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(54) CLEANING EFFICACY OF METAL-SAFE SOLID FOR AUTOMATED INSTRUMENT PROCESSING

REINIGUNGSWIRKSAMKEIT EINES METALLSICHEREN FESTSTOFFES FÜR AUTOMATISIERTE INSTRUMENTENVERARBEITUNG

EFFICACITÉ DE NETTOYAGE D’UNE MATIÈRE SOLIDE SANS DANGER POUR LES MÉTAUX POUR LE TRAITEMENT AUTOMATISÉ D’INSTRUMENTS

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(73) Proprietor: **Ecolab USA Inc.
St. Paul, MN 55012 (US)**

(72) Inventors:
- **GERET, Laurence**
  50259 Pulheim (DE)
- **STINGL, Carola**
  40597 Düsseldorf (DE)
- **PATHICHERIL, Beana**
  40231 Düsseldorf (DE)
- **KURZAWE, Christoph**
  40223 Düsseldorf (DE)
- **PORTER, Matt**
  West St. Paul, Minnesota 55118 (US)
- **LUBICH, Jill**
  Woodbury, Minnesota 55129 (US)

(74) Representative: **Godemeyer Blum Lenze
Patentanwälte
Partnerschaft mbB - werkpatent
An den Gärten 7
51491 Overath (DE)**

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Description

Field of the Invention

[0001] The invention relates to a solid alkaline concentrated cleaning composition and methods for automated cleaning processing of surfaces with effective cleaning compositions. In particular, the invention relates to solid alkaline concentrated cleaning compositions useful in the cleaning of articles or surfaces, including plastic articles, plastic surfaces, metal articles, metal surfaces, such as surgical, medical, and dental instruments.

Background of the Invention

[0002] Many commercial and domestic articles include surface metal layers. Such articles are known to those skilled in a variety of occupations or domestic activities, particularly those working in industrial plants, hospitals, maintenance and repair services, manufacturing facilities, kitchens, restaurants and the like. Surgical, medical, and dental instruments after use are typically contaminated with blood and other body matter and potentially with infectious microorganisms. Before being reused in a future procedure these instruments must be washed and disinfected where indicated.

[0003] Aqueous alkali cleaners are known as effective cleaning agents. However, many such alkali cleaners have disadvantages when used for automated cleaning processing due to the formation of foam, thus requires the content of additional foam inhibiting agents, which make the composition more complex. The formation of foam lowers the cleaning properties, due to the loss of mechanical agitation. Further, pumping of foam dramatically reduce the liquid flow rates, thus causes dosing and transport problems in the sump, liquid conduits, as well as in the dispensing drawer. Thus, foam is not acceptable in an automated washer.

[0004] Many articles having a surface that requires cleaning contain an alkaline sensitive metal, such as, aluminum or aluminum containing alloys. Exemplary equipment having a surface containing an alkaline sensitive metals include surgical, medical, and dental instruments, sinks, cookware, utensils, machine parts, vehicles, tanker trucks, vehicle wheels, work surfaces, tanks, immersion vessels, spray washers, and ultrasonic baths. Aqueous alkali cleaners are known as effective cleaning agents. However, many alkali cleaners have disadvantages when used on alkaline sensitive metals, such as, aluminum. A problem with using aqueous alkali systems to clean aluminum surfaces is the potential to corrode and/or discolor.

[0005] One particular disadvantage of known commercial concentrated liquid products such as surface cleaners, detergent bleach, automatic instrument and cleaning formulations and the like comprising caustic alkali are hazardous, causes chemical "burns" if splashed onto the skin and causes corrosion of sensitive metal surfaces that come into contact with aqueous alkaline solutions. Further, the known commercial instrument processing liquid concentrated caustic alkali solutions have the disadvantage of transportation and storage because they are bulky. Although said commercial liquid products have an excellent disinfection effects the danger for humans and environment is still considerable, since the commercial products are liquid.

[0006] Solid alkaline cleaning compositions comprising an alkaline source and polyethylene glycol are disclosed in WO 2007/131549, WO 2004/085596, US 5756444 and US 3293148.

[0007] It is still a need in prior art to provide a solid concentrated alkaline composition for automated cleaning processing of hard and/or soft surfaces. In particular, it is a need to provide a solid concentrated alkaline composition for automated cleaning processing of metal surface layers to remove blood or other matter are allowed to dry, which is not bulky, avoids the disadvantages of transport and storage of liquids, provides a rapid dissolution in water, and develops after dissolution based on a low active concentration a good cleaning effect. Further, it shows practical no foam formation during the automated processing and prevents corrosion of metal surfaces that are exposed to aqueous alkaline solutions.

Summary of the Invention

[0008] The object of the present invention is to provide a solid alkaline composition for cleaning, comprising $\geq$ 10 wt.-% to $\leq$ 50 wt.-% of at least one alkaline source selected from the group consisting of sodium hydroxide, potassium hydroxide, and lithium hydroxide, $\geq$ 0.5 wt.-% to $\leq$ 20 wt.-% of at least one polyethylene glycol, $\geq$ 2 wt.-% to $\leq$ 10 wt.-% of at least one corrosion inhibitor, and a solvent is added add. 100 wt.-%, wherein the weight ratio of alkaline source to polyethylene glycol is in the range from 20 :1 to 2 :1 and wherein the weight-% of the components are based on the total weight of the composition.

[0009] It has surprisingly found, that the alkaline cleaning composition of the invention is remarkable sensitive to metal articles, metal surfaces, plastic articles and/or plastic surfaces.

[0010] The term "alkaline sensitive metal" identifies those metals that exhibit corrosion and/or discoloration when exposed to an aqueous alkaline solution. An aqueous alkaline solution is an aqueous solution having a pH that is greater than about 8. Exemplary alkaline sensitive metals include soft metals such as aluminum, nickel, tin, zinc,/copper, brass, bronze, and mixtures thereof. Aluminum and aluminum alloys are common alkaline sensitive metals that can be cleaned by the cleaning compositions of the invention.

[0011] References herein to a "solid" composition are to those, which are solid at about 23° C and up to about 60° C. Preferably, the solid composition of the present invention may be form stable and/or rigid.

[0012] A solvent, preferably water, can be added add. 100 wt.-% to the composition of the invention. The solvent content, such as the water content, of the composition according to the invention is simply determined by subtracting the amounts of all the usual ingredients from 100 wt. %.

[0013] The weight-% (wt.-%) of the components are calculated based on the total weight amount of the composition, if not otherwise stated.

[0014] The ratio of components is parts by weight, if not otherwise stated.

[0015] The total amount of all components of the composition does not exceed 100 wt.-%.

[0016] It should be understood that the addition of other surfactants to the solid as well as to the liquid alkaline composition for automated cleaning processing of hard and/or soft surfaces is optional and can be omitted. Preferably, the compositions of the invention are free of other surfactants, except polyethylene glycol.

[0017] It should be understood that the compositions of the invention can be free of a hydrotrope component.

[0018] It should be understood that the compositions of the invention can be free of a zeolite.

[0019] It should be understood that the compositions of the invention can be free of at least one additive, preferably all additives, selected from the group of antimicrobials, fungicides, fragrances, dyes, antistatic agents, UV absorbers, reducing agents and/or buffering compounds.

[0020] The combination of an alkaline source in combination with a polyethylene glycol leads to an increased foam formation, thus not suitable for use in an automated cleaning processing. However, it has been surprisingly found, that at a specific ratio of the alkaline source to the polyethylene glycol provides a low foaming composition suitable for automated cleaning processing of hard and/or soft surfaces, such as metal articles, metal surfaces, plastic articles and/or plastic surfaces.

[0021] The specific ratio of the alkaline source to polyethylene glycol according to the present invention provides a good cleaning effect in combination with low foaming as required for an automated processing of metal articles, metal surfaces, plastic articles and/or plastic surfaces.

[0022] At the time of dissolution with the solvent, such as water, a spontaneous and intensive foam formation in the dispensing draw of an apparatus for cleaning processing as well as in the cleaning chamber is observed, if the ratio or concentration of polyethylene glycol in the solid alkaline composition of the present invention is selected to high. However, if the ratio or concentration of polyethylene glycol is selected too low, the cleaning action is insufficient.

[0023] According to the present invention the weight ratio of alkaline source to polyethylene glycol is in the range from 20:1 to 2:1, preferably about 20:1 to about 5:1, further preferred about 20:1 to about 8:1, also preferred about 18:1 to about 10:1 and in addition preferred about 15:1 to about 12:1.

[0024] Non or practical non foam formation is observed for the compositions according to the present invention, especially in the dispensing draw of an apparatus for cleaning processing as well as in the cleaning chamber.

[0025] Due to none or marginal foam formation the automated pumping flow rate of water-dissolved composition according to the present invention is not affected.

[0026] Further, the cleaning and disinfection action of a solid alkaline composition of the present invention used in an automated washing process is surprisingly good, although the concentration of the polyethylene glycol in the solid alkaline composition of the present invention is relatively low. Especially, body fluids, such as blood, lipids and synovial fluids from joints adhere to the items metal surface used during a procedure. As these fluids dry, the adhesion gets stronger and the fluids get harder to dissolve using ordinary cleaning methods. Blood in particular becomes much more difficult to remove once it has dried. Eventually, the adhesion of the soils becomes too strong for normal detergents to break and the instruments remain soiled after cleaning.

[0027] A problem with using aqueous alkali systems to clean metal surfaces, such as aluminum surfaces is the potential to corrode and/or discolor. Therefore, a corrosion inhibitor is used to prevent corrosion of metal surfaces that are exposed to aqueous alkaline solutions.

[0028] It should be understood that a silicate(s) corrosion inhibitor is optional and can be omitted. Silicates, comprising sodium silicate, have a tendency to begin precipitating from aqueous solution at a pH below 11, thus reducing its effectiveness to prevent corrosion of the contacted surfaces when used in aqueous cleaning solutions having a lower pH. Additionally, when silicates are allowed to dry on the surface to be cleaned, films or spots are often formed, which are visible and which are themselves very difficult to remove. The presence of these silicon-containing deposits can affect the texture of the cleaned surface, the appearance of the surface, and on cooking or storage surfaces, can affect the taste of the materials that come into contact with the cleaned surfaces. Further, the alkaline composition of the invention is found to be a sensitive metal and/or plastic cleaning composition. Thus, the sensitive metal and/or plastic cleaning composition of the invention in use minors or avoids corrosion in such an extent that the addition of silicate(s) corrosion inhibitor is not required.

