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(54) **USE OF A COMPOSITION FOR REPEATED SANITIZING**

(57) The present invention relates to the use of a composition comprising an alkyd resin and an organic solvent for the repeated sanitizing or cleansing of a surface.

EP 4 242 288 A1

Description

[0001] The present invention relates to the use of a composition comprising an alkyd resin and an organic solvent for the repeated sanitizing or cleansing of a surface.

[0002] Sanitizing surfaces is well known in the art. For example, treatment by ozone or chlorine containing gases is known for disinfecting surfaces and containers and cleaning and removal of organic contaminants.

[0003] It is also known to apply ultraviolet (UV-) radiation to disinfect surfaces, containers, and even liquids. Further, it is known to apply silver ions or copper ions to solutions and surfaces in order to reduce the microbiological contamination.

[0004] Surfaces are also frequently disinfected with aqueous solutions comprising alcohols, such as iso-propanol, hydrogen peroxide or NaOCl.

[0005] The disinfection of a surface with an aqueous solution of, for example, hydrogen peroxide or iso-propanol has the disadvantage that the effect is of only very short duration because the hydrogen peroxide decomposes and the iso-propanol evaporates. After decomposition or evaporation of the disinfectant, the surface can again be contaminated with, for example, bacteria. This requires a frequent disinfection of the surface and it always remains the risk that between two disinfection cycles the surface becomes contaminated and potentially does not have the required low level of bacteria or other microorganisms.

[0006] In an alternative approach it is known from EP 3 426 739 that alkyd resins provide antimicrobial properties to a surface. While this provides a good long-term effect, there remains the problem that the alkyd resin should preferably be applied to an already disinfected surface, which requires an additional disinfectant and a further disinfection step prior to the coating of the surface with the alkyd resin layer.

[0007] It would therefore be desirable to have one disinfecting composition which provides an immediate disinfection effect and at the same time provides a long-term effect, which prevents the treated surface from contamination with bacteria and other microorganisms between two disinfections cycles.

[0008] In an effort to solve this problem, the present inventors combined the known immediately acting disinfectants with alkyd resin compositions. However, it turned out that if such combined composition is repeatedly applied to a surface, an increasing alkyd resin layer is retained on the surface. The thickness of this layer increases with each disinfection cycle and after some time, increases to an extent which can make the surface unsuitable for the intended purpose. Removing such alkyd resin layer can be quite cumbersome and makes a mere combination of usual disinfectants with an alkyd resin composition undesirable for a repeated disinfection of a surface.

[0009] Upon further investigations, the present inventors found that, if the alkyd resin is combined with certain organic solvents, it is possible to provide a composition which, when applied to a surface, exhibits an immediate antimicrobial effectivity and leaves an alkyd resin layer on the surface, which provides a long-term antimicrobial effect, but when the composition is applied repeatedly to the same surface, the thickness of the alkyd resin layer does not increase.

[0010] The present invention therefore relates to the use of a composition comprising an alkyd resin and an organic solvent for the repeated sanitizing or cleansing of a surface, wherein the alkyd resin comprises fatty acid residues, which contain at least six carbon atoms in their saturated or unsaturated aliphatic chain, and the organic solvent is selected from the group consisting of alcohols, esters, ketones, ethers, aldehydes and mixtures thereof.

[0011] In the context of the present invention the term "sanitizing" is characterized by the ability to deter, render harmless, destroy and/or exert a controlling effect on all forms and/or parts of microbial life (e.g. bacteria, viruses, fungi, spore forms, etc.); and/or by the ability to remove and/or reduce offensive and/or unpleasant scents. "Sanitizing" therefore includes an antimicrobial effect.

[0012] In the context of the present invention the term "cleansing" is characterized by the ability to remove dirt.

[0013] In the context of the present invention, the term "repeated" is to be understood as describing an action which is repeated at least two times, preferably at least three or four times, more preferably at least five, six of seven times, and even more preferably at least eight, nine or ten times, in particular at least ten times. Between two repetitions of the action, there can be a time span of a few seconds, such as, for example, 5 seconds, 10 seconds, 20 seconds, 30 seconds, 40 seconds, 50 seconds or 60 seconds. The time span between two repetitions of the action can, however, be considerably longer as, for example, 30 minutes, 1 hour, 2 hours, 6 hours, 12 hours, 1 day, 1 week, or even longer. Preferably, the time span between the repetition of two actions is at least as long as it requires for the organic solvent to evaporate.

[0014] The term "antimicrobial", as used herein, refers to the ability of the composition to kill microorganisms.

