relates to a cleaning composition comprising a water-soluble aminopolycarboxylate and/or aminopolycarboxylic acid chelant, a carboxylate and/or organic carboxylic acid, a sequestering agent, a liquid conditioner polymer, and a solvent. EP-799612 relates to a detergent composition comprising a sulfate ester surfactant, at least one surfactant selected from amphoteric surfactants, amine oxide surfactants, alkanol amide surfactants and amide amino-acid surfactants, a cationic bactericide and a metal chelating agent. EP2245128 relates to compositions of surfactant-based products containing anionic and nonionic sufactants, one or more sequestering agents, a glycol solvent for the preparation of liquid cleaning compositions. US2014/0148371 and US2014/0148372 relate to alkaline or neutral viscoelastic cleaning compositions which use non polymer thickening agents. WO2001/000760 relates to organic compositions for removing complex organic soils from wood, metal and other hard surfaces, which comprise nonionic surfactants, silicone surfactants, hydrotropes and other optional functional materials such as sequestrants. WO2003/018733 relates to a low foaming surfactant blend for use in highly alkaline conditions including at least one C3 to C10 alkyl polyglucoside, at least one amine oxide, at least one polycarboxylated alcohol alkoxylate, and at least one alcohol alkoxylate.

[0007] US 6,395,698 B1 relates to a corrosion inhibiting, sanitizing/disinfecting, wood preserving and hard surface cleaning formulation comprising: a quaternary ammonium halide; and a sequestrant in a sufficient amount to sequester the halide ion without eliminating the quaternary ammonium ion's sanitizing/disinfecting capability, wood preserving characteristics, and hard surface cleaning ability. US 6,218,349 B1 relates to a composition suitable for removing proteinaceous material comprising water, an emulsifier, a chelating agent, one or more mineral acids, and a surfactant; wherein: the emulsifier is a polyether nonionic emulsifier or an amine oxide; the chelating agent is an alkylaminophosphonic acid, a hydroxyalkylphosphonic acid, or an alkylphosphonic acid carboxylic acid; the one or more mineral acids are present in an mount such that the pH of the composition is less than about 4.5; and the surfactant is a cationic surfactant. DE 2,141,9,82 relates to compositions for cleaning and disinfecting containers in the food and food and agriculture industries, the compositions comprising phosphocarboxylic acids which do not precipitate out the quaternary ammonium salts and are resistant to hydrolysis. WO 2006/114243 A1 relates to an aqueous disinfectant contains a combination of benzalkonium chloride, phenoxyethanol and amino trimethylene phosphonic acid, and can be used in a methods for disinfecting hard surfaces. ES2402725 A1 relates to a detergent liquid and methods for the removal of

biofilms on surfaces, comprising between 10% and 20% of at least one oxidizing and biocidal agent; between 1.0% and 3.0% of at least one chelating agent; between 0.7% and 1.5% of at least one phosphonate; between 2.0% and 3.0% of at least one cationic surfactant; and between 69% and 85.45% of a dissolution medium, for example water. WO 2004/013271 A1 relates to aqueous cleaning agents used to treat hard surfaces, containing at least one surfactant, one ethoxylated triglyceride and one hydrophilizing agent.

SUMMARY OF THE INVENTION

[0008] The present invention relates to an antimicrobial liquid hard surface cleaning composition comprising: a surfactant system, the surfactant system comprising nonionic surfactant; from 0.05 wt% to 1.8 wt% of an antimicrobial agent, wherein the antimicrobial agent is a quaternary ammonium compound selected from the group consisting of: didecyl dimethyl ammonium chloride, a blend of alkyl dimethyl benzyl ammonium chloride and alkyl dimethyl ethylbenzyl ammonium chloride, and mixtures thereof; and a phosphono-chelant. The present invention further relates to use of phosphonocarboxylic acids or salt thereof, in an antimicrobial liquid hard surface cleaning composition, for improving shine of a hard surface.

DETAILED DESCRIPTION OF THE INVENTION

[0009] Antimicrobial hard surface cleaning compositions of the present invention provide improved shine after treatment of the surface.

[0010] As defined herein, "essentially free of" a component means that no amount of that component is deliberately incorporated into the respective premix, or composition. Preferably, "essentially free of" a component means that no amount of that component is present in the respective premix, or composition.

[0011] As defined herein, "stable" means that no visible phase separation is observed for a premix kept at 25°C for a period of at least two weeks, or at least four weeks, or greater than a month or greater than four months.

[0012] All percentages, ratios and proportions used herein are by weight percent of the composition, unless otherwise specified. All average values are calculated "by weight" of the composition, unless otherwise expressly indicated. All ratios are calculated as a weight/weight level, unless otherwise specified.

[0013] All measurements are performed at 25°C unless otherwise specified.

[0014] Unless otherwise noted, all component or composition levels are in reference to the active portion of that component or composition, and are exclusive of impurities, for example, residual solvents or by-products, which may be present in commercially available sources of such components or compositions.

The antimicrobial liquid hard surface cleaning composition

[0015] By "liquid hard surface cleaning composition", it is meant herein a liquid composition for cleaning hard surfaces found in households, especially domestic households. Surfaces to be cleaned include kitchens and bathrooms, e.g., floors, walls, tiles, windows, cupboards, sinks, showers, shower plastified curtains, wash basins, WCs, fixtures and fittings and the like made of different materials like ceramic, vinyl, no-wax vinyl, linoleum, melamine, glass, steel, kitchen work surfaces, any plastics, plastified wood, metal or any painted or varnished or sealed surface and the like. Household hard surfaces also include household appliances including, but not limited to refrigerators, freezers, washing machines, automatic dryers, ovens, microwave ovens, dishwashers and so on. Such hard surfaces may be found both in private households as well as in commercial, institutional and industrial environments.

[0016] In a preferred embodiment, the liquid compositions herein are aqueous compositions, comprising at least 10% by weight of water. Therefore, they may comprise from 30% to 99.5% by weight of the total composition of water, preferably from 50% to 98% and more preferably from 80% to 97%.

[0017] For improved cleaning, especially greasy soil and particulate greasy soil cleaning performance, the composition pH is preferably greater than 7.0, more preferably greater than 9.5. For improved antibacterial efficacy, in addition to improved cleaning, the pH is still more preferably greater than 10. For improved surface safety, the pH is can be less than 13, preferably less than 12, more preferably less than 11.5, most preferably less than 11. Accordingly, the compositions herein may further comprise an acid or base to adjust pH as appropriate.

[0018] A suitable acid for use herein is an organic and/or an inorganic acid. A preferred organic acid for use herein has a pKa of less than 6. A suitable organic acid is selected from the group consisting of: citric acid, lactic acid, glycolic acid, succinic acid, glutaric acid and adipic acid and mixtures thereof. A suitable inorganic acid can be selected from the group consisting of: hydrochloric acid, sulphuric acid, phosphoric acid and mixtures thereof.

[0019] A typical level of such acids, when present, is from 0.01% to 5.0% by weight of the total composition, preferably from 0.04% to 3.0% and more preferably from 0.05% to 1.5 %.