[0029] However, a silicate(s) corrosion inhibitor can be used in the solid composition according to the present invention. The silicate(s) corrosion inhibitor can be an alkali silicate, particularly preferably crystalline or amorphous alkali disilicates in quantities of about ≥ 0.05 to about ≤ 10, preferably about ≥ 0.1 to about ≤ 5 and more preferred of about ≥ 0.5 to about ≤ 2; wherein the weight-% of the components are based on the total weight of the composition.

[0030] An aqueous alkaline composition having a high pH are often more corrosive than an aqueous composition having a light acidic pH. In order to minimize the potential to corrode and/or discolor the metal surface, the pH of the aqueous alkaline solutions of the solid alkaline composition can be adjusted to a lower pH in the range of about ≥ 11 pH to about ≤ 13 pH.

[0031] The soil removal or cleaning action of an aqueous solution of the solid alkaline composition according to the present invention can be improved by adding at least one sequestering agent to the solid alkaline composition, preferably at least one sequestering agent that exhibits soil removal properties.

Alkaline Source

[0032] The source of alkalinity selected from the group consisting of sodium hydroxide, potassium hydroxide and lithium hydroxide, is the source of alkalinity that is compatible with the other components of the cleaning composition and that will provide the use solution, i.e. concentrated liquid composition as well as the ready-to-use solution with the desired pH.

[0033] The source of alkalinity, may be added to the composition in a variety of forms, including for example in the form of solid beads, dissolved in an aqueous solution or a combination thereof. Alkali metal hydroxides are commercially available as pellets or beads having a mix of particle sizes ranging from 12-100 U. S. mesh, or as an aqueous solution, as for example, as about 45 wt. %, about 50 wt. % and about 73 wt. % solution.

Polyethylene Glycol

[0034] A suitable polyethylene glycol for use in the present invention can have a molecular weight (MW) in the range of about ≥ 4000 to about ≤ 12000, preferably about ≥ 6000 to about ≤ 10000 and more preferred of about ≥ 7000 to about ≤ 8000. Polyethylene glycol that can be used are marketed for example by BASF under the tradename PLURIOL®.

Corrosion Inhibitor

[0035] The corrosion inhibitor can be selected from the group comprising silicate, calcium acetate, calcium chloride, calcium gluconate, calcium phosphate, calcium borate, calcium carbonate, calcium citrate, calcium lactate, calcium sulfate, calcium tartrate, benzotriazole, 1,2,3-benzotriazole and mixtures thereof.

[0036] More preferred, the corrosion inhibitor is a heterocyclic compound, a triazole derivate, such as a benzotriazole or 1,2,3-benzotriazole and mixtures thereof.

[0037] Exemplary silicates include sodium metasilicates, sesquisilicates, orthosilicates, potassium silicates, and mixtures thereof. However, most preferred can be sodium silicate.

[0038] The silicates may comprise at least one crystalline layer-forming silicate of the general formula NaMSixO2x+1.yH2O, wherein M represents sodium or hydrogen, x is a number from about 1.9 to about 22, preferably about 1.9 to about 4 and y stands for a number from about 0 to about 33.

[0039] The crystalline layer-forming silicates of the formula NaMSixO22x+1.yH2O are marketed for example by Clariant GmbH (Germany) under the trade names Na-SKS, eg. Na-SKS-1 (Na2Si22O45.xH2O, Kenyait), Na-SKS-2 (Na2Si14O29.xH2O, Magadiit), Na-SKS-3 (Na2Si8O17.xH2O) or Na-SKS-4 (Na2Si4O9.xH2O, Makatit).

[0040] Crystalline, layered silicates of the above formula, in which x stands for 2, are particularly suitable for the purposes of the present invention.

[0041] Na-SKS-5 (alpha -Na2Si2O5), Na-SKS-7 (beta -Na2Si2O5, Natrosilit), Na-SKS-9 (NaHSi2O5.H2O), Na-SKS-10 (NaHSi2O5.3H2O, Kanemit), Na-SKS-11 (t-Na2Si2O5) and Na-SKS-13 (NaHSi2O5) are most notably suitable, particularly Na-SKS-6 (delta -Na2Si2O5).

[0042] In the context of the present application, silicates can comprise a content by weight of crystalline layered silicates of formula NaMSixO2x+1.yH2O of 0.1 to 20 wt. %, preferably about 0.2 to about 15 wt. % and particularly about 0.4 to about 10 wt. %, each based on the total weight of the corrosion inhibitor agent.

[0043] Particularly preferred are especially those that have a total silicate content about > 0 and below about 7 wt.- %, advantageously below about 6 wt.- %, preferably below about 5 wt.- %, particularly preferably below about 4 wt.- %, quite particularly preferably below about 3 wt. -% and especially below about 2.5 wt.- %, wherein this silicate, based on the total weight of the comprised silicate, is advantageously at least about 70 wt.- %, preferably at least about 80 wt.- % and especially at least about 90 wt.- % of a silicate of the general formula NaMSixO2x+1.yH2O.

[0044] As already mentioned before, it should be understood that a silicate(s) corrosion inhibitor is optional and can be omitted.

[0045] However, other corrosion inhibitors can be suitable added to the solid alkaline composition of this invention include magnesium and/or zinc ions and Ca $(NO_2)_2$. Preferably, the metal ions are provided in water-soluble form.

[0046] Examples of useful water-soluble forms of magnesium and zinc ions are the water-soluble salts thereof including the chlorides, nitrates and sulfates of the respective metals. If any of the alkalinity providing agents are the alkali metal carbonates, bicarbonates or mixtures of such agents, magnesium oxide can be used to provide the Mg ion. The magnesium oxide is water soluble and is a preferred source of Mg ions.

[0047] In order to maintain the dispersibility of the magnesium and/or zinc corrosion inhibitors in aqueous solution, and in the presence of agents which would otherwise cause precipitation of the zinc or magnesium ions, e. g. , carbonates, phosphates, etc. , it might be advantageous to include a carboxylated polymer to the solution.

[0048] The useful carboxylated polymer corrosion inhibitors may be generically categorized as water-soluble carboxylic acid polymers such as polyacrylic and polymethacrylic acids or vinyl addition polymers, in addition to the acid-substituted polymers used in the present invention.

[0049] Of the vinyl addition polymer corrosion inhibitors contemplated, maleic anhydride copolymers as with vinyl acetate, styrene, ethylene, isobutylene, acrylic acid and vinyl ethers are examples.

[0050] The polymers tend to be water-soluble or at least colloidally dispersible in water. The molecular weight of these polymers may vary over a broad range although it is preferred to use polymers having average molecular weights ranging between about 1,000 up to about 1,000, 000. These polymers have a molecular weight of about 100,000 or less and between about 1,000 and about 10,000.

[0051] The polymers or copolymers (either the acid-substituted polymers or other added polymers) may be prepared by either addition or hydrolytic techniques. Thus, maleic anhydride copolymers are prepared by the addition polymerization of maleic anhydride and another comonomer such as styrene.

[0052] The low molecular weight acrylic acid polymer corrosion inhibitors may be prepared by addition polymerization of acrylic acid or its salts either with itself or other vinyl comonomers.

[0053] Alternatively, such polymers may be prepared by the alkaline hydrolysis of low molecular weight acrylonitrile homopolymers or copolymers.

[0054] The corrosion inhibitor can be used in quantities of about ≥ 0 to about ≤ 10, preferably about ≥ 0.05 to about ≤ 5, also preferred about ≥ 0.1 to about ≤ 3 and more preferred of about ≥ 0.5 to about ≤ 2; wherein the weight-% of the components are based on the total weight of the composition.

Threshold Inhibitor/Crystal Modifier

[0055] The solid alkaline composition according to the present invention can comprise at least one threshold inhibitor/crystal modifier. The amount of threshold inhibitor/crystal modifier can be about ≥ 1 wt.-% to about ≤ 15 wt.-%, preferably about ≥ 3 wt.-% to about ≤ 12 wt.-%, further preferred about ≥ 5 wt.-% to about < 16 wt.-%, and more preferred about ≥ 6 wt.-% to about ≤ 8 wt.-%, wherein the weight-% of the components are based on the total weight of the composition.

[0056] The threshold inhibitor/crystal modifier is selected from the group comprising salts of phosphonocarboxylic acids, phosphonates, salts of 1-hydroxyethylidene -1,1,-diphosphonic acid (HEDP), salts of acid substituted polymers, and mixtures thereof. preferably salts of acid substituted polymers of monomers of acrylate, methacrylate, salts of polyitaconic acid, salts of polymaleic acid, and mixtures thereof. In particular preferred are salts of polyacrylic acid.

Sequestering Agent

[0057] The solid alkaline composition according to the present invention can comprise at least one sequestering agent. The amount of sequestering agent can be about ≥ 5 wt.-% to about ≤ 40 wt.-%, preferably about ≥ 10 wt.-% to about ≤ 35 wt.-%, further preferred about ≥ 20 wt.-% to about ≤ 30 wt.-%, and more preferred about ≥ 25 wt.-% to about ≤ 28 wt.-%, wherein the weight-% of the components are based on the total weight of the composition.

[0058] The sequestering agent can be selected from the group of sodium gluconate, pentasodium salt of diethylenetriamine pentaacetic acid, sodium glucoheptonate, salts of ethylene diamine tetraacetic acid, salts of ethylene diamine tetraacetic acid, salts of hydroxyethyl ethylene diamine triacetic acid, salts of hydroxyethyl ethylene diamine triacetic acid, salts of nitrilotriacetic acid, salts of nitrilotriacetic acid, diethanolglycine sodium salt, ethanoldiglycine disodium salt, salts of hydroxymonocarboxylic acid compounds, salts of hydroxydicarboxylic acid compounds, salts of amine containing carboxylic acids, terasodium N,N-bis(carboxylatomethyl)-L-glutamate (GDLA) and mixtures thereof.