[0015] The term "microorganism", as referred to herein, includes bacteria, viruses, fungi and algae. Preferably, the term "microorganism", as used herein, refers to bacteria and viruses.

[0016] The ability to kill microorganisms results in disinfecting, antifouling, self-sanitizing and and/or biocidal effects. In this context "antifouling" refers to the ability to prevent or remove biofouling on wetted surfaces. Biofouling is the accumulation of microorganisms, plants, algae or animals on wetted surfaces and killing such microorganisms, including algae, supports the prevention or removal of biofouling.

[0017] The term "surface", as referred to herein, includes surfaces of bodies of any material, including for example

polymers, metal, glass and stone, as well as coatings on such bodies. The bodies may have any shape including for example plates, sheets, fibers and tubes.

[0018] The term "alkyd resin", as used herein, refers to a polyester modified by the addition of fatty acids and optionally other components. Alkyd resins are derived from a di-, tri- or polyol and a di-, tri- or polycarboxylic acid or carboxylic acid anhydride. The monomers as such are not encompassed by the term "alkyd resin".

[0019] The di-, tri- or polyacid can for example be selected from the group consisting of oxalic acid, malonic acid, succinic acid, glutaric acid, adipic acid, pimelic acid, suberic acid, azelaic acid, cebacic acid, maleic acid, fumaric acid, glutaconic acid, malic acid, aspartic acid, glutamic acid, tartaric acid, phthalic acid, isophthalic acid, terephthalic acid and/or mixtures thereof. Anhydrides of these acids are also suitable. Preferably, the acid residue in the polyester is a diacid residue.

[0020] The di-, tri- or polyalcohol can for example be selected from the group consisting of ethylene glycol, butylene glycol, pentanediol, neopentyl glycol, hexylene glycol, diethylene glycol, dipropylene glycol, triethylene glycol, glycerol, trimethylolethane, trimethylopropane, pentaerythritol, methylglucoside, sugars, sugar alcohols, such as mannitol, xylitol and sorbitol and/or mixtures thereof.

[0021] In addition to the fatty acid residue the polyester backbone in the alkyd resin can be modified by any other organic residue, preferably a hydrophobic residue, more preferably a hydrophobic residue which does not contain any additional reactive functional groups as defined below.

[0022] The term "fatty acid" refers to a carboxylic acid having an aliphatic chain. In one embodiment, the aliphatic chain is saturated. In another embodiment, the aliphatic chain is unsaturated. The number of C-atoms in the aliphatic chain can be in the range from 6 to 40 C-atoms, preferably 6 to 26 C-atoms or 6 to 18 C-atoms. Even more preferably the number of C-atoms in the aliphatic chain is at least 10 or at least 15. More preferably the number of C-atoms in the aliphatic chain is in the range of 6 to 40, 6 to 26, 6 to 20, 10 to 40, 10 to 26, 10 to 20, 15 to 40, 15 to 26 or 15 to 20; 15 to 20 being particularly preferred.

[0023] Preferably, the fatty acid is selected from the group consisting of caproic acid, caprylic acid, capric acid, myristoleic acid, palmitoleic acid, sapienic acid, oleic acid, elaidic acid, vaccenic acid, linoleic acid, linoelaidic acid, α-linolenic acid, arachidonic acid, palmitic acid, stearic acid, lauric acid, myristic acid and/or combinations thereof. In another embodiment, the fatty acid can be di- or trifunctional and is selected from the list consisting of adipic acid, fumaric acid, isophthalic acid, maleic acid, phthalic acid, succinic acid, citric acid and/or combinations thereof. In a further embodiment, the fatty acid is an anhydride of the above named fatty acids.

[0024] In one embodiment the fatty acid does not contain any additional reactive functional group, such as hydroxy, amino, sulfo, phosphato, carboxy, carboxy-amid, cyano, etc. Possible unsaturations in the fatty acid residues are not considered as reactive functional groups in the sense of the present invention.

[0025] In one embodiment, the alkyd resin is a linear polyester. A linear polyester, as defined herein is a difunctional molecule and has two reactive sites.

[0026] In another embodiment, the alkyd resin is a branched polyester containing fatty-acid side groups. A branched polyester, as defined herein is a tri-, tetra-, or higher functional molecule and has three, four, or more reactive sites. Branched polyester may form, as linear polyester, molecular chains, but, in addition, branching connections are formed, which result in a three-dimensional network (cross-linking).