[0020] A suitable base to be used herein is an organic and/or inorganic base. Suitable bases for use herein are the

caustic alkalis, such as sodium hydroxide, potassium hydroxide and/or lithium hydroxide, and/or the alkali metal oxides such, as sodium and/or potassium oxide or mixtures thereof. A preferred base is a caustic alkali, more preferably sodium hydroxide and/or potassium hydroxide. Other suitable bases include ammonia, ammonium carbonate, K_2CO_3, Na_2CO_3 and alkanolamines (such as monoethanolamine, triethanolamine, aminomethylpropanol, and mixtures thereof). Typical levels of such bases, when present, are from 0.01% to 5.0% by weight of the total composition, preferably from 0.05% to 3.0% and more preferably from 0.1% to 2.0 %.

Surfactant system

[0021] The antimicrobial liquid hard surface cleaning composition according to the present invention comprises a surfactant system to clean the hard surface. The composition can comprise 1.0% to 20.0% by weight of the surfactant system. The total amount of surfactant is preferably from 1.5 to 15, more preferably from 2 to 12 and most preferably from 3 to 10% by weight of the composition. The surfactant system comprises nonionic surfactant.

[0022] The nonionic surfactant can be selected from the group consisting of: alkoxylated nonionic surfactants, alkyl polyglycosides, amine oxides, and mixture thereof. Typically, the composition may comprise from 1.0 wt% to 12.0 wt% by weight of the total composition of said nonionic surfactant, preferably from 3.0 wt% to 10 wt%, more preferably from 4.0 wt% to 9.0 wt% and most preferably from 5.0 wt% to 8.0 wt%.

[0023] Suitable nonionic surfactants include amine oxide surfactants. The surfactant system preferably comprises up to 10 wt% of an amine oxide surfactant by weight of the composition. Typically, the liquid composition herein comprises from 0.1 % to 7.0% by weight of the total composition of said amine oxide surfactant, preferably from 0.15 to 6.0%, more preferably from 0.3% to 3.0%. Suitable amine oxide surfactants are according to the formula: $R_1R_2R_3NO$ wherein R1 is an hydrocarbon chain comprising from 1 to 30 carbon atoms, preferably from 6 to 20, more preferably from 8 to 16 and wherein R_2 and R_3 are independently saturated or unsaturated, substituted or unsubstituted, linear or branched hydrocarbon chains comprising from 1 to 4 carbon atoms, preferably from 1 to 3 carbon atoms, and more preferably are methyl groups. R1 maybe a saturated or unsaturated, substituted or unsubstituted linear or branched hydrocarbon chain.

[0024] Suitable amine oxides for use herein are for instance preferably C_{12}-C_{14} dimethyl amine oxide, commercially available from Albright & Wilson, C_{12}-C_{14} amine oxides commercially available under the trade name Genaminox® LA from Clariant or AROMOX® DMC from AKZO Nobel.

[0025] The hard surface cleaning composition can comprise from 1 wt% to 10 wt%, preferably from 1.5wt% to 8 wt%, more preferably from 2 wt% to 7 wt% and most preferably from 2 wt% to 6 wt% of the composition of alkoxylated alcohol, preferably ethoxylated alcohol.

[0026] Suitable alkoxylated nonionic surfactants include primary C_6-C_{16} alcohol polyglycol ether i.e. ethoxylated alcohols having 6 to 16 carbon atoms in the alkyl moiety and 4 to 30 ethylene oxide (EO) units. When referred to for example C_{9-14} it is meant average carbons and alternative reference to for example EO8 is meant average ethylene oxide units.

[0027] Suitable alkoxylated nonionic surfactants are according to the formula RO-$(A)_nH$, wherein: R is a C_6 to C_{18}, preferably a C_8 to C_{16}, more preferably a C_8 to C_{12} alkyl chain, or a C_6 to C_{28} alkyl benzene chain; A is an ethoxy or propoxy or butoxy unit, and wherein n is from 1 to 30, preferably from 1 to 15 and, more preferably from 4 to 12 even more preferably from 5 to 10. Preferred R chains for use herein are the C_8 to C_{22} alkyl chains. Even more preferred R chains for use herein are the C_9 to C_{12} alkyl chains. R can be linear or branched alkyl chain.

[0028] Suitable ethoxylated nonionic surfactants for use herein are Dobanol® 91-2.5 (HLB = 8.1; R is a mixture of C_9 and C_{11} alkyl chains, n is 2.5), Dobanol® 91-10 (HLB =14.2 ; R is a mixture of C_9 to C_{11} alkyl chains, n is 10), Dobanol® 91-12 (HLB =14.5 ; R is a mixture of C_9 to C_{11} alkyl chains, n is 12), Greenbentine DE80 (HLB = 13.8, 98 wt% C10 linear alkyl chain, n is 8), Marlipal 10-8 (HLB = 13.8, R is a C10 linear alkyl chain, n is 8), Lialethl® 11-5 (R is a C_{11} alkyl chain, n is 5), Isalchem® 11-5 (R is a mixture of linear and branched C11 alkyl chain, n is 5), Lialethl® 11-21 (R is a mixture of linear and branched C_{11} alkyl chain, n is 21), Isalchem® 11-21 (R is a C_{11} branched alkyl chain, n is 21), Empilan® KBE21 (R is a mixture of C_{12} and C_{14} alkyl chains, n is 21) or mixtures thereof. Preferred herein are Dobanol® 91-5 , Neodol® 11-5, Lialethl® 11-21 Lialethl® 11-5 Isalchem® 11-5 Isalchem® 11-21 Dobanol® 91-8, or Dobanol® 91-10, or Dobanol® 91-12, or mixtures thereof. These Dobanol®/Neodol® surfactants are commercially available from SHELL. These Lutensol® surfactants are commercially available from BASF and these Tergitol® surfactants are commercially available from Dow Chemicals.

[0029] Suitable chemical processes for preparing the alkoxylated nonionic surfactants for use herein include condensation of corresponding alcohols with alkylene oxide, in the desired proportions. Such processes are well known to the person skilled in the art and have been extensively described in the art, including the OXO process and various derivatives thereof. Suitable alkoxylated fatty alcohol nonionic surfactants, produced using the OXO process, have been marketed under the tradename NEODOL® by the Shell Chemical Company. Alternatively, suitable alkoxylated nonionic surfactants can be prepared by other processes such as the Ziegler process, in addition to derivatives of the OXO or Ziegler processes.

[0030] Preferably, said alkoxylated nonionic surfactant is a C_{9-11} EO5 alkylethoxylate, C_{12-14} EO5 alkylethoxylate, a

C_{11} EO5 alkylethoxylate, C_{12-14} EO21 alkylethoxylate, C_{9-11} EO8 alkylethoxylate, or a mixture thereof. Most preferably, said alkoxylated nonionic surfactant is a C_{11} EO5 alkylethoxylate, a C_{9-11} EO8 alkylethoxylate, a C_{10} EO8 alkylethoxylate, and mixtures thereof. Suitable C_{10} EO8 alkylethoxylate include Marlipal® 10/8 supplied by Sasol, and Greenbentin® DE/080.