[0059] In particular preferred is at least one sequestering agent that exhibits soil removal properties when used at a pH of at least about 10.0. The sequestering agent is provided for tying up metals in the soil to assist in cleaning and detergency. The sequestering agent can be provided as part of the solid alkaline composition. Exemplary sequestering agents that exhibit soil removal properties at a pH of greater than about 10.0 that can be used according to the invention include sodium gluconate, pentasodium salt of diethylenetriamine pentaacetic acid (available under the name Versenex 80), sodium glucoheptonate, ethylene diamine tetraacetic acid (EDTA), salts of ethylene diamine tetraacetic acid, hydroxyethyl ethylene diamine triacetic acid (HEDTA), salts of hydroxyethyl ethylene diamine triacetic acid, nitrilotriacetic acid (NTA), salts of nitrilotriacetic acid, diethanolglycine sodium salt (DEG), ethanoldiglycine disodium salt (EDG), tetrasodium N,N-bis(carboxylatomethyl)-L-glutamate (GLDA), methyl glycine diacetic acid (MGDA)and mixtures thereof. Exemplary salts of ethylene diamine tetraacetic acid include disodium salts, tetrasodium salts, diammonium salts, and trisodium salts. An exemplary salt of hydroxyethyl ethylene diamine triacetic acid is the trisodium salt.

[0060] It should be understood that the sequestering agent can include mixtures of different sequestering agents.

Solvents

[0061] Suitable solvents include, water, alcohols, glycols, glycol ethers, esters, or combinations thereof. Suitable alcohols include, ethanol, isopropanol (propan-2-ol), 2-butoxy ethanol (butyl glycol), 1-decanol, benzyl alcohol, glycerin, monoethanolamine (MEA) or combinations thereof.

[0062] Suitable glycols include, ethylene glycol (monoethylene glycol or MEG), diethylene glycol (propylene glycol or butoxy diglycol or DEG), triethylene glycol (TEG), tetraethylene glycol (TETRA EG), glycerin, propylene glycol, dipropylene glycol, hexylene glycol, or combinations thereof. Preferably the composition comprises at least two solvents and more preferred the composition comprises water and hexylene glycol.

Solid Alkaline Composition

[0063] According to one embodiment of the invention, the solid alkaline composition comprises:

- - ≥ 10 wt.-% to ≤ 50 wt.-%, preferably about ≥ 15 wt.-% to about ≤ 45 wt.-%, further preferred about ≥ 20 wt.-% to about ≤ 40 wt.-%, also preferred about ≥ 25 wt.-% to about ≤ 38 wt.-% and more preferred about ≥ 30 wt.-% to about ≤ 36 wt.-%, of at least one alkaline source selected from the group consisting of sodium hydroxide, potassium hydroxide and lithium hydroxide;
- - ≥ 0.5 wt.-% to ≤ 20 wt.-%, preferably about ≥ 1 wt.-% to about ≤ 18 wt.-%, further preferred about ≥ 2 wt.-% to about < 16 wt.-%, and more preferred about ≥ 5 wt.-% to about ≤ 10 wt.-%, of at least one polyethylene glycol; and
- - ≥ 2 wt.-% to ≤ 10 wt.-%, preferably about ≥ 3 wt.-% to about ≤ 9 wt.-%, further preferred about ≥ 4 wt.-% to about ≤ 8 wt.-%, and more preferred about ≥ 5 wt.-% to about ≤ 6 wt.-%, of at least one corrosion inhibitor, preferably the corrosion inhibitor is not a silicate; and a solvent, preferably water, is added add. 100 wt.-%; wherein the weight-% of the components are based on the total weight of the composition.

[0064] According to another embodiment of the invention, the solid alkaline composition can comprise:

- ≥ 10 wt.-% to ≤ 50 wt.-%, preferably about ≥ 15 wt.-% to about ≤ 45 wt.-%, further preferred about ≥ 20 wt.-% to about ≤ 40 wt.-%, and more preferred about ≥ 25 wt.-% to about ≤ 35 wt.-%, of at least one alkaline metal selected from the group consisting of sodium hydroxide, potassium hydroxide and lithium hydroxide, preferably sodium hydroxide;
- ≥ 0.5 wt.-% to ≤ 20 wt.-%, preferably about ≥ 1 wt.-% to about ≤ 18 wt.-%, further preferred about ≥ 2 wt.-% to about < 16 wt.-%, and more preferred about ≥ 5 wt.-% to about ≤ 10 wt.-%, of at least one polyethylene glycol, preferably a polyethylene glycol with a MW in the range of 4.000 to 12.000;
- ≥ 2 wt.-% to ≤ 10 wt.-%, preferably about ≥ 3 wt.-% to about ≤ 9 wt.-%, further preferred about ≥ 4 wt.-% to about ≤ 8 wt.-%, and more preferred about ≥ 5 wt.-% to about ≤ 6 wt.-%, of at least one corrosion inhibitor, preferably the corrosion inhibitor is a heterocyclic compound and more preferred a benzotriazol;
- about ≥ 1 wt.-% to about ≤ 15 wt.-%, preferably about ≥ 5 wt.-% to about ≤ 10 wt.-%, and more preferred about ≥ 6 wt.-% to about ≤ 8 wt.-% of at least one threshold inhibitor/crystal modifier selected from the group consisting of salts of phosphonocarboxylic acids, phosphonates, salts of 1-hydroxyethylidene-1,1-diphosphonic acid (HEDP), salts of acid substituted polymers, and mixtures thereof, preferably the threshold inhibitor/crystal modifier is a salt of a polyacrylic acid; and
- about ≥ 5 wt.-% to about ≤ 40 wt.-%, preferably about ≥ 15 wt.-% to about ≤ 30 wt.-%, and more preferred about ≥ 25 wt.-% to about ≤ 28 wt.-% of at least one sequestering agent, preferably the sequestering agent is a salt of an amine containing carboxylic acid; a solvent, preferably water, is added add. 100 wt.-%; wherein the weight-% of the components are based on the total weight of the composition.

Liquid Alkaline Composition

[0065] Another object of the present invention is directed to a liquid alkaline composition obtained from the solid alkaline composition of the invention. The cleaning compositions according to the invention can take the form of a single concentrate or multiple concentrates that can be diluted and combined to provide a ready-to-use solution, and as a ready-to-use liquid composition that can be used to clean articles having a metal surface, such as surgical, medical, and dental instruments, including endoscopes.

[0066] The solution can be in the form of a concentrate that can be diluted with a solvent, such as water, to provide a ready-to-use solution that can be used for cleaning applied to articles having a metal surface, such as surgical, medical, and dental instruments.

[0067] In addition, the solutions can be provided as a relatively dilute solution that can be, without the addition of water, to provide an organic ready-to use solution, for example an alcohol based ready-to use solution, that can be for cleaning applied to articles having a metal surface, such as surgical, medical, and dental instruments.

[0068] It is advantageous to provide the solution as a concentrate and then to dilute the concentrate at the situs of use in order to decrease transportation costs associated with transporting large amounts of solvent, such as water.

[0069] The concentrate liquid composition and/or the ready-to-use solution can be used in an automated washing process for cleaning and disinfection metal surfaces, in particular metal surfaces of surgical, medical, and dental instruments including endoscopes, from body fluids, such as blood, lipids, contrast agent and synovial fluids from joints adhere to the metal surface used during a procedure.

Concentrated Alkaline Liquid Composition

[0070] The source of alkalinity and addition of the solvent, preferably water, are provided so that the concentrated, preferably aqueous, liquid composition of the solid alkaline composition according to the present invention may have a pH in the range of about 12 pH to about 14 pH, preferably a pH in the range of about 12.5 pH to about 13.5 pH and more preferred a pH of about 13 pH.

[0071] The weight ratio of the solvent, preferably water, to solid, to provide a concentrated liquid composition, preferably an aqueous solution, of the solid alkaline composition can be in the range of from about 200 : 1 to about 10 : 1, preferably about 100 : 1 to about 12 : 1, further preferred about 50 : 1 to about 15 : 1, also preferred about 40 : 1 to about 17 : 1 and in particular preferred about 30 : 1 to 20 : 1.

[0072] According to one embodiment of the invention, the alkaline concentrated liquid composition can comprise:

- about ≥ 0.05 wt.-% to about ≤ 5 wt.-%, preferably about ≥ 0.3 wt.-% to about ≤ 3.75 wt.-%, further preferred about ≥ 0.8 wt.-% to about ≤ 2.6 wt.-%, and more preferred about ≥ 1 wt.-% to about ≤ 2 wt.-%, of at least one alkaline source selected from the group consisting of sodium hydroxide, potassium hydroxide and lithium hydroxide,
- about ≥ 0.0025 wt.-% to about ≤ 2 wt.-%, preferably about ≥ 0.01 wt.-% to about ≤ 1.5 wt.-%, further preferred about ≥0.04 wt.-% to about ≤ 0.5 wt.-%, and more preferred about ≥ 0.08 wt.-% to about ≤ 0.2 wt.-%, of at least one polyethylene glycol;
- about ≥ 0.01 wt.-% to about ≤ 1 wt.-%, preferably about ≥ 0.03 wt.-% to about ≤ 0.75 wt.-%, further preferred about ≥ 0.08 wt.-% to about ≤ 0.5 wt.-%, and more preferred about ≥ 0.16 wt.-% to about ≤ 0.3 wt.-%, of at least one corrosion inhibitor; and
- a solvent, preferably water, is added add 100 wt.-%; wherein the weight-% of the components are based on the total weight of the composition.