[0027] In addition to the alkyd resin, the composition used in the present invention comprises and organic solvent being selected from alcohols, esters, ketones, aldehydes and mixtures thereof. Suitable alcohols have, for examples, 1 to 5, preferably 1 to 4 carbon atoms. Examples of suitable alcohols are methanol, ethanol, n-propanol, iso-propanol, n-butanol, iso-butanol, tert-butanol and mixtures thereof.

[0028] Suitable ketones usually comprise from 3 to 10, preferably from 3 to 6 carbon atoms. Examples of suitable ketones are ethyl methyl ketone, acetone and mixtures thereof.

[0029] Suitable esters usually contain from 3 to 10, preferably from 3 to 6 carbon atoms. A suitable ester is, for example, ethyl acetate.

[0030] Suitable aldehydes usually contain from 1 to 6, preferably from 1 to 5 carbon atoms. A suitable aldehyde is, for example, formaldehyde.

[0031] In one embodiment, the composition further comprises and/or the alkyd resin is modified with an unsaturated or saturated oil.

[0032] Preferably, the unsaturated or saturated oil is selected from the group consisting of tung oil, linseed oil, sunflower oil, safflower oil, walnut oil, soybean oil, fish oil, corn oil, tall oil, dehydrated castor oil, coconut oil, rapeseed oil, peppermint oil, pine oil, lavender oil, safflower oil, walnut oil, fish oil, corn oil, tall oil, dehydrated castor oil, cumin oil, flax oil, vernonia oil and/or mixtures thereof. Linseed oil, sunflower oil, coconut oil, rapeseed oil, peppermint oil, pine oil, lavender oil, soybean oil, safflower oil, walnut oil, fish oil, corn oil, tall oil, dehydrated castor oil, cumin oil, flax oil, wood oil and vernonia oil being particularly preferred.

[0033] The above oils can be present in the composition as such or as derivatives thereof, for example as their fatty acid, monoester, fatty acid diester, and esters with other carboxylic acids, such as ascorbic acid, acetic acid, propionic

acid, benzoic acid or lactic acid.

[0034] Further possible additives in the composition are for example fatty acids, in particular those as described above, oct-1-en-3-ol, citronellal and pheromones of clothing mots, such as for example (Z, E)-tetradeca-9,12-dienyl acetate.

[0035] The amounts of alkyd resin and organic solvent in the composition used in the present invention are not particularly limited and may be selected by the person skilled in the art according to the requirements. It was, however, surprisingly found that when applying the composition of the present invention repeatedly to a surface, an equilibrium between the built-up of the thickness of the alkyd resin layer and the removal of the alkyd resin layer adjusts and that it is possible to tailor this equilibrium by the ratio of alkyd resin to organic solvent in the composition. The higher the amount of alkyd resin relative to the amount of organic solvent in the compositions is, the thicker the alkyd resin layer will be on the surface after repeated use of the composition until the equilibrium has been adjusted.

[0036] In one embodiment, the composition comprises from 1 to 99 % by weight of the alkyd resin and from 1 to 99 % by weight of the organic solvent, each based on the total weight of the composition. In a further embodiment, the composition comprises from 3 to 80 % by weight, preferably from 5 to 70 % by weight and more preferably from 10 to 60 % by weight of the alkyd resin, based on the total weight of the composition. The amount of organic solvent usually is equal to or higher than the amount of alkyd resin. Thus, the weight ratio of alkyd resin to organic solvent may, for example, be in the range of 1:100 to 1:1, preferably in the range of 1:80 to 1:1, more preferably in the range of 1:50 to 1:1, and even more preferably in the range of 1:10 to 1:2.

[0037] The composition may consist of the alkyd resin and the organic solvent. Alternatively, the composition may comprise further components, such as the above described oil. If the composition contains components further to the alkyd resin and the organic solvent, the weight ratio of the alkyd resin to the organic solvent preferably is within the above ranges.

[0038] Alkyd resins comprising an unsaturated or saturated oil are classified by the amount of oil based on the total weight of the resin. In one embodiment, the amount of unsaturated or saturated oil is higher than 60 wt.-% (long-oil alkyd resin), between 40 wt.-% and 60 wt.-% (medium-oil alkyd resin), or lower than 40 wt.-% (short-oil alkyd resin) based on the total weight of the alkyd resin. In a preferred embodiment the alkyd resin is a medium-oil alkyd resin or a long-oil alkyd resin.

[0039] In one embodiment, the alkyd resin is a drying or a non-drying alkyd resin.

[0040] Drying alkyd resins cure at approximately 20°C or by drying at 60°-80°C. Non-drying alkyd resins do not dry at these temperatures, but are cured by baking.