[0031] Alkyl polyglycosides are biodegradable nonionic surfactants which are well known in the art, and can also be used in the compositions of the present invention. Suitable alkyl polyglycosides can have the general formula $C_nH_{2n+1}O(C_6H_{10}O_5)_xH$ wherein n is preferably from 9 to 16, more preferably 11 to 14, and x is preferably from 1 to 2, more preferably 1.3 to 1.6.

[0032] The nonionic surfactant is preferably a low molecular weight nonionic surfactant, having a molecular weight of less than 950 g/mol, more preferably less than 500 g/mol.

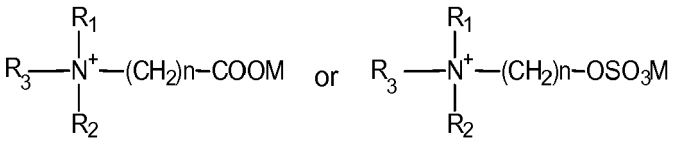
[0033] For further improved shine, the hard surface cleaning compositions, comprising the antimicrobial agents, preferably comprises low levels of anionic surfactant, or is free of anionic surfactant. As such, the hard surface cleaning compositions, comprising the antimicrobial agents, preferably comprises less than 2.0 wt% or less than 1.0 wt% of an anionic surfactant, or less than 0.1 wt% of anionic surfactant. In most preferred embodiments, the composition is essentially free, or free of, anionic surfactant. If anionic surfactant is used, alkyl ethoxylated sulphates, especially those with an ethoxylation degree of 1 to 8, preferably 2 to 5, are preferred.

[0034] The hard surface cleaning composition may comprise up to 15% by weight of an additional surfactant, preferably selected from: an amphoteric, zwitterionic, and mixtures thereof. More preferably, the hard surface cleaning composition can comprise from 0.5% to 5%, or from 0.5% to 3%, or from 0.5% to 2% by weight of the additional surfactant.

[0035] Suitable zwitterionic surfactants typically contain both cationic and anionic groups in substantially equivalent proportions so as to be electrically neutral at the pH of use, and are well known in the art. Some common examples of zwitterionic surfactants (such as betaine/sulphobetaine surfacants) are described in US. Pat. Nos. 2,082,275, 2,702,279 and 2,255,082.

[0036] Amphoteric surfactants can be either cationic or anionic depending upon the pH of the composition. Suitable amphoteric surfactants include dodecylbeta-alanine, N-alkyltaurines such as the one prepared by reacting dodecylamine with sodium isethionate, as taught in US. Pat. No. 2,658,072, N-higher alkylaspartic acids such as those taught in U.S. Pat. No. 2,438,091, and the products sold under the trade name "Miranol", as described in US. Pat. No. 2,528,378. Other suitable additional surfactants can be found in McCutcheon's Detergents and Emulsifers, North American Ed. 1980.

[0037] Suitable betaine and sulfobetaine surfactants are according to the formulae:



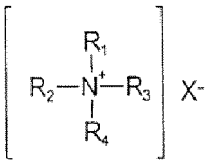
wherein : R_1 and R_2 are each independently linear or branched, saturated or unsaturated hydrocarbon chains of from 1 to 30 carbon atoms, preferably 1 to 20, more preferably 1 to 7 carbon atoms; R_3 is a linear or branched hydrocarbon chain of from 10 to 20 carbon atoms, preferably of from 10 to 18, more preferably 12 to 16 carbon atoms; n is an integer of from 1 to 20, preferably 1 to 10, more preferably 1 to 5; and M is H or an alkali metal, or mixtures thereof.

[0038] Suitable betaine surfactant include coconut-dimethyl betaine commercially available under tradename Mackam35® from McIntyre.

[0039] Preferably, the surfactant system comprises surfactant selected from the group consisting of: alkoxylated nonionic surfactant, amine oxide surfactant, and mixtures thereof. More preferably, the surfactant system comprises ethoxylated nonionic surfactant, and amine oxide surfactant.

Antimicrobial agent:

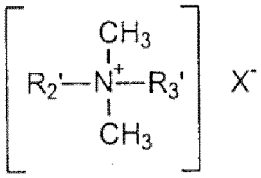
[0040] The hard surface cleaning composition comprises an antimicrobial agent. Suitable antimicrobial agents include cationic antimicrobial agents, such as quaternary ammonium compounds. Preferred quaternary ammonium compounds are those of the formula:



wherein at least one of R_1, R_2, R_3 and R_4 is a hydrophobic, aliphatic, aryl aliphatic or aliphatic 30 aryl radical of from 6 to 26 carbon atoms, and the entire cation portion of the molecule has a molecular weight of at least 165. The hydrophobic radicals maybe long-chain alkyl, long-chain alkoxy aryl, long-chain alkyl aryl, halogen-substituted long-chain alkyl aryl, long-chain alkyl phenoxy alkyl, aryl alkyl, etc. The remaining radicals on the nitrogen atoms other than the hydrophobic radicals are substituents of a hydrocarbon structure usually containing a total of no more than 12 carbon atoms. The radicals R_1, R_2, R_3 and R_4 may be straight chained or may be branched, but are preferably straight chained, and may include one or more amide or ester linkages. The radical X may be any salt- forming anionic radical, and preferably aids in the solubilization of the quaternary ammonium germicide in water. X can be a halide, for example a chloride, bromide or iodide, or X can be a methosulfate counterion, or X can be a carbonate ion.

[0041] Exemplary quaternary ammonium compounds include the alkyl ammonium halides such as cetyl trimethyl ammonium bromide, alkyl aryl ammonium halides such as octadecyl dimethyl benzyl ammonium bromide, N-alkyl pyridinium halides such as N-cetyl pyridinium bromide, and the like. Other suitable types of quaternary ammonium compounds include those in which the molecule contains either amide or ester linkages such as octyl phenoxy ethoxy ethyl dimethyl benzyl ammonium chloride, N-(laurylcocoaminoformylmethyl-pyridinium chloride, and the like. Other very effective types of quaternary ammonium compounds which are useful as germicides include those in which the hydrophobic radical is characterized by a substituted aromatic nucleus as in the case of lauryloxyphenyltrimethyl ammonium chloride, cetylaminophenyltrimethyl ammonium methosulfate, dodecylphenyltrimethyl ammonium methosulfate, dodecylbenzyltrimethyl ammonium chloride, chlorinated dodecylbenzyltrimethyl ammonium chloride, and the like.

[0042] More preferred quaternary ammonium compounds used in the compositions of the invention include those of the structural formula:



wherein R_2' and R_3' may be the same or different and are selected from C8-C12 alkyl, or R_2' is C12-C16 alkyl, C8-C18 alkylethoxy, C8-C18 alkylphenolethoxy and R_3' is benzyl, and X is a halide, for example a chloride, bromide or iodide, or X is a methosulfate counterion. The alkyl groups recited in R_2' and R_3' may be linear or branched, but are preferably substantially linear, or fully linear.