[0073] According to another embodiment of the invention, the alkaline concentrated liquid composition can comprise:

- about ≥ 0.05 wt.-% to about ≤ 5 wt.-%, preferably about ≥ 0.3 wt.-% to about ≤ 3.75 wt.-%, further preferred about ≥ 0.8 wt.-% to about ≤ 2.6 wt.-%, and more preferred about ≥ 1 wt.-% to about < 2 wt.-%, of at least one alkaline source selected from the group consisting of sodium hydroxide, potassium hydroxide and lithium hydroxide, preferably sodium hydroxide;
- about ≥ 0.0025 wt.-% to about ≤ 2 wt.-%, preferably about ≥ 0.01 wt.-% to about ≤ 1.5 wt.-%, further preferred about ≥0.04 wt.-% to about ≤ 0.5 wt.-%, and more preferred about ≥ 0.08 wt.-% to about ≤ 0.2 wt.-%, of at least one polyethylene glycol, preferably a polyethylene glycol with a MW in the range of about 4000 to about 12000;
- about ≥ 0.01 wt.-% to about ≤ 1 wt.-%, preferably about ≥ 0.03 wt.-% to about ≤ 0.75 wt.-%, further preferred about ≥ 0.08 wt.-% to about ≤ 0.5 wt.-%, and more preferred about ≥ 0.16 wt.-% to about ≤ 0.3 wt.-%, of at least one corrosion inhibitor, preferably the corrosion inhibitor is a heterocyclic compound and more preferred a benzotriazol;
- about ≥ 0.005 wt.-% to about ≤ 1.5 wt.-%, preferably about ≥ 0.05 wt.-% to about ≤ 0.8 wt.-%, further preferred about ≥0.08 wt.-% to about ≤ 0.5 wt.-% and more preferred about ≥ 0.1 wt.-% to about ≤ 0.3 wt.-% of at least one threshold

inhibitor/crystal modifier selected from the group consisting of salts of phosphonocarboxylic acids, phosphonates, salts of 1-hydroxyethylidene-1,1-diphosphonic acid (HEDP), salts of acid substituted polymers, and mixtures thereof, preferably the threshold inhibitor/crystal modifier is a salt of a polyacrylic acid;
- about ≥ 0.025 wt.-% to about ≤ 4 wt.-%, preferably about ≥ 0.15 wt.-% to about ≤ 2.5 wt.-%, further preferred about ≥ 0.4 wt.-% to about ≤ 2 wt.-% and more preferred about ≥ 0.8 wt.-% to about ≤ 1.5 wt.-% of at least one sequestering agent, preferably the sequestering agent is a salt of an amine containing carboxylic acid; and
- a solvent, preferably water, is added add 100 wt.-%; wherein the weight-% of the components are based on the total weight of the composition.

Readv-To-Use Solution

[0074] The source of alkalinity and addition of solvent, preferably water, are provided so that the aqueous ready-to-use solution of the solid alkaline composition according to the present invention may have a pH in the range of about ≥10 pH to about ≤ 11.5 pH and preferably a pH in the range of about ≥ 10.5 pH to about ≤ 11 pH.

[0075] The ratio of the solvent, preferably water, to solid, to provide a ready-to-use solution, preferably an aqueous solution, of the solid alkaline composition can be in the range of from about 5000 : 1 to about 100 : 1, preferably about 4000 : 1 to about 300 : 1, further preferred about 3000 : 1 to about 500 : 1, also preferred about 2500 : 1 to about 750 : 1 and in particular preferred about 2000 : 1 to about 1000 : 1.

[0076] According to one embodiment of the invention, the ready-to-use solution can comprise:

- about ≥ 0.001 wt.-% to about ≤ 0.1 wt.-%, preferably about ≥ 0.002 wt.-% to about ≤ 0.08 wt.-%, further preferred about ≥ 0.003 wt.-% to about ≤ 0.05 wt.-%, and more preferred about ≥ 0.004 wt.-% to about ≤ 0.03 wt.-%, of at least one alkaline source selected from the group consisting of sodium hydroxide, potassium hydroxide and lithium hydroxide,
- about ≥ 0.00008 wt.-% to about ≤ 0.005 wt.-%, preferably about ≥ 0.0001 wt.-% to about ≤ 0.003 wt.-%, further preferred about ≥ 0.00015 wt.-% to about ≤ 0.001 wt.-%, and more preferred about ≥ 0.0002 wt.-% to about ≤ 0.0008 wt.-%, of at least one polyethylene glycol;
- about ≥ 0.0001 wt.-% to about ≤ 0.005 wt.-%, preferably about ≥ 0.0003 wt.-% to about ≤ 0.004 wt.-%, further preferred about ≥ 0.0004 wt.-% to about ≤ 0.003 wt.-%, and more preferred about ≥ 0.0005 wt.-% to about ≤ 0.002 wt.-%, of at least one corrosion inhibitor; and
- a solvent, preferably water, is added add 100 wt.-%; wherein the weight-% of the components are based on the total weight of the composition.

[0077] According to another embodiment of the invention, the ready-to-use solution can comprise:

- about ≥ 0.001 wt.-% to about ≤ 0.1 wt.-%, preferably about ≥ 0.002 wt.-% to about ≤ 0.08 wt.-%, further preferred about ≥ 0.003 wt.-% to about ≤ 0.05 wt.-%, and more preferred about ≥ 0.004 wt.-% to about ≤ 0.03 wt.-%, of at least one alkaline source selected from the group consisting of sodium hydroxide, potassium hydroxide and lithium hydroxide, preferably sodium hydroxide;
- about ≥ 0.00008 wt.-% to about ≤ 0.005 wt.-%, preferably about ≥ 0.0001 wt.-% to about ≤ 0.003 wt.-%, further preferred about ≥ 0.00015 wt.-% to about ≤ 0.001 wt.-%, and more preferred about ≥ 0.0002 wt.-% to about ≤ 0.0008 wt.-%, of at least one polyethylene glycol, preferably a polyethylene glycol with a MW in the range of about 4000 to about 12000;
- about ≥ 0.0001 wt.-% to about ≤ 0.005 wt.-%, preferably about ≥ 0.0003 wt.-% to about ≤ 0.004 wt.-%, further preferred about ≥ 0.0004 wt.-% to about ≤ 0.003 wt.-%, and more preferred about ≥ 0.0005 wt.-% to about ≤ 0.002 wt.-%, of at least one corrosion inhibitor, preferably the corrosion inhibitor is a heterocyclic compound and more preferred a benzotriazol;
- about ≥ 0.0001 wt.-% to about ≤ 0.009 wt.-%, preferably about ≥ 0.0002 wt.-% to about ≤ 0.003 wt.-%, further preferred about ≥ 0.0003 wt.-% to about ≤ 0.001 wt.-% and more preferred about ≥ 0.0004 wt.-% to about ≤ 0.0009 wt.-% of at least one threshold inhibitor/crystal modifier selected from the group consisting of salts of phosphonocarboxylic acids, phosphonates, salts of 1-hydroxyethylidene-1,1-diphosphonic acid (HEDP), salts of acid substituted polymers, and mixtures thereof, preferably the threshold inhibitor/crystal modifier is a salt of a polyacrylic acid;
- about ≥ 0.001 wt.-% to about ≤ 0.05 wt.-%, preferably about ≥ 0.002 wt.-% to about ≤ 0.03 wt.-%, further preferred about ≥ 0.003 wt.-% to about ≤ 0.01 wt.-%, and more preferred about ≥ 0.004 wt.-% to about ≤ 0.009 wt.-% of at least one sequestering agent, preferably the sequestering agent is a salt of an amine containing carboxylic acid; and
- a solvent, preferably water, is added add 100 wt.-%; wherein the weight-% of the components are based on the total weight of the composition.

Manufacture of Solid Alkaline Composition

[0078] There are a number of processes known in prior art to provide a solidified product. For example, all components of the solid alkaline composition can be mixed together or added portionwise or one after the other. A cast process then solidifies the heated slurry, e.g. the solidification can erupt after cooling down a NaOH melt by crystallization.

Cleaning Apparatus

[0079] Also described herein is a cleaning apparatus. The cleaning apparatus is used to clean and to disinfect articles having a metal surface, such as surgical, medical, and dental instruments.

[0080] The cleaning apparatus includes at least a first tank to receive the solid alkaline composition of the invention; at least a second component tank to receive water diluted concentrated composition or a ready-to-use solution of said solid alkaline composition of the invention, a water feed, and a use solution line; and optional a third component tank to receive a day portion of the concentrated composition or a ready-to-use solution of the invention.

[0081] The first component tank is provided for containing the solid alkaline composition of the invention. The first component tank can be provided for mixing water to the solid alkaline composition to provide a concentrated liquid composition. The solid alkaline composition can be mixed with water in a circulation method to obtain a defined alkaline aqueous concentrated liquid composition.

[0082] The second component tank is provided for receiving the aqueous concentrated liquid composition or for mixing water to the alkaline aqueous concentrated liquid composition to provide an alkaline ready-to-use solution.

[0083] The optional third component tank is provided for receiving a day portion of the aqueous concentrated liquid composition or for mixing water to the alkaline aqueous concentrated liquid composition to provide a day portion of an alkaline ready-to-use solution.

[0084] The water feed is provided for conveying water to the first tank, second tank (makeup tank) and/or third tank (day tank) for dissolving the solid alkaline composition (first tank) and/or for providing an aqueous concentrated alkaline liquid composition or alkaline ready-to-use solution (second tank) and/or for providing an aqueous alkaline ready-to-use solution (third tank). It can be preferred that the aqueous concentrated alkaline liquid composition is transferred to the day tank, by the time the defined concentration, pH, volume and/or temperature is reached.

[0085] However, the makeup tank (second tank) and more preferred the third tank (day tank) can be used to receive and stock the alkaline aqueous concentrated liquid composition or the ready-to-use solution. Most preferred is to provide the ready-to-use solution at the place of use, for example in an applicator, by adding sufficient water. The aqueous concentrated alkaline liquid composition can be conveyed from the second tank or a day tank (optional third tank) to a dispenser and the dispenser sprays out the ready-to-use solution at the place of operation in a defined concentration.

[0086] The solution line is provided for conveying solution from the second container to a use solution applicator.

[0087] In more detail, the solid alkaline composition of the invention can be used in combination with a healthcare solid dispenser. This dispenser sprays out the solid alkaline composition of the invention having the form of a capsule in a circulation method to a defined concentration. This alkaline aqueous concentrated liquid composition is collected in a makeup tank and transferred to a day tank as soon as the concentration and referring conductivity has reached the defined level. From there the pumps of the washer disinfectors dose the cleaning alkaline aqueous concentrated liquid composition in the cleaning cycle of the reprocessing step. The solid can be diluted to a 5% alkaline aqueous concentrated liquid composition in the dispenser.