[0041] In one embodiment, the composition further comprises a siccative (oil-drying agent), which catalyzes the curing of the alkyd resins. Siccatives are typically derived from cobalt, calcium, strontium, barium, manganese and iron ions. In another embodiment, the alkyd resin does not contain any siccatives.

[0042] Suitable alkyd resins are, for example, WorleeKyd B 845 (Worlee-Chemie GmbH, Germany), Setal 196 XX (Nuplex, USA, Kentucky) or Alkydal F26 XX, Alkydal F251 X (Covestro, Germany) and Mundex W or Mundex Pro (Munditia Technologies GmbH).

[0043] In one embodiment, the composition additionally reduces the growth of a biofilm on the surface. The term "additionally" as used herein has the meaning of "simultaneously" and/or "sequentially".

[0044] The term "biofilm", as used herein, refers to an assembly of microorganisms wherein cells stick to each other on the surface of a substrate. The term "growth of biofilm" or "biofilm growth", as used herein, refers to the microorganism built-up adhering to a surface.

[0045] The term "reduction of the growth of a biofilm", as used herein, refers to the decrease, preferably the inhibition, of the microorganism built-up on a long term scale, i.e. at least 1 week, preferably at least 1 month, more preferably at least 1 year, even more preferably at least 3 years, on the surface being treated with a composition as described herein compared to the surface not being treated with a composition as described herein.

[0046] In one embodiment, the compositions as described herein are particularly suitable for simultaneously imparting antimicrobial properties to a surface and reducing, particularly inhibiting, the growth of a biofilm on the surface, thereby reducing, preferably inhibiting, the growth of biofilm on a surface and maintaining the microbial efficacy of the alkyd resins on a long term time scale (at least 2 weeks, preferably at least 1 month, more preferably at least 1 year, even more preferably at least 3 years).

[0047] A particular advantage of the use, according to the present invention, is the finding that alkyd resins itself without the requirement of any further biocidally acting compound provides the desired long-term antimicrobial effect. Therefore, in a particularly preferred embodiment of the present invention the composition is free of any additional antimicrobial compound (except the organic solvent), in particular free of any biocidal product as defined in Article 3(1)(a) of the Regulation (EU) No. 528-2012 of the European Parliament and the Counsel of 22 May 2012. In particular, the composition used in the present invention preferably does not contain any nanoparticles, such as metal nanoparticles, in particular silver nanoparticles. Preferably the composition is free of silver, organotin and gum rosin.

[0048] In a further embodiment the composition used according to the present invention does not contain any internal biocides, preferably the alkyd resin does not contain any internal biocides and any external biocides. In this context

"internal biocides" are understood as compounds having biocidal activity (in particular those compounds as defined in Article 3(1)(a) of the Regulation (EU) No. 528-2012 of the European Parliament and the Counsel of 22 May 2012), which are chemically bound to the alkyd resin, such as the gum rosin in the alkyd resin of example 1 of WO 2010/040903 or the organotin compound in the alkyd resin of US 4,039,494. "External biocides" are to be understood as those biocidal compounds which are present in the alkyd resin, but which are not chemically bound to the alkyd polymer.

[0049] The composition of the present invention may comprise any further suitable compositions, in particular further organic solvents and also water. The water content should, however, be at a concentration at which the formation of the equilibrium in the thickness of the alkyd resin is not adversely affected. In this regard, it was found that a water concentration of up to 50 % by weight, preferably up to 45 % by weight and more preferably up to 40 % by weight based on the total weight of the composition is generally tolerable.

[0050] The present invention furthermore relates to a method for the repeated sanitizing or cleansing of a surface comprising the repeated applying of a composition to the surface, wherein the composition comprises an alkyd resin and an organic solvent, wherein the alkyd resin comprises fatty acid residues, which contain at least 6 carbon atoms in their saturated or unsaturated aliphatic chain, and the organic solvent is selected from the group consisting of alcohols, esters, ketones, aldehydes and mixtures thereof.

[0051] All preferred embodiments described above with respect to the use of the present invention also apply to this method.

Examples

[0052] One composition according to the invention (example 1) and two comparative compositions (comparative examples 1 and 2) were prepared and repeatedly applied to the surface of an aluminum plate (10 cm x 10 cm). Each time 2 g of the composition were applied to the surface and spread with a soft cloth. The plate was weighed before the first application of the composition and after each application of the composition after the coating had been dried. From the weight gain it can be concluded whether the alkyd resin layer formed on the surface of the aluminum plate increases in thickness after each application of the composition.