[0043] Particularly useful quaternary germicides include compositions presently commercially available under the tradenames BARDAC, BARQUAT, BTC, CARBOQUAT, and HYAMINE. These quaternary ammonium compounds are usually provided in a solvent, such as a C2 to C6 alcohol (such as ethanol, n-propanol, isopropanol, n-butanol, sec-butanol, and the like), glycols such as ethylene glycol, or in an mixtures containing water, such alcohols, and such glycols. Particularly preferred is didecyl dimethyl ammonium chloride, such as supplied by Lonza under tradenames such as: Bardac 2250™, Bardac 2270™, Bardac 2270E ™, Bardac 2280 ™, and/or a blend of alkyl, preferably C12-C18, dimethyl benzyl ammonium chloride and alkyl, preferably C12-C18, dimethyl ethylbenzyl ammonium chloride, such as supplied by Lonza under the brand names: Barquat 4280Z™. In preferred embodiments, the alkyl dimethyl benzyl ammonium chloride and alkyl dimethyl ethylbenzyl ammonium chloride are present in a ratio of from 20:80 to 80:20, or 40:60 to 60:40, with a ratio of 50:50 being the most preferred.

[0044] Other suitable, but less preferred, antimicrobial agents include germicidal amines, particularly germicidal triamines such as LONZA-BAC 12, (ex. Lonza, Inc., Fairlawn, NJ and/or from Stepan Co., Northfield IL, as well as other sources).

[0045] When present in the cleaning compositions according to the invention, the antimicrobial agent, preferably quaternary ammonium compound, should be present in amounts which are effective in exhibiting satisfactory germicidal activity - against selected bacteria sought to be treated by the cleaning compositions. Such efficacy may be achieved against less resistant bacterial strains with only minor amounts of the quaternary ammonium compounds being present, while more resistant strains of bacteria require greater amounts of the quaternary ammonium compounds in order to destroy these more resistant strains. As such, the quaternary ammonium compound need only be present in germicidally effective amounts, which can be as little as 0.001 wt% to less than 20 wt%. The hard surface cleaning composition comprises the antimicrobial agent at a level of from 0.05 wt% to 1.8 wt%, preferably from 0.1 wt% to 1.75 wt%, more preferably from 0.12 % to 1.5 by weight of the composition, for improved shine in addition to germicidal efficacy.

[0046] A germicidally effective amount of the antimicrobial agent is considered to result in at least a log 5 reduction of staphylococcus aureus, using the method of EN1276 (Chemical Disinfectants Bactericidal Activity Testing), with a contact time of 5 minutes.

[0047] The antimicrobial agents typically result in reduced shine on the treated surface. It has surprisingly been found

that phosphono alkane carboxylic acid chelants improve the shine of surfaces treated with hard surface cleaning compositions which comprise antimicrobial agents.

Water-soluble organic phosphonic acid or salt thereof:

[0048] Suitable water-soluble organic phosphonic acids or salts thereof can have the formula:

$$R_1N[CH_2PO_3H_2]_2$$

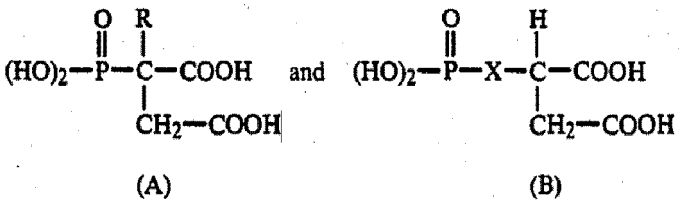
wherein R_1 is:

- [(lower)alkyl]$N[CH_2PO_3H_2]_2$ or salt thereof, or
- [(lower)alkyl]$N[CH_2PO_3H_2]$[(lower)alkyl]$N[CH_2PO_3H_2]_2$ or salt thereof,
- $[CH_2PO_3H_2]$ moiety or salt thereof.

[0049] Preferably, R_1 is -[(lower)alkyl]$N[CH_2PO_3H_2]$[(lower)alkyl]$N[CH_2PO_3H_2]_2$ or salt thereof. Suitable lower alkyl groups include those with the main hydrocarbon chain containing at least 2, preferably 2 to 8, more preferably 2 to 4 carbon atoms, optionally with substituents on the chain selected from alkyl, alkenyl, alkynyl, aryl, aralkyl, and carboxylic and halogenated versions thereof. Most preferably, the (lower)alkyl groups are $-C_2H_4-$ ethyl groups.

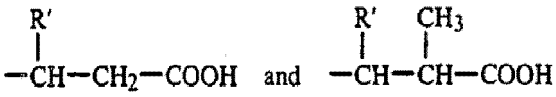
[0050] When present as a salt, alkali metal salts are preferred, especially the sodium or potassium salt. Suitable organic phosphonic acid sodium salts include amino [tri(methylenephosphonic acid)] ($N[CH_2PO_3H_2]_3$) or salt thereof, available from Monsanto as Dequest® 2000, a 50% aqueous solution; ethylenediamine [tetra(methylene-phosphonic acid)] available from Monsanto as Dequest® 2041, a 90% solid acid product, and diethylenetriamine penta(methylene phosphonic acid) (DTPMP).

[0051] Particularly preferred are phosphonocarboxylic acids, or salts thereof, including those of formula (A) and (B):

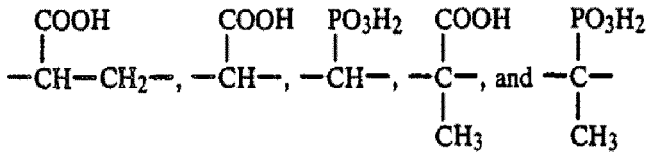


(A) (B)

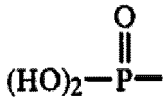
wherein R is hydrogen, alkyl, alkenyl, or alkynyl radical having 1 to 4 carbon atoms, an aryl, cycloalkyl, or aralkyl radical, or the radical selected from the following:



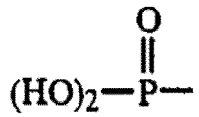
wherein R' is hydrogen, alkyl radical of 1 to 4 carbon atoms, or a carboxyl radical; and X is selected from the following:



wherein the $-PO_3H_2$ group is the phosphono group:



[0052] Suitable Water-soluble organic phosphonic acid or salt thereof include low molecular weight phosphonopolycarboxylic acids such as one having 2-4 carboxylic acid moieties and about 1-3 phosphonic acid groups. Illustrative of specific phosphonocarboxylic acids include 1-phosphono-1-methylsuccinic acid, phosphonosuccinic acid, 1-phosphonopropane-2,3-dicarboxylic acid, 2-phosphonobutane-1,2,4-tricarboxylic acid, α-allyl-phosphonosuccinic acid, α-p-chloro-phenylphosphonosuccinic acid, α-propargyl-phosphonosuccinic acid, α-benzyl-phosphonosuccinic acid, α-cyclohexyl-phoshonosuccinic acid, 2-phosphono-3-(α-methyl-carboxymethyl-hexane-1,2,4-tricarboxylic acid, 2,2-diphosphono-butane-4-dicarboxylic acid, and the like. The preferred phosphonocarboxylic acids are 1-phosphono-1-methylsuccinic acid, phosphonosuccinic acid and 2-phosphonobutane-1,2,4-tricarboxylic acid, in particular, 2-phosphonobutane-1,2,4-tricarboxylic acid (available from Mobay Chemical Corporation, Inorganic Chemicals Division, Pittsburgh, Pa. as Bayhibit AM, a 45-50% aqueous solution). The phosphonocarboxylic acids, which are also typically referred to as phosphonoalkane carboxylic acids and phosphono loweralkane carboxylic acids, contain at least one and preferably one or two phosphono groups:



[0053] Preferably at least two and more preferably two or three carboxylic acid groups, with the main hydrocarbon chain containing at least 2, preferably 2 to 8, more preferably 2 to 4 carbon atoms, optionally with substituents on the chain selected from alkyl, alkenyl, alkynyl, aryl, aralkyl, and carboxylic and halogenated versions thereof.

[0054] The above-mentioned phosphonic acids can also be used in the form of water-soluble acid salts, particularly the alkali metal salts, such as sodium or potassium; the ammonium salts or the alkylol amine salts where the alkylol has 2 to 3 carbon atoms, such as mono-, di-, or tri-ethanolamine salts. If desired, mixtures of the individual phosphonic acids or their acid salts can also be used. Phosphonic acids are discussed in U.S. Pat. No. 4,051,058.

[0055] Preferred water-soluble organic phosphonic acid or salts can be selected from the group consisting of: diethylenetriamine penta(methylene phosphonic acid) (DTPMP), 2-phosphonobutane-1,2,4-tricarboxylic acid, or salts thereof, and mixtures thereof, preferably 2-phosphonobutane-1,2,4-tricarboxylic acid, or salts thereof.

Thickener

[0056] The antimicrobial liquid hard surface cleaning composition may further comprise thickener. Thickener provides a thicker cleaning composition which gives longer contact time and therefore surfactant system penetrates better on greasy soil and/or particulated greasy soil to improve cleaning effectiveness.

[0057] Suitable thickeners are herein include polyacrylate based polymers, preferably hydrophobically modified polyacrylate polymers; hydroxyl ethyl cellulose, preferably hydrophobically modified hydroxyl ethyl cellulose, xanthan gum, hydrogenated castor oil (HCO) and mixtures thereof. Preferred thickeners are polyacrylate based polymers, preferably hydrophobically modified polyacrylate polymers. Preferably a water soluble copolymer based on main monomers acrylic acid, acrylic acid esters, vinyl acetate, methacrylic acid, acrylonitrile and mixtures thereof, more preferably copolymer is based on methacrylic acid and acrylic acid esters having appearance of milky, low viscous dispersion. Most preferred hydrologically modified polyacrylate polymer is Rheovis® AT 120, which is commercially available from BASF.

[0058] Other suitable thickeners are hydroxethylcelluloses (HM-HEC) preferably hydrophobically modified hydroxyethylcellulose. Suitable hydroxethylcelluloses (HM-HEC) are commercially available from Aqualon/Hercules under the product name Polysurf 76® and W301 from 3V Sigma.

[0059] Xanthan gum is one suitable thickener used herein. Xanthan gum is a polysaccharide commonly used rheology modifier and stabilizer. Xanthan gum is produced by fermentation of glucose or sucroce by *the xanthomonas campestris* bacterium. Suitable Xanthan gum is commercially available under trade name Kelzan T® from CP Kelco.

[0060] Hydrogenated castor oil is one suitable thickener used herein. Suitable hydrogenated castor oil is available under trade name TIXCIN R from Elementis.

[0061] Typically, the thickened liquid composition herein comprises from 0.1% to 10.0% by weight of the total composition of said thickener, preferably from 0.2% to 5.0%, more preferably from 0.2% to 2.5% and most preferably from 0.2% to 2.0%.

[0062] Such compositions thypically have a viscosity of from 50 Pa.s to 1000 Pa.s, preferably from 100 Pa.s to 500 Pa.s, more preferably from 150 Pa.s to 350 Pa.s, still more preferably from 150 Pa.s to 300 Pa.s, and most preferably from 150 Pa.s to 250 Pa.s, when measured at 20°C with a AD1000 Advanced Rheometer from Atlas® shear rate 10 s^{-1} with a coned spindle of 40mm with a cone angle 2° and a truncation of ±60μm.

Additional chelating agents

[0063] The antimicrobial liquid hard surface cleaning composition according to the present invention may further comprise an additional chelating agent or mixtures thereof.

[0064] Additional chelating agent can be incorporated in the compositions herein in amounts ranging from 0.05% to 5.0% by weight of the total composition, preferably from 0.1 % to 3.0%, more preferably from 0.2% to 2.0% and most preferably from 0.2% to 0.4%.

[0065] A preferred biodegradable chelating agent for use herein is ethylene diamine N,N'- disuccinic acid, or alkali metal, or alkaline earth, ammonium or substitutes ammonium salts thereof or mixtures thereof. Ethylenediamine N,N'-disuccinic acids, especially the (S,S) isomer have been extensively described in US patent 4, 704, 233, November 3, 1987, to Hartman and Perkins. Ethylenediamine N,N'- disuccinic acids is, for instance, commercially available under the tradename ssEDDS® from Palmer Research Laboratories.

[0066] Most preferred biodegradable chelating agent is L-glutamic acid N,N-diacetic acid (GLDA) commercially available under tradename Dissolvine 47S from Akzo Nobel.

[0067] Suitable amino carboxylates for use herein include ethylene diamine tetra acetates, diethylene triamine pentaacetates, diethylene triamine pentaacetate (DTPA), N-hydroxyethylethylenediamine triacetates, nitrilotriacetates, ethylenediamine tetrapropionates, triethylenetetraaminehexa-acetates, ethanoldiglycines, and methyl glycine diacetic acid (MGDA), both in their acid form, or in their alkali metal, ammonium, and substituted ammonium salt forms. Particularly suitable amino carboxylate to be used herein is propylene diamine tetracetic acid (PDTA) which is, for instance, commercially available from BASF under the trade name Trilon FS® and methyl glycine di-acetic acid (MGDA). Most preferred aminocarboxylate used herein is diethylene triamine pentaacetate (DTPA) from BASF.

[0068] Further carboxylate chelating agents for use herein include salicylic acid, aspartic acid, glutamic acid, glycine, malonic acid or mixtures thereof.

Polymers

[0069] The antimicrobial liquid hard surface cleaning composition according to the present invention may further comprise a polymer as highly preferred optional ingredient. It has been found that the presence of a specific polymer as described herein, when present, allows further improving the grease removal performance of the liquid composition due to the specific sudsing/foaming characteristics they provide to said composition. Suitable polymers for use herein are disclosed in co-pending EP patent application EP2272942 (09164872.5) and granted European patent EP2025743 (07113156.9).