[0088] The ready-to-use solution or the concentrated liquid composition can be in any form including liquid, gel, paste and slurry.

[0089] The cleaning solutions, i.e. ready-to-use solution and/or the concentrated liquid composition, are suitable to treat any metal surface contaminated with a wide variety of contaminants.

[0090] Exemplary contaminants include body fluids, such as blood, lipids and synovial fluids and chemical residues.

[0091] The aqueous cleaning solutions of this invention, i.e. the aqueous alkaline ready-to-use solution and/or the concentrated aqueous alkaline liquid composition, may be used at any temperature, including an elevated temperature of from about 30° C to about 70° C, preferably about 45° C to about 60° C and more preferred about 55° C. After contact with the cleaning solution, the solution is removed from the metal surface.

[0092] The contact time of the aqueous cleaning solution in an automated process, i.e. ready-to-use solution and/or the concentrated liquid composition, with the metal substrates will vary depending upon the degree of contamination but broadly will range between a few seconds or about ≥ 1 minute to about ≤ 30 minutes, with about ≥ 3 minutes to about ≤ 15 minutes being more typical and most preferred is about ≥ 5 minutes to about ≤ 10 minutes.

[0093] Preferably, the cleaning apparatus may comprise:

(a) a first container comprising the alkaline solid composition according to claims 1 to 10;
(b) a second container comprising a concentrated liquid composition of the solid composition according to claim 11

or 12 having a pH of about ≥ 12.5 to about ≤ 13.5, preferably a pH of about 13;

(c) optional a third container comprising a day solution of the concentrated liquid composition or a ready to use solution having a pH of about ≥ 10 to about ≤ 11,5;

(c) a water feed for conveying water to the first container for forming said solution from water;

(d) a solution line for conveying solution from the first container to the second container;

(e) optional a third container that is connected with the second container with a solution line for conveying solution from the second container to the third container; and

(f) a use solution line for conveying the use solution from the second container and/or third container to a use solution applicator and/or to the place of use.

[0094] The following examples are presented to help illustrate the invention and should not be construed as limiting the invention.

[0095] When processing solids in the cast process there are different ways to ensure a solidification of the product. The solidification can erupt after cooling down a NaOH melt by crystallization, e.g. with silicates and polyethylene glycol. Foaming of this formula was observed to an extent that was not acceptable in the field of automated reprocessing. If the cleaner generates too much foam in the washer, the cleaning efficiency goes down due to lack of mechanical agitation in the washer.

[0096] It was observed that polyethylene glycol in combination with NaOH and heat lead to a high foaming composition. The formation of foam lowers in particular the cleaning properties, due to the loss of mechanical agitation. Further, pumping of foam dramatically reduce the liquid flow rates, thus causes dosing and transport problems in the sump, liquid conduits, as well as in the dispensing drawer. Thus, foam is not acceptable in an automated washer. Cleaning efficacy tests have shown that that the results without polyethylene glycol in the formula were not as good as with polyethylene glycol in the formula.

[0097] To achieve a good level of cleaning efficacy it was successfully tried to add a small amount of polyethylene glycol to the NAOH based formulation. With this addition of a minor amount of polyethylene glycol (PEG) the composition of the invention has a surprising cleaning efficacy due to none or practical none foam formation, if mixed with water, as sump solution or in the dispensing drawer.

Example

[0098] The following examples were carried out to illustrate the reduced foam formation of the cleaning compositions according to the invention.

[0099] The following alkaline concentrates were provided in a solid form:

All components of table 1 and 2 are mixed together. Then the slurry is mixed and heated to temperature of about 80° C for about 30 minutes. Thereafter, the mixed slurry is casted and allows cooling to room temperature, whereby a casted alkaline solid is formed.

Table 1

Solid alkaline concentrate of the invention							
Components	E1	E2	E3	E4	E5	E6	E7
	Wt.-%	Wt.-%	Wt.-%	wt.-%	wt.-%	wt.-%	wt.-%
Polyethylene glycol (PEG 8000)	2	3	5	6	9	10	12
Hexylene glycol	---	---	---	0.6	0.6	0.6	0.6
Polyacrylic acid	6	6	5	5	5	5	4
NaOH	37	35	33	30	28	25	25
1,2,3-Benzotriazole	6	5	4				7
Disilicate				4	5	3	
N,N-bis (carboxylatomethyl)-L-glutamate (GLDA)					25	22	22
Water	Add. 100	Add. 100	Add. 100	Add. 100	Add. 100	Add. 100	Add. 100

(continued)

Components	E8	E9	E10	E11	E12	E13	E14
	Wt.-%	Wt.-%	Wt.-%	Wt.-%	Wt.-%	Wt.-%	Wt.-%
Polyethylene glycol (PEG 4000)	2	4	6	---	---	---	---
Polyethylene glycol (PEG 10000)	---	---	---	2	6	8	10
Hexylene glycol					0.6	0.5	0.4
Polyacrylic acid	6	6	5	6	5	5	5
NaOH	37	33	30	28	26	26	25
1,2,3-Benzotriazole	6	6	5				
Disilcate				6	5	4	4
N,N-bis (carboxylatomethyl)-L-glutamate (GLDA)	28					24	24
Water	Add. 100	Add. 100	Add. 100	Add. 100	Add. 100	Add. 100	Add. 100

Table 2

Solid alkaline concentrate provided for comparison							
Components	**V1**	**V2**	**V3**	**V4**	**V5**	**V6**	**V7**
	Wt.-%	Wt.-%	Wt.-%	Wt.-%	Wt.-%	Wt.-%	Wt.-%
Polyethylene glycol (PEG 8000)	18	---	---	20	---	---	22
Polyethylene glycol (PEG 4000)	---	18	---	---	20	---	---
Polyethylene glycol (PEG 10000)	---	---	18	---	---	20	---
Hexylene glycol					0.6	0.6	0.6
Polyacrylic acid	3,9	3,9	3,9	3,9	3,9	3,9	3,9
NaOH	30	30	30	30	30	30	30
1,2,3-Benzotriazole	3	3	3	3			
Disilicate					3	3	3
N,N-bis (carboxylatomethyl)-L-glutamate (GLDA)					22,7	22,7	20,7
Water	Add. 100	Add. 100	Add. 100	Add. 100	Add. 100	Add. 100	Add. 100

Foam Formation Test

[0100] This test method provides a basis to assess the foam formation properties of the liquid alkaline cleaning composition of the invention.

Foam testing equipment

[0101]

250 ml long-necked glass cylinder
Rubber stopper to close the long-necked glass cylinder

Test method

[0102] An aqueous alkaline ready-to-use solution is formed, wherein 1.0 g of examples 1 to 14 and V1 to V7 are dissolved in 100 ml of deionized water each.

[0103] 100 ml of said aqueous alkaline ready-to-use solution of examples E1 to E14 and V1 to V7 are added to a graduated 250 ml long-necked glass cylinder.

[0104] The long-necked glass cylinder was then turned up and down 20 x times in 20 seconds. Thereafter the glass cylinder was placed and the foam depth of each cylinder was scaled in ml to determine the foam formation. This test was carried out at a temperature of the cleaning solution at ambient temperature, 20° C and 55° C.

[0105] The foam hight of about ≥ 0 ml and about < 0.1 ml are considered to be excellent (++) and in line with the invention. The foam hight of about ≥ 0.1 ml to about ≤ 5 ml are considered to be good (+) and in line with the invention. The foam hight of about ≥ 5 ml are considered to be insufficient (-) thus not in line with the invention, i.e. non-inventive.

[0106] The table 3 shows the result of the foam formation caused by the aqueous alkaline ready-to-use solution of examples E1 to E14 and V1 to V7 obtained by the foam formation test.

Table 3

Foam Formation Test-Results					
Exampels					
E1	++	E8	++	V1	-
E2	++	E9	++	V2	-
E3	++	E10	++	V3	-
E4	++	E11	++	V4	-
E5	+	E12	+	V5	-
E6	+	E13	+	V6	-
E7	+	E14	+	V7	-

Material Compatibility Test

[0107] This test method provides a basis to assess the enhanced metal-surface-safeness of the liquid alkaline cleaning composition of the invention with respect to corrosion.

Corrosion testing equipment

[0108]

350 ml wide-necked screw cap flasks for each test condition
Acetone
Aluminum test plates of 100 mm x 50 mm x 1.5 mm
(The aluminum test plates are cleaned with acetone before use)
Clean paper toweling
Stop watch
Drying oven
Analytical balance capable of weighing to the 0.0001 place.

Test method

[0109] The cleaning compositions E1 to E14 were diluted with deionized water to a 0.8 wt.-% ready-to-use solution. The weights of aluminum test plates of 100 mm x 50 mm x 1.5 mm were recorded and then placed in the center area of the bottom of a 350 ml wide-necked screw cap flask each. The aluminum test plates were completely submerged. Subsequently, each wide-necked screw cap flask was filed to the top with said 0.8 wt.-% ready-to-use solution E1 to

E14 having a temperature of 23° C. The wide-necked screw cap flasks were closed with the cap and allow staying for 7 days at a temperature of 23° C. Thereafter, the aluminum test plates were removed, rinsed with deionized water, placed on a clean paper towel and allowed to dry at a temperature of 23° C. The aluminum test plates were then weighted and the weight was taken to the fourth place. Subsequently the aluminum test plates were returned in there wide-necked screw cap flasks for another 7 days. Thereafter, the aluminum test plates were removed, rinsed with deionized water, placed on a clean paper towel and allowed to dry at a temperature of 23° C. The aluminum test plates were then weighted and the weight was taken to the fourth place. Subsequently the aluminum test plates were returned again in there wide-necked screw cap flasks for another 7 days. The weight loss was calculated. Three test were run for each experiment and the average weight loss was determined. The average weight loss for each aluminum test plates after treatment with said ready-to-use solution obtained from E1 to E14 were about ≤ 0.34 wt.-%.