[0053] The composition of example 1 was a mixture of 50 g Mundex Pro (alkyd resin) and 50 g of iso-propanol. The composition of comparative example 1 was a mixture of 50 g of Mundex Pro (alkyd resin), 47 g of water and 3 g of a 30-33 % hydrogen peroxide solution. The composition of comparative example 2 was a mixture of 50 g of Mundex Pro (alkyd resin) and 50 g of a 5 % NaOCl solution in water.

[0054] The results of the experiments are summarized in the following table 1.

Table 1

Application of composition	Weight of plate [g]		
	Example 1	Comparative Example 1	Comparative Example 2
0	22.11	21.78	21.74
1	22.12	21.79	21.75
2	22.12	21.81	21.76
3	22.13	21.82	21.77
4	22.13	21.82	21.78
5	22.13	21.83	21.78
6	22.14	21.83	21.79
7	22.14	21.84	21.81
8	22.14	21.85	21.82
9	22.14	21.86	21.82
10	22.14	21.87	21.84

[0055] From the data in the above table it is evident that, if the aluminum plate was repeatedly sanitized according to the invention (example 1), the built-up and removal of the alkyd resin layer on the surface reached an equilibrium after 6 repetitions of the application of the composition to the surface and the thickness of the alkyd resin layer did not further increase. With the comparative compositions (comparative examples 1 and 2) there was no such equilibrium but the

thickness of the alkyd resin layer increased with each repetition of the application of the composition to the surface. The composition being used according to the invention therefore was significantly more suitable for the repeated sanitizing of a surface even for a very high number of repetitions.

Claims

1. Use of a composition comprising an alkyd resin and an organic solvent for the repeated sanitizing or cleansing of a surface, wherein the alkyd resin comprises fatty acid residues, which contain at least six carbon atoms in their saturated or unsaturated aliphatic chain, and the organic solvent is selected from the group consisting of alcohols, esters, ketones, ethers, aldehydes and mixtures thereof.

2. Use according to claim 1, wherein the sanitizing includes the killing and/or the prevention or reduction of growth of bacteria, fungi, viruses and/or algae, as well as the provision of antifouling properties.

3. Use according to claim 1 or 2, wherein the alkyd resin is a polyester modified with fatty acid residues.

4. Use according to claim 3, wherein the polyester is linear or branched.

5. Use according to any of the preceding claims, wherein the organic solvent is an alcohol, preferably an alcohol selected from the group consisting of methanol, ethanol, n-propanol, iso-propanol, n-butanol, iso-butanol, tert-butanol and mixtures thereof.

6. Use according to any of the preceding claims, wherein the organic solvent is or additionally comprises a ketone and/or an ester and/or an ether, preferably a ketone selected from the group consisting of ethyl methyl ketone, acetone and mixtures thereof and/or an ethyl acetate ester.

7. Use according to any of the preceding claims, wherein the composition further comprises and/or the alkyl resin is modified with an unsaturated or saturated oil.

8. Use according to claim 7, wherein the unsaturated or saturated oil is selected from the group consisting of linseed oil, sunflower oil, coconut oil, rapseed oil, peppermint oil, pine oil, lavender oil, soybean oil, safflower oil, walnut oil, fish oil, corn oil, tall oil, dehydrated castor oil, cumin oil, flax oil, wood oil, vernonia oil and mixtures thereof.

9. Use according to any of the preceding claims, wherein the composition comprises from 1 to 90 % by weight of the alkyd resin and from 1 to 99 % by weight of the organic solvent, each based on the total weight of the composition.

10. Use according to any of the preceding claims, wherein the alkyd resin is a medium-oil alkyd resin or a long-oil alkyd resin.

11. Use according to any of the preceding claims, wherein the alkyd resin is a drying alkyd resin or a non-drying alkyd resin.

12. Use according to any of the preceding claims, wherein the composition further comprises a siccative.

13. Use according to any of the preceding claims, wherein the sanitizing or cleansing additionally includes the reduction of the growth of a biofilm on the surface.

14. Use according to any of the preceding claims, wherein the composition does not contain any further internal or external biocidal compound, preferably no further internal biocidal compound.

15. Method for the repeated sanitizing or cleansing of a surface comprising the repeated applying of a composition to the surface, wherein the composition comprises an alkyd resin and an organic solvent, wherein the alkyd resin comprises fatty acid residues, which contain at least six carbon atoms in their saturated or unsaturated aliphatic chain, and the organic solvent is selected from the group consisting of alcohols, esters, ketones, ethers and mixtures thereof.

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EUROPEAN SEARCH REPORT

Application Number
EP 22 16 0883

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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TECHNICAL FIELDS SEARCHED (IPC)

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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	9 August 2022	Placke, Daniel

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

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