[0070] The polymer can be selected from the group consisting of: a vinylpyrrolidone homopolymer (PVP); a polyethyleneglycol dimethylether (DM-PEG); a vinylpyrrolidone/dialkylaminoalkyl acrylate or methacrylate copolymers; a polystyrenesulphonate polymer (PSS); a poly vinyl pyridine-N-oxide (PVNO); a polyvinylpyrrolidone/ vinylimidazole copolymer (PVP-VI); a polyvinylpyrrolidone/ polyacrylic acid copolymer (PVP-AA); a polyvinylpyrrolidone/ vinylacetate copolymer (PVP-VA); a polyacrylic polymer or polyacrylicmaleic copolymer; and a polyacrylic or polyacrylic maleic phosphono end group copolymer; and mixtures thereof. Typically, the liquid composition herein may comprise from 0.005% to 5.0% by weight of the total composition of said polymer, preferably from 0.10% to 4.0%, more preferably from 0.1 % to 3.0% and most preferably from 0.20% to 1.0%.

Branched fatty alcohol

[0071] The hard surface cleaning compositions of the present invention may comprise a branched fatty alcohol, or mixtures thereof as a highly preferred optional ingredient. Suitable branched fatty alcohols to be used in the present invention are the 2-alkyl alkanols having an alkyl chain comprising from 6 to 16, preferably from 7 to 13, more preferably from 8 to 12, most preferably from 8 to 10 carbon atoms and a terminal hydroxy group, said alkyl chain being substituted in the α position (i.e., position number 2) by an alkyl chain comprising from 1 to 10, preferably from 2 to 8 and more preferably 4 to 6 carbon atoms. Typically, the liquid composition herein may comprise up to 2.0% by weight of the total composition of said branched fatty alcohol, preferably from 0.10% to 1.0%, more preferably from 0.1% to 0.8% and most preferably from 0.1% to 0.5%.

Solvent

[0072] The hard surface cleaning compositions of the present invention may comprise a solvent or mixtures thereof as a preferred optional ingredient. Suitable solvent is selected from the group consisting of: ethers and diethers having from 4 to 14 carbon atoms; glycols or alkoxylated glycols; alkoxylated aromatic alcohols; aromatic alcohols; alkoxylated aliphatic alcohols; aliphatic alcohols; C_8-C_{14} alkyl and cycloalkyl hydrocarbons and halohydrocarbons; C_6-C_{16} glycol

ethers; terpenes; and mixtures thereof.

Perfumes

[0073] The hard surface cleaning compositions of the present invention may comprise a perfume or a mixture thereof as a highly preferred optional ingredient. Suitable perfumes for use herein include materials which provide an olfactory aesthetic benefit and/or cover any "chemical" odour that the product may have.

Other optional ingredients:

[0074] The hard surface cleaning compositions according to the present invention may comprise a variety of other optional ingredients depending on the technical benefit aimed for and the surface treated. Suitable optional ingredients for use herein include builders, buffers, colorants, stabilisers, radical scavengers, abrasives, soil suspenders, dye transfer agents, brighteners, anti dusting agents, dispersants, dye transfer inhibitors, pigments, silicones and/or dyes.

The method of treating a surface

[0075] The present invention encompasses a method for treating a surface with an antimicrobial liquid composition according to the present invention. Suitable surfaces herein are described herein above.

[0076] In a preferred embodiment said surface is contacted with the composition according to the present invention, preferably wherein said composition is applied onto said surface.

[0077] The method can comprise the steps of dispensing (e.g., by spraying, pouring, squeezing) the liquid composition according to the present invention from a container containing said liquid composition and thereafter cleaning said surface.

[0078] The composition may be applied to the hard surface to be treated in its neat form or in its diluted form.

[0079] By "diluted form", it is meant herein that said liquid composition is diluted by the user typically with water. The composition is diluted prior to use to a typical dilution level of 10 to 400 times its weight of water, preferably from 10 to 200 and more preferably from 10 to 100. A usually recommended dilution level is from 1.2% to 1.5% dilution of the composition in water, for concentrated compositions recommended dilution level is from 0.4% to 0.6% dilution of the composition in water.

[0080] The liquid composition can be poured onto said hard surface. More preferably, said liquid composition is poured in its neat form onto said hard surface.

[0081] By "in its neat form", it is to be understood that said liquid composition is applied directly onto the surface to be treated without undergoing any dilution, i.e., the liquid composition herein is applied onto the hard surface as described herein.

[0082] The hard surface to be treated can be inclined or vertical. Inclined or vertical hard surfaces include mirrors, lavatory pans, urinals, drains, waste pipes and the like. Alternatively, the hard surface can be horizontal, such as floors and counter tops.

[0083] Suitable methods of cleaning the hard surface can include the steps of applying, preferably spraying, said liquid composition onto said hard surface, leaving said liquid composition to act onto said surface for a period of time to allow said composition to act, preferably without applying mechanical action, and optionally removing said liquid composition, preferably removing said liquid composition by rinsing said hard surface with water and/or wiping said hard surface with an appropriate instrument, e.g., a sponge, a paper or cloth towel and the like.

[0084] The hard surfaces to be treated are preferably soiled with a greasy soil (e.g., greasy soap scum, body grease, kitchen grease, particulate greasy soils, and the like).

Methods:

A) pH measurement:

[0085] The pH is measured on the neat composition, at 25°C, using a Sartarius PT-10P pH meter with gel-filled probe (such as the Toledo probe, part number 52 000 100), calibrated according to the instructions manual.

B) Shine test for floor cleaning:

[0086] The composition was diluted to a level of 0.48 wt% using water having a hardness of 0.93 mmol/l. Black glossy tiles (20cm x 25 cm reference H07300 Sphinx ceramic tiles) are soaked in a nil-polymer APC solution overnight, rinsed and dried. The tiles are sprayed with a soil blend comprising vegetable oil, polymerized vegetable oil, sugar and house dust (18:2:29:51 blend in isopropanol alcohol) until 0.015 g of the soil has been applied and the tile dried. The tiles are

then cleaned using a non-woven cloth soaked in the diluted cleaning solution, first horizontally, then vertically, and then again horizontalty. The cloth is then rinsed in the diluted cleaning solution, and the tiles cleaned in the same manner, using the other side of the nonwoven cloth.

[0087] The tiles are then graded using the grading scale described below, versus tiles cleaned using the reference composition. A positive value means improved shine versus the reference, a negative value means worse shine versus the reference.