[0110] Metal surfaces and/or plastic surfaces in need of cleaning are found in several locations. Exemplary locations include surgical instruments, medical instruments, and dental instruments, sinks, cookware, utensils, machine parts, vehicles, tanker trucks, vehicle wheels, work surfaces, tanks, immersion vessels, spray washers, and ultrasonic baths.

[0111] The cleaning compositions of the present invention can be used for removing residues including blood, greases, cutting fluids, drawing fluids, machine oils, antirust oils such as cosmoline, carbonaceous soils, sebaceous soils, particulate matter, waxes, paraffins, used motor oil, fuels, etc..

[0112] Metal surfaces that can be cleaned include iron-based metals such as iron, iron alloys, e. g. steel, tin, aluminum, copper, tungsten, titanium, molybdenum, etc., for example. The structure of the metal surface to be cleaned can vary widely. Thus, the metal surface and/or plastic surface can be as a metal and/or plastic part of complex configuration, sheeting, coils, rolls, bars, rods, plates, disks, etc..

[0113] More preferred is the use of the liquid alkaline cleaning solution of the invention, in particular the ready-to-use-solution to clean metal and/or plastic articles, especially metal instruments, plastic instruments, instruments with a plastic surface and/or instruments with a metal surface.

[0114] Most preferred is the use of the liquid alkaline cleaning solution of the invention, in particular the ready-to-use-solution, to clean in an automated instrument processing metal and/or plastic articles, especially metal instruments, plastic instruments, instruments with a plastic surface and/or instruments with a metal surface.

[0115] As used herein, the term "about" refers to variation in the numerical quantity that can occur, for example, through typical measuring and liquid handling procedures used for making concentrates or use solutions in the real world; through inadvertent error in these procedures; 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 amounts that differ due to different equilibrium conditions for a composition resulting from a particular initial mixture. Whether or not modified by the term "about", the claims include equivalents to the quantities.

[0116] It should be noted that, as used in this specification and the appended claims, the singular forms "a", "an" and "the" include plural referents unless the content clearly dictates otherwise.

Claims

1. A solid alkaline composition for cleaning, comprising ≥ 10 wt.-% to ≤ 50 wt.-% of at least one alkaline source selected from the group consisting of sodium hydroxide, potassium hydroxide, and lithium hydroxide, ≥ 0.5 wt.-% to ≤ 20 wt.-% of at least one polyethylene glycol, ≥ 2 wt.-% to ≤ 10 wt.-% of at least one corrosion inhibitor, and a solvent is added add. 100 wt.-%, wherein the weight ratio of alkaline source to polyethylene glycol is in the range from 20 :1 to 2 :1 and wherein the weight-% of the components are based on the total weight of the composition.

2. The solid alkaline composition according to claim 1, wherein the weight ratio of alkaline source to polyethylene glycol is in the range from 15 :1 to 10 :1.

3. The solid alkaline composition according to claims 1 or 2, comprising:

   - ≥ 15 wt.-% to ≤ 45 wt.-%, further preferred

     ≥ 20 wt.-% to ≤ 40 wt.-%, and more preferred ≥ 25 wt.-% to ≤ 35 wt.-%, of at least one alkaline source selected from the group consisting of sodium hydroxide, potassium hydroxide and lithium hydroxide;
     ≥ 1 wt.-% to ≤ 18 wt.-%, further preferred ≥ 2 wt.-% to ≤ 16 wt.-%, and more preferred ≥ 5 wt.-% to ≤ 10 wt.-%, of at least one polyethylene glycol; and

   - ≥ 3 wt.-% to ≤ 9 wt.-%, further preferred ≥ 4 wt.-% to ≤ 8 wt.-%, and more preferred ≥ 5 wt.-% to ≤ 6 wt.-%, of at least one corrosion inhibitor, preferably the corrosion inhibitor is not a silicate; the solvent, being water.

4. The solid alkaline composition according to claims 1 to 3, wherein the composition comprises a threshold inhibitor/crystal modifier component selected from the group consisting of salts of phosphonocarboxylic acids, phosphonates, salts of 1-hydroxyethylidene-1,1-diphosphonic acid (HEDP), salts of acid substituted polymers, and mixtures thereof.

5. The solid alkaline composition according to claims 1 to 4, wherein the composition comprises at least one sequestering agent composition.

6. The solid alkaline composition according to claims 1 to 5, wherein the composition comprises at least one corrosion inhibitor selected from the group comprising silicate, sodium silicate, calcium acetate, calcium chloride, calcium gluconate, calcium phosphate, calcium borate, calcium carbonate, calcium citrate, calcium lactate, calcium sulfate, calcium tartrate, benzotriazole, 1,2,3-benzotriazole and mixtures thereof.

7. The solid alkaline composition according to claims 1 to 6, wherein the composition comprises at least one threshold inhibitor/crystal modifier selected from the group consisting of salts of acid substituted polymers of monomers of acrylate, methacrylate, salts of polyitaconic acid, salts of polymaleic acid, and mixtures thereof.

8. The solid alkaline composition according to claims 1 to 7, wherein the composition comprises at least one sequestering agent composition selected from the group consisting of sodium gluconate, pentasodium salt of diethylenetriamine pentaacetic acid, sodium glucoheptonate, salts of ethylene diamine tetraacetic acid, salts of hydroxyethyl ethylene diamine triacetic acid, salts of nitrilotriacetic acid, diethanolglycine sodium salt, ethanoldiglycine disodium salt, salts of hydro xymonocarboxylic acid compounds, salts of hydroxydicarboxylic acid compounds, salts of amine containing carboxylic acids, terasodium N,N-bis(carboxylatomethyl)-L- glutamate and mixtures thereof.

9. The solid alkaline composition according to claims 1 to 8, wherein the composition comprises at least one solvent selected from the group consisting of water, alcohols, preferably alcohols selected from ethanol, isopropanol, 2-butoxy ethanol, 1-decanol, benzyl alcohol, glycerin, monoethanolamine, glycols, preferably glycols selected frometh-ylene glycol, diethylene glycol, propylene glycol, butoxy diglycol, triethylene glycol, tetraethylene glycol, glycerin, propylene glycol, dipropylene glycol, hexylene glycol, glycol ethers, esters, and combinations thereof.

10. The solid alkaline composition according to claims 1 to 9, comprising:

- ≥10 wt.-% to ≤ 50 wt.-%, preferably ≥ 15 wt.-% to ≤ 45 wt.-%, further preferred ≥ 20 wt.-% to ≤ 40 wt.-%, and more preferred ≥ 25 wt.-% to ≤ 35 wt.-%, of at least one alkaline source selected from the group consisting of sodium hydroxide, potassium hydroxide and lithium hydroxide; preferably sodium hydroxide;
- ≥ 0.5 wt.-% to ≤ 20 wt.-%, preferably ≥ 1 wt.-% to ≤18 wt.-%, further preferred ≥ 2 wt.-% to ≤ 16 wt.-%, and more preferred ≥ 5 wt.-% to ≤ 10 wt.-%, of at least one polyethylene glycol, preferably a polyethylene glycol with a MW in the range of 4.000 to 12.000;
- ≥ 2 wt.-% to ≤ 10 wt.-%, preferably ≥ 3 wt.-% to ≤ 9 wt.-%, further preferred ≥ 4 wt.-% to ≤ 8 wt,-%, and more preferred ≤ 5 wt.-% to ≤ 6 wt.-%, of at least one corrosion inhibitor, preferably the corrosion inhibitor is a heterocyclic compound and more preferred a benzotriazol;
- ≥ 1 wt.-% to ≤ 15 wt.-%, preferably ≥ 5 wt.-% to ≤ 10 wt.-%, and more preferred ≥ 6 wt.-% to ≤ 8 wt.-% of at least one thresold inhibitior/crystal modifier selected from the group consisting of salts of phosphonocarboxylic acids, phosphonates, salts of 1-hydroxyethylidene-1, 1-diphosphonic acid (HEDP), salts of acid substituted polymers, and mixtures thereof, preferably the threshold inhibitor/crystal modifier is a salt of a polyacrylic acid; and
- ≥ 5 wt.-% to ≤ 40 wt.-%, preferably ≥ 15 wt.-% to ≤ 30 wt.-%, and more preferred ≥ 25 wt.-% to ≤ 28 wt.-% of at least one sequestering agent, preferably the sequestering agent is a salt of an amine containing carboxylic acid; a solvent, preferably water, is added add. 100 wt.-%; wherein the weight-% of the components are based on the total weight of the composition.

11. A solution of the solid alkaline composition according to claims 1 to 10.

12. The solution of claim 10, wherein the weight ratio of the solvent, preferably water, to solid, to provide a concentrated liquid composition, preferably an aqueous solution, of the solid alkaline composition is in the range of from 200 :1 to 10 :1, preferably 100 :1 to 12 :1, further preferred 50 :1 to 15 :1, also preferred 40 : 1 to 17 :1 and in particular preferred 30 : 1 to 20:1; or the ratio of the solvent, preferably water, to solid, to provide a ready-to-use solution, preferably an aqueous solution, of the solid alkaline composition is in the range of from 5000 : 1 to 100 :1, preferably 4000 :1 to 300 :1, further preferred 3000 : 1 to 500 :1, also preferred 2500 :1 to 750 : 1 and in particular preferred

2000 : 1 to 1000 : 1.

13. Use of the solution of claims 11 to 12 to clean hard and soft surfaces, preferably metal and/or plastic articles, metal surfaces and/or plastic surfaces, more preferred metal instruments, plastic instruments, instruments with a plastic surface and/or instruments with a metal surface,

14. Use of the solution of claim 13 to clean hard and soft surfaces, preferably metal and/or plastic articles, metal surfaces and/or plastic surfaces, more preferred metal instruments, plastic instruments, instruments with a plastic surface and/or instruments with a metal surface, in an automated processing.

Patentansprüche

1. Feste alkalische Zusammensetzung zum Reinigen, umfassend ≥ 10 Gew.-% bis ≤ 50 Gew.-% mindestens einer alkalischen Quelle, die aus der Gruppe ausgewählt ist, bestehend aus Natriumhydroxid, Kaliumhydroxid und Lithiumhydroxid, ≥ 0,5 Gew.-% bis ≤ 20 Gew.-% mindestens eines Polyethylenglykols, ≥ 2 Gew.-% bis ≤ 10 Gew.-% mindestens eines Korrosionsinhibitors und wobei ein Lösungsmittel zugesetzt wird, um 100 Gew.-% zu erreichen, wobei das Gewichtsverhältnis von alkalischer Quelle zu Polyethylenglykol in dem Bereich von 20 : 1 bis 2 : 1 liegt und wobei die Gewichtsprozent der Komponenten auf dem Gesamtgewicht der Zusammensetzung basieren.

2. Feste alkalische Zusammensetzung nach Anspruch 1, wobei das Gewichtsverhältnis von alkalischer Quelle zu Polyethylenglykol in dem Bereich von 15 : 1 bis 10 : 1 liegt.

3. Feste alkalische Zusammensetzung nach den Ansprüchen 1 oder 2, umfassend:

   - ≥ 15 Gew.-% bis ≤ 45 Gew.-%, ferner bevorzugt

     ≥ 20 Gew.-% bis ≤ 40 Gew.-%, und mehr bevorzugt ≥ 25 Gew.-% bis ≤ 35 Gew.-% mindestens einer alkalischen Quelle, die aus der Gruppe ausgewählt ist, bestehend aus Natriumhydroxid, Kaliumhydroxid und Lithiumhydroxid;
     ≥ 1 Gew.-% bis ≤ 18 Gew.-%, ferner bevorzugt ≥ 2 Gew.-% bis ≤ 16 Gew.-%, und mehr bevorzugt ≥ 5 Gew.-% bis ≤ 10 Gew.-% mindestens eines Polyethylenglykols; und

   - ≥ 3 Gew.-% bis ≤ 9 Gew.-%, ferner bevorzugt ≥ 4 Gew.-% bis ≤ 8 Gew.-% und mehr bevorzugt ≥ 5 Gew.-% bis ≤ 6 Gew.-% mindestens eines Korrosionsinhibitors, wobei der Korrosionsinhibitor vorzugsweise kein Silicat ist; wobei das Lösungsmittel Wasser ist.

4. Feste alkalische Zusammensetzung nach den Ansprüchen 1 bis 3, wobei die Zusammensetzung eine Schwelleninhibitor-/Kristallmodifikatorkomponente umfasst, die aus der Gruppe ausgewählt ist, bestehend aus Salzen von Phosphonocarbonsäuren, Phosphonaten, Salzen von 1-Hydroxyethyliden-1,1-diphosphonsäure (HEDP), Salzen von säuresubstituierten Polymeren und Mischungen davon.

5. Feste alkalische Zusammensetzung nach den Ansprüchen 1 bis 4, wobei die Zusammensetzung mindestens eine Maskierungsmittelzusammensetzung umfasst.

6. Feste alkalische Zusammensetzung nach den Ansprüchen 1 bis 5, wobei die Zusammensetzung mindestens einen Korrosionsinhibitor umfasst, der aus der Gruppe ausgewählt ist, umfassend Silicat, Natriumsilicat, Calciumacetat, Calciumchlorid, Calciumgluconat, Calciumphosphat, Calciumborat, Calciumcarbonat, Calciumcitrat, Calciumlactat, Calciumsulfat, Calciumtartrat, Benzotriazol, 1,2,3-Benzotriazol und Mischungen davon.

7. Feste alkalische Zusammensetzung nach den Ansprüchen 1 bis 6, wobei die Zusammensetzung mindestens einen Schwelleninhibitor/Kristallmodifikator umfasst, der aus der Gruppe ausgewählt ist, bestehend aus Salzen von säuresubstituierten Polymeren von Monomeren von Acrylat, Methacrylat, Salzen von Polyitaconsäure, Salzen von Polymaleinsäure und Mischungen davon.

8. Feste alkalische Zusammensetzung nach den Ansprüchen 1 bis 7, wobei die Zusammensetzung mindestens eine Maskierungsmittelzusammensetzung umfasst, die aus der Gruppe ausgewählt ist, bestehend aus Natriumgluconat,

Pentanatriumsalz von Diethylentriaminpentaessigsäure, Natriumglucoheptonat, Salzen von Ethylendiamintetraessigsäure, Salzen von Hydroxyethylethylendiamintriessigsäure, Salzen von Nitrilotriessigsäure, Diethanolglycinnatriumsalz, Ethanoldiglycindinatriumsalz, Salzen von Hydroxymonocrbonsäureverbindungen, Salzen von Hydroxydicarbonsäureverbindungen, Salzen von carbonsäurehaltigem Amin, Teranatrium-N,N-bis(carboxylatomethyl)-L-glutamat und Mischungen davon.

9. Feste alkalische Zusammensetzung nach den Ansprüchen 1 bis 8, wobei die Zusammensetzung mindestens ein Lösungsmittel umfasst, das aus der Gruppe ausgewählt ist, bestehend aus Wasser, Alkoholen, vorzugsweise Alkoholen, die ausgewählt sind aus Ethanol, Isopropanol, 2-Butoxyethanol, 1-Decanol, Benzylalkohol, Glycerin, Monoethanolamin, Glykolen, vorzugsweise Glykolen, die ausgewählt sind aus Ethylenglykol, Diethylenglykol, Propylenglykol, Butoxydiglykol, Triethylenglykol, Tetraethylenglykol, Glycerin, Propylenglykol, Dipropylenglykol, Hexylenglykol, Glykolethern, Estern und Kombinationen davon.

10. Feste alkalische Zusammensetzung nach den Ansprüchen 1 bis 9, umfassend:

- $\geq$ 10 Gew.-% bis $\leq$ 50 Gew.-%, vorzugsweise $\geq$ 15 Gew.-% bis $\leq$ 45 Gew.-%, ferner bevorzugt $\geq$ 20 Gew.-% bis $\leq$ 40 Gew.-% und mehr bevorzugt $\geq$ 25 Gew.-% bis $\leq$ 35 Gew.-% mindestens einer alkalischen Quelle, die aus der Gruppe ausgewählt ist, bestehend aus Natriumhydroxid, Kaliumhydroxid und Lithiumhydroxid; vorzugsweise Natriumhydroxid;
- $\geq$ 0,5 Gew.-% bis $\leq$ 20 Gew.-%, vorzugsweise $\geq$ 1 Gew.-% bis $\leq$ 18 Gew.-%, ferner bevorzugt $\geq$ 2 Gew.-% bis $\leq$ 16 Gew.-% und mehr bevorzugt $\geq$ 5 Gew.-% bis $\leq$ 10 Gew.-% mindestens eines Polyethylenglykols; vorzugsweise eines Polyethylenglykols mit einem Molekulargewicht in dem Bereich von 4000 bis 12000;
- $\geq$ 2 Gew.-% bis $\leq$ 10 Gew.-%, vorzugsweise $\geq$ 3 Gew.-% bis $\leq$ 9 Gew.-%, ferner bevorzugt $\geq$ 4 Gew.-% bis $\leq$ 8 Gew.-% und mehr bevorzugt $\geq$ 5 Gew.-% bis $\leq$ 6 Gew.-% mindestens eines Korrosionsinhibitors, wobei der Korrosionsinhibitor vorzugsweise keine heterozyklische Verbindung und mehr bevorzugt Benzotriazol ist;
- $\geq$ 1 Gew.-% bis $\leq$ 15 Gew.-%, vorzugsweise $\geq$ 5 Gew.-% bis $\leq$ 10 Gew.-%, und mehr bevorzugt $\geq$ 6 Gew.-% bis $\leq$ 8 Gew.-% mindestens eines Schwelleninhibitors/Kristallmodifikators, der aus der Gruppe ausgewählt ist, bestehend aus Salzen von Phosphonocarbonsäuren, Phosphonaten, Salzen von 1-Hydroxyethyliden-1,1-diphosphonsäure (HEDP), Salzen von säuresubstituierten Polymeren, und Mischungen davon, wobei vorzugsweise der Schwelleninhibitor/Kristallmodifikator ein Salz einer Polyacrylsäure ist; und
- $\geq$ 5 Gew.-% bis $\leq$ 40 Gew.-%, vorzugsweise $\geq$ 15 Gew.-% bis $\leq$ 30 Gew.-% und mehr bevorzugt $\geq$ 25 Gew.-% bis $\leq$ 28 Gew.-% mindestens eines Maskierungsmittels, wobei das Maskierungsmittel vorzugsweise ein Salz eines carbonsäurehaltigen Amins ist; wobei ein Lösungsmittel, vorzugsweise Wasser, zugesetzt wird, 100 Gew.-%, wobei das Gew.-% der Komponenten auf dem Gesamtgewicht der Zusammensetzung basieren.

11. Lösung der festen alkalischen Zusammensetzung nach den Ansprüchen 1 bis 10.

12. Lösung nach Anspruch 10, wobei das Gewichtsverhältnis des Lösungsmittels, vorzugsweise Wasser, zu Feststoff, um eine konzentrierte flüssige Zusammensetzung, vorzugsweise eine wässrige Lösung, der festen alkalischen Zusammensetzung bereitzustellen, in dem Bereich von 200 : 1 bis 10 : 1, vorzugsweise 100 : 1 bis 12 : 1, ferner bevorzugt 50 : 1 bis 15 : 1, ebenso bevorzugt 40 : 1 bis 17 : 1 und insbesondere bevorzugt 30 : 1 bis 20 : 1 liegt; oder das Verhältnis des Lösungsmittels, vorzugsweise Wasser, zu Feststoff, um eine gebrauchsfertige Lösung, vorzugsweise eine wässrige Lösung, der festen alkalischen Zusammensetzung bereitzustellen, in dem Bereich von 5000 : 1 bis 100 : 1, vorzugsweise 4000 : 1 bis 300 : 1, ferner bevorzugt 3000 : 1 bis 500 : 1, ebenso bevorzugt 2500 : 1 bis 750 : 1 und insbesondere bevorzugt 2000 : 1 bis 1000 : 1 liegt.