PSUScale (average of 3 graders):

[0088]

0 = I see no difference
1 = I think there is difference
2 = I am sure there is a slight difference
3 = I am sure there is a difference
4 = I am sure there is a big difference

EXAMPLES

[0089] Examples 1 was prepared as a formulae of the present invention. Example 1 comprised 1.95 wt% of an ethoxylated nonionic surfactant and 0.30 wt% of amine oxide surfactant, didecyl dimethyl ammonium chloride as the antimicrobial agent, and 1,2,4-butanetricarboxylic acid, 2-phosphono-sodium salt as the chelant. Example 2 was prepared as a formulae of the present invention, with the same ingredients, at the same level as example 1, except that diethylenetriamine penta(methylene phosphonic acid) (DTPMP) was used as the chelant. Comparative example A was formulated with the same ingredients, at the same level as example 1, except that diethylene triamine pentaacetic acid was used as the chelant. A shine tests were run using water having a hardness of 0.93 mmol/l, with comparative example A as the reference.

	Ex 1 wt%	Ex 2 wt%	Ex A* wt%
C9/11 EO8	1.95	1.95	1.95
C12-14 Amine Oxide	0.30	0.30	0.30
Sodium Carbonate	0.50	0.50	0.50
Citric Acid	0.20	0.20	0.20
Sodium Hydroxide	0.1125	0.1125	0.1125
Monoethanolamine	0.40	0.40	0.40
Didecyl dimethyl ammonium chloride[2]	0.125	0.125	0.125
1,2,4-butanetricarboxylic acid, 2-phosphono-, sodium salt[3]	0.10	-	-
DTPMP[4]	-	0.10	
DTPA[5]	-	-	0.10
Perfume	0.50	0.50	0.50
Minors and Water	to 100%	to 100%	to 100%
pH	11.10	11.10	11.10
Shine (ΔPSU)	+3.1	+3.1	Ref

* Comparative
[1] Available from Huntsman
[2] Bardac™ 2280, available from Lonza
[3] BayHibit™ AM, available from LanXESS
[4] Diethylenetriamine penta(methylene phosphonic acid)-sodium salt, available from Giovanni Bozzetto SPA
[5] Diethylene triamine pentaacetic acid commercially available form Dow chemical

[0090] Examples 3 was prepared as a formulae of the present invention. Example 3 comprised no amine oxide and higher levels of C9/11 EO8 in order to provide the composition with the same level of surfactant as example 1. Comparative example B was formulated with the same ingredients, at the same level as example 3, except that diethylene triamine pentaacetic acid was used as the chelant. A shine tests were run using water having a hardness of 0.93 mmol/l, with comparative example B as the reference.

	Ex 3 wt%	Ex B* wt%
Nonionic C9/11 EO8	2.25	2.25
C12-14 Amine Oxide	-	-
Sodium Carbonate	0.50	0.50
Citric Acid	0.20	0.20
Sodium Hydroxide	0.1125	0.1125
Monoethanolamine	0.40	0.40
Didecyl dimethyl ammonium chloride[2]	0.125	0.125
1,2,4-butanetricarboxylic acid, 2-phosphono-, sodium salt[3]	0.10	-
DTPA[5]	-	0.10
Perfume	0.50	0.50
Minors and Water	to 100%	to 100%
pH	11.10	11.10
Shine (ΔPSU)	+2.2	ref

[0091] As can be seen from the shine results, the compositions of inventive examples 1 to 3 provide improved shine, in comparison to the composition comprising the alternative chelant (comparative examples A and B respectively). As can be seen from the comparative tests, the improvement is particularly large when the composition comprises both alkoxylated nonionic surfactant and amine oxide surfactant.

[0092] The antimicrobial efficacy delivered by examples 1 to 3 was assessed using the method of EN1276 (Chemical Disinfectants Bactericidal Activity Testing), using a contact time of 4 minutes. All products delivered a log kill > 5, indicating that the compositions of the present invention provided the desired antimicrobial efficacy.

[0093] The following are exemplary formulae of the present invention, which can be applied to hard surfaces in both neat and diluted form.

	Ex 4 wt%	Ex 5 wt %	Ex 6 wt%	Ex 7 wt%	Ex 8 wt %
Amine Oxide C12/14[1]	0.5	-	3.0	1.75	2.25
Nonionic C9/11 EO8	-	-	-	5.25	6.75
Nonionic C10 EO8[6]	1.95	3.80	-	-	-
50:50 Blend of alkyl dimethyl benzyl ammonium chloride and alkyl dimethyl ethylbenzyl ammonium chloride[7]	0.15	-	0.18		-
Didecyl dimethyl ammonium chloride[2]	-	0.25	-	0.5	0.7
Citric acid	0.2	0.2	0.15	0.3	0.3
Sodium carbonate	0.7	0.5	0.55	0.8	0.4
Monoethanolamine	0.2	0.3	0.35	0.4	0.4
n-BPP[8]	-	-	-	-	2.0
1,2,4-butanetricarboxylic acid, 2-phosphono-, sodium salt[3]	0.2	0.15	0.2	0.25	0.3

(continued)

	Ex 4 wt%	Ex 5 wt %	Ex 6 wt%	Ex 7 wt%	Ex 8 wt %
PDMS	-	-	-	0.006	0.006
Rheovis AT 120[9]	-	-	-	-	1.15
Perfume	0.3	0.5	0.6	0.8	0.7
pH (trimmed with NaOH)	11.1	10.6	10.8	11.0	11.1
[6] Marlipal™ 10/8, straight chain ethoxylated nonionic surfactant, supplied by Sasol [7] Barquat™ 4280Z, available from Lonza [8] N-Butoxypropoxypropanol [9] Rheovis™ AT-120, HASE thickener supplied by BASF					

[0094] The dimensions and values disclosed herein are not to be understood as being strictly limited to the exact numerical values recited. Instead, unless otherwise specified, each such dimension is intended to mean both the recited value and a functionally equivalent range surrounding that value. For example, a dimension disclosed as "40 mm" is intended to mean "about 40 mm".

Claims

1. An antimicrobial liquid hard surface cleaning composition comprising:

a) a surfactant system, the surfactant system comprising nonionic surfactant;
b) from 0.05 wt% to 1.8 wt% of an antimicrobial agent, wherein the antimicrobial agent is a quaternary ammonium compound selected from the group consisting of: didecyl dimethyl ammonium chloride, a blend of alkyl dimethyl benzyl ammonium chloride and alkyl dimethyl ethylbenzyl ammonium chloride, and mixtures thereof; and
c) a chelant selected from the group consisting of:

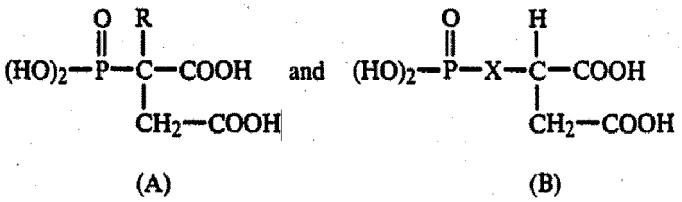
i. water-soluble organic phosphonic acids or salts thereof can have the formula:

$$R_1N[CH_2PO_3H_2]_2$$

wherein R_1 is a:

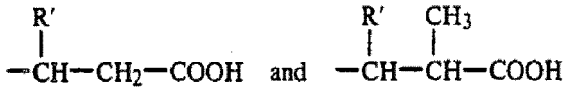
- $[(lower)alkyl]N[CH_2PO_3H_2]_2$ or salt thereof, or
- $[(lower)alkyl]N[CH_2PO_3H_2][(lower)alkylene]N[CH_2PO_3H_2]_2$ or salt thereof, or
- $[CH_2PO_3H_2]$ moiety or salt thereof;

ii. phosphonocarboxylic acids, or salts thereof, including those of formula (A) and (B):

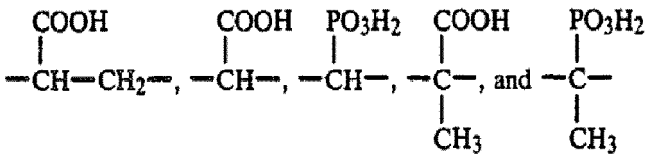


(A) (B)

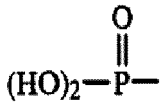
wherein R is hydrogen, alkyl, alkenyl, or alkynyl radical having 1 to 4 carbon atoms, an aryl, cycloalkyl, or aralkyl radical, or the radical selected from the following:



wherein R' is hydrogen, alkyl radical of 1 to 4 carbon atoms, or a carboxyl radical; and X is selected from the following:



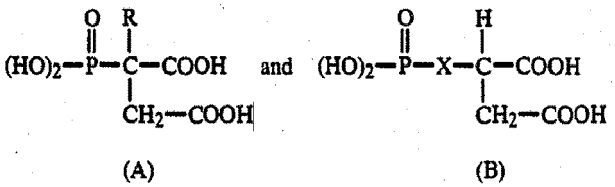
wherein the -PO_3H_2 group is the phosphono group:



;

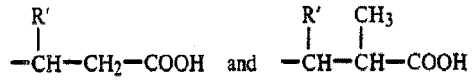
iii. and mixtures thereof.

2. The antimicrobial liquid hard surface cleaning composition according to claim 1, wherein the chelant is selected from phosphonocarboxylic acids of formula (A) and (B), or their salts:

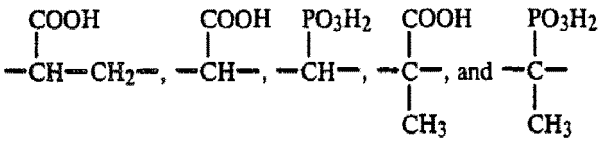


(A) (B)

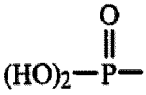
wherein R is hydrogen, alkyl, alkenyl, or alkynyl radical having 1 to 4 carbon atoms, an aryl, cycloalkyl, or aralkyl radical, or the radical selected from the following:



wherein R' is hydrogen, alkyl radical of 1 to 4 carbon atoms, or a carboxyl radical; and X is selected from the following:



wherein the -PO3H2 group is the phosphono group:



3. The antimicrobial liquid hard surface cleaning composition according to any preceding claims, wherein the chelant

is selected from the group consisting or: diethylenetriamine penta(methylene phosphonic acid) (DTPMP), α-methylphosphonosuccinic acid, phosphonosuccinic acid, 1-phosphonopropane-2,3-dicarboxylic acid, 2-phosphonobutane-1,2,4-tricarboxylic acid, α-allyl-phosphonosuccinic acid, α-p-chloro-phenylphosphonosuccinic acid, α-propargyl-phosphonosuccinic acid, a-benzyl-phosphonosuccinic acid, α-cyclohexyl-phoshonosuccinic acid, 2-phosphono-3-(α-methyl-carboxymethyl-hexane-1,2,4-tricarboxylic acid, 2,2-diphosphono-butane-4-dicarboxylic acid, their salts, and mixtures thereof.

4. The antimicrobial liquid hard surface cleaning composition according to claim 3, wherein the chelant is selected from the group consisting of: diethylenetriamine penta(methylene phosphonic acid) (DTPMP), 2-phosphonobutane-1,2,4-tricarboxylic acid, or salts thereof, and mixtures thereof, preferably 2-phosphonobutane-1,2,4-tricarboxylic acid, or salts thereof.

5. The antimicrobial liquid hard surface cleaning composition according to any preceding claims, wherein the composition comprises 1.0% to 20.0% by weight of a surfactant system.

6. The antimicrobial liquid hard surface cleaning composition according to any preceding claims, wherein the surfactant system comprises surfactant selected from the group consisting of:

alkoxylated nonionic surfactant, amine oxide surfactant, and mixtures thereof.

7. The antimicrobial liquid hard surface cleaning composition according to claim 6, wherein the surfactant system comprises amine oxide surfactant at a level of up to 10%, preferably from 0.1 to 7.0%, more preferably from 0.15% to 3.0%, most preferably from 0.3% to 3.0% by weight of the total composition.

8. The antimicrobial liquid hard surface cleaning composition according to any of claims 6 or 7, wherein the surfactant system comprises alkoxylated nonionic surfactant, preferably ethoxylated nonionic surfactant, at a level of from 1% to 10%, preferably from 1.5% to 8%, more preferably from 2% to 7% and most preferably from 2% to 6% by weight of the total composition.

9. The antimicrobial liquid hard surface cleaning composition according to any preceding claims, wherein the composition comprises less than 2.0 wt%, preferably less than 1.0 wt% of an anionic surfactant, more preferably less than 0.1 wt% of anionic surfactant.

10. The antimicrobial liquid hard surface cleaning composition according to any preceding claims having pH of from 9 to 12, preferably from 9.5 to 11.5, more preferably from 10.0 to 11.0.

11. The antimicrobial liquid hard surface cleaning composition according to any preceding claims, wherein the composition comprises thickener selected from the group consisting of:

polyacrylate based polymers; hydroxyl ethyl cellulose, xanthan gum, hydrogenated castor oil (HCO) and mixtures thereof.

12. The antimicrobial liquid hard surface cleaning composition according to claim 11, wherein the composition has a viscosity of from 50 Pa.s to 1000 Pa.s, preferably from 100 Pa.s to 500 Pa.s, more preferably from 150 Pa.s to 350 Pa.s, still more preferably from 150 Pa.s to 300 Pa.s, and most preferably from 150 cps to 250 Pa.s, when measured at 20°C with a AD1000 Advanced Rheometer from Atlas® shear rate 10 s^{-1} with a coned spindle of 40mm with a cone angle 2° and a truncation of $\pm 60\mu m$.

13. The antimicrobial liquid hard surface cleaning composition according to any of the preceding claims, whereas said cleaning composition is loaded on a cleaning substrate, whereas the substrate is a paper or nonvowen towel or wipe or a sponge.

14. The use of aphosphonocarboxylic acid or salt thereof, in an antimicrobial liquid hard surface cleaning composition according to any preceding claim, for improving shine of a hard surface.

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EUROPEAN SEARCH REPORT

Application Number
EP 17 15 0033

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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	5 July 2017	Bertran Nadal, Josep

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