13. Verwendung der Lösung nach den Ansprüchen 11 bis 12, um harte und weiche Oberflächen, vorzugsweise Metall- und/oder Kunststofferzeugnisse, Metalloberflächen und/oder Kunststoffoberflächen, mehr bevorzugt Metallinstrumente, Kunststoffinstrumente, Instrumente mit einer Kunststoffoberfläche und/oder Instrumente mit einer Metalloberfläche zu reinigen.

14. Verwendung der Lösung nach Anspruch 13, um harte und weiche Oberflächen, vorzugsweise Metall- und/oder Kunststofferzeugnisse, Metalloberflächen und/oder Kunststoffoberflächen, mehr bevorzugt Metallinstrumente, Kunststoffinstrumente, Instrumente mit einer Kunststoffoberfläche und/oder Instrumente mit einer Metalloberfläche, in einer automatisierten Verarbeitung zu reinigen.

Revendications

1. Composition alcaline solide destinée au nettoyage, comprenant ≥ 10 % en poids à ≤ 50 % en poids d'au moins une source alcaline choisie dans le groupe constitué d'hydroxyde de sodium, d'hydroxyde de potassium et d'hydroxyde de lithium, ≥ 0,5 % en poids à ≤ 20 % en poids d'au moins un polyéthylène glycol, ≥ 2 % en poids à ≤ 10 % en poids d'au moins un inhibiteur de corrosion, et un solvant est ajouté à raison de 100 % en poids, le rapport pondéral de la source alcaline au polyéthylène glycol étant dans la plage de 20:1 à 2:1 et le % en poids des composants étant basé sur le poids total de la composition.

2. Composition alcaline solide selon la revendication 1, dans laquelle le rapport pondéral de la source alcaline au polyéthylène glycol est dans la plage de 15:1 à 10:1.

3. Composition alcaline solide selon les revendications 1 ou 2, comprenant :

   - ≥ 15 % en poids à ≤ 45 % en poids, de manière plus préférée

     ≥ 20 % en poids à ≤ 40 % en poids, et de manière encore plus préférée ≥ 25 % en poids à ≤ 35 % en poids, d'au moins une source alcaline choisie dans le groupe constitué d'hydroxyde de sodium, d'hydroxyde de potassium et d'hydroxyde de lithium ;
     ≥ 1 % en poids à ≤ 18 % en poids, de manière plus préférée ≥ 2 % en poids à ≤ 16 % en poids et de manière encore plus préférée ≥ 5 % en poids à ≤ 10 % en poids, d'au moins un polyéthylène glycol ; et

   - ≥ 3 % en poids à ≤ 9 % en poids, de manière plus préférée ≥ 4 % en poids à ≤ 8 % en poids et de manière encore plus préférée ≥ 5 % en poids à ≤ 6 % en poids d'au moins un inhibiteur de corrosion, de préférence l'inhibiteur de corrosion n'est pas un silicate ; le solvant étant de l'eau.

4. Composition alcaline solide selon les revendications 1 à 3, dans laquelle la composition comprend un composant inhibiteur de seuil/modificateur cristallin choisi dans le groupe constitué de sels d'acides phosphonocarboxyliques, de phosphonates, de sels d'acide 1-hydroxyéthylidène-1,1-diphosphonique (HEDP), de sels de polymères substitués par un acide, et des mélanges de ceux-ci.

5. Composition alcaline solide selon les revendications 1 à 4, dans laquelle la composition comprend au moins une composition d'agent séquestrant.

6. Composition alcaline solide selon les revendications 1 à 5, dans laquelle la composition comprend au moins un inhibiteur de corrosion choisi dans le groupe comprenant du silicate, du silicate de sodium, de l'acétate de calcium, du chlorure de calcium, du gluconate de calcium, du phosphate de calcium, du borate de calcium, du carbonate de calcium, du citrate de calcium, du lactate de calcium, du sulfate de calcium, du tartrate de calcium, du benzotriazole, du 1,2,3-benzotriazole et des mélanges de ceux-ci.

7. Composition alcaline solide selon les revendications 1 à 6, dans laquelle la composition comprend au moins un inhibiteur de seuil/modificateur cristallin choisi dans le groupe constitué de sels de polymères substitués par un acide de monomères d'acrylate, de méthacrylate, de sels d'acide polyitaconique, de sels d'acide polymaléique et des mélanges de ceux-ci.

8. Composition alcaline solide selon les revendications 1 à 7, dans laquelle la composition comprend au moins une composition d'agent séquestrant choisie dans le groupe constitué de gluconate de sodium, de sel pentasodique d'acide diéthylènetriaminepentaacétique, de glucoheptonate de sodium, des sels d'acide éthylènediaminetétraacétique, des sels d'acide hydroxyéthyléthylènediaminetriacétique, des sels d'acide nitrilotriacétique, de sel du sodium de diéthanolglycine, de sel disodique éthanoldiglycine, des sels des composés d'acide hydroxymonocarboxylique, des sels des composés d'acide hydroxydicarboxylique, des sels d'acides carboxyliques contenant une amine, de terasodium N,N-bis(carboxylatomethyl)-L-glutamate et des mélanges de ceux-ci.

9. Composition alcaline solide selon les revendications 1 à 8, dans laquelle la composition comprend au moins un solvant choisi dans le groupe constitué d'eau, d'alcools, de préférence d'alcools choisis parmi l'éthanol, l'isopropanol, le 2-butoxyéthanol, le 1-décanol, l'alcool benzylique, la glycérine, la monoéthanolamine, les glycols, de préférence les glycols choisis parmi l'éthylène glycol, le diéthylène glycol, le propylène glycol, le butoxy diglycol, le triéthylèneglycol, le tétraéthylèneglycol, la glycérine, le propylène glycol, le dipropylèneglycol, l'hexylèneglycol, les éthers

glycoliques, les esters et des combinaisons de ceux-ci.

10. Composition alcaline solide selon les revendications 1 à 9, comprenant :

- ≥ 10 % en poids à ≤ 50 % en poids, de préférence ≥ 15 % en poids à ≤ 45 % en poids, de manière plus préférée ≥ 20 % en poids à ≤ 40 % en poids, et de manière encore plus préférée ≥ 25 % en poids à ≤ 35 % en poids, d'au moins une source alcaline choisie dans le groupe constitué d'hydroxyde de sodium, d'hydroxyde de potassium et d'hydroxyde de lithium ;
- ≥ 0,5 % en poids à ≤ 20 % en poids, de préférence ≥ 1 % en poids à ≤ 18 % en poids, de manière plus préférée ≥ 2 % en poids à ≤ 16 % en poids, et de manière encore plus préférée ≥ 5 % en poids à ≤ 10 % en poids, d'au moins un polyéthylène glycol, de préférence un polyéthylène glycol dont la masse moléculaire est comprise entre 4 000 et 12 000 ;
- ≥ 2 % en poids à ≤ 10 % en poids, de préférence ≥ 3 % en poids à ≤ 9 % en poids, de manière plus préférée ≥ 4 % en poids à ≤ 8 % en poids, et de manière encore plus préférée ≥ 5 % en poids à ≤ 6 % en poids d'au moins un inhibiteur de corrosion, de préférence l'inhibiteur de corrosion est un composé hétérocyclique et avec une préférence plus grande, un benzotriazol ;
- ≥ 1 % en poids à ≤ 15 % en poids, de préférence ≥ 5 % en poids à ≤ 10 % en poids, et de manière encore plus préférée ≥ 6 % en poids à ≤ 8 % en poids d'au moins un inhibiteur de seuil/modificateur cristallin choisi dans le groupe constitué de sels d'acides phosphonocarboxyliques, de phosphonates, de sels d'acide 1-hydroxyéthylène-1,1-diphosphonique (HEDP), de sels de polymères substitués par un acide et des mélanges de ceux-ci, de préférence l'inhibiteur de seuil/modificateur cristallin est un sel d'acide polyacrylique ; et
- ≥ 5 % en poids à ≤ 40 % en poids, de préférence ≥ 15 % en poids à ≤ 30 % en poids, et de manière encore plus préférée ≥ 25 % en poids à ≤ 28 % en poids d'au moins un agent séquestrant, l'agent séquestrant est de préférence un sel d'acide carboxylique contenant une aminé ; un solvant, de préférence de l'eau, est ajouté à raison de 100 % en poids ; dans laquelle le pourcentage en poids des composants est basé sur le poids total de la composition.

11. Solution de composition alcaline solide selon les revendications 1 à 10.

12. Solution selon la revendication 10, dans laquelle le rapport pondéral du solvant, de préférence de l'eau, au solide, pour fournir une composition liquide concentrée, de préférence une solution aqueuse, de la composition alcaline solide est dans la plage de 200:1 à 10:1, de préférence 100:1 à 12:1, de manière plus préférée 50:1 à 15:1, également de de manière préférée 40:1 à 17:1 et en particulier de manière préférée 30:1 à 20:1 ; ou le rapport du solvant, de préférence de l'eau, au solide, pour fournir une solution prête à l'emploi, de préférence une solution aqueuse, de la composition alcaline solide est dans la plage de 5 000:1 à 100:1, de préférence 4 000:1 à 300:1, de manière plus préférée 3 000:1 à 500:1, également de manière préférée 2 500:1 à 750:1 et en particulier de manière préférée 2 000:1 à 1 000:1.

13. Utilisation de la solution selon les revendications 11 à 12 pour nettoyer des surfaces dures et souples, de préférence des objets métalliques et/ou plastiques, des surfaces métalliques et/ou des surfaces plastiques, avec une préférence encore plus grande des instruments métalliques, des instruments plastiques, des instruments dotés d'une surface plastique et/ou des instruments dotés d'une surface métallique.

14. Utilisation de la solution selon la revendication 13 pour nettoyer des surfaces dures et souples, de préférence des objets métalliques et/ou plastiques, des surfaces métalliques et/ou des surfaces plastiques, avec une préférence encore plus grande des instruments métalliques, des instruments plastiques, des instruments dotés d'une surface plastique et/ou des instruments dotés d'une surface métallique, dans un traitement automatisé.

REFERENCES CITED IN THE DESCRIPTION

Patent documents cited in the description

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