(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) **EP 4 403 692 A1**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
24.07.2024 Bulletin 2024/30

(21) Application number: **23151889.5**

(22) Date of filing: **17.01.2023**

(51) International Patent Classification (IPC):
D06M 13/02 *(2006.01)* ***D06M 13/148*** *(2006.01)*
D06M 13/224 *(2006.01)* ***D06M 13/372*** *(2006.01)*
D06M 13/46 *(2006.01)* ***D06M 13/525*** *(2006.01)*
D06M 13/53 *(2006.01)* ***D06P 5/30*** *(2006.01)*
D06M 23/16 *(2006.01)* ***D06M 13/463*** *(2006.01)*
D06M 13/184 *(2006.01)* ***D06M 13/395*** *(2006.01)*
D06M 15/03 *(2006.01)* ***D06M 15/564*** *(2006.01)*

(52) Cooperative Patent Classification (CPC):
D06M 13/148; D06M 13/02; D06M 13/184; D06M 13/2243; D06M 13/395; D06M 13/463; D06M 13/525; D06M 13/53; D06M 15/03; D06M 15/564; D06M 23/16; D06M 2200/12; D06M 2200/45; D06M 2200/50

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC ME MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA
Designated Validation States:
KH MA MD TN

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(54) **TEXTILE FINISHING COMPOSITION**

(57) The present invention relates to an aqueous textile finishing composition, and a process for finishing a textile. The aqueous textile finishing composition comprises 1,2,3-propanetriol, a surfactant, and a fatty acid ester containing finishing agent. The textile finishing compositions is silicone- and fluorine-free.

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Description

FIELD OF THE INVENTION

[0001] The present invention relates to the technical field of textile finishing compositions, in particular textile softening compositions, water-repellent finishing compositions and textile finishing compositions for improving the wicking properties, and processes for textile finishing.

BACKGROUND OF THE INVENTION

[0002] Nowadays, the textile industry uses many industrial finishing treatments. Thus, textiles are frequently subjected to a finishing process, which confers certain characteristics on the textile thus finished. The finishing process can be carried out mechanically (e.g. emerizing, compressive shrinkage, shearing) or chemically and provides to the product its final appearance and properties.

[0003] Chemical finishing consists of the modification of textile fibers through chemical action. Chemical finishing is typically carried out by padding, during which the textile is fully immersed in a textile finishing composition and subsequently subjected to repeated cycles of drying (typically by exposure to IR), fixation (typically by using a high temperature fixation frame) and condensation. The padding process leads to considerable use of resources, such as finishing compositions, water and energy.

[0004] Depending on the used textile finishing composition, the chemical finishing treatment can impart to the textile a wide variety of properties, such as softness, water-repellence, improved wicking properties, UV-blocking properties, and flame retardancy properties.

[0005] A textile softening composition is a textile finishing composition, which makes the textile soft, fluffy and antistatic, thereby providing it with a soft hand. A textile softening composition contains a softener or a softening agent, which reduces the friction coefficient between fibers leading to the surface softness and lubricating effect on fibers. Currently silicones (polyxiloxanes), including epoxy or/and amino-modified polysiloxanes, polyether-modified polysiloxanes, which contain polyether active groups grafted on the side chains of polysiloxane chains, and linear multiblock polysiloxane copolymers, are widely used as softeners or softening agents in a textile softening composition to impart softness to and improve the wear feeling of the treated textile. Silicone softening agents are synthetic compounds, the synthesis of which generally requires a lot of energy. Moreover, the production of textile softening composition using silicone softeners has a high carbon footprint since a lot of energy is required for obtaining the desired emulsion. Furthermore, silicone softening agents are not biodegradable and accumulate in the environment.

[0006] A water-repellent finishing composition provides the treated textile with water-repellent properties. A water-repellent finishing composition typically contains a fluorinated water-repellent agent, such as a per- or polyfluoroalkyl substance (PFAS). Fluorinated compounds, in particular PFAS, are known to accumulate in the environment, drinking water and food, and to be harmful to the environment and the human body.

[0007] The consumers' expectations in terms of textiles they use and the manufacturing processes of said textiles have drastically increased lately. Besides suiting their taste in terms of appearance and properties, the textiles must be health- and environment-friendly and produced by environmentally friendly manufacturing processes.

[0008] Given the drawbacks of the currently available textile finishing compositions and processes, particularly in terms of non-biodegradability and toxicity of the finishing agents, and the water and energy consumption, there is a need for a textile finishing composition containing health- and environmentally-friendly ingredients (i.e. biodegradable ingredients that are not harmful for the humans and the environment) that is applicable to the textile by processes other than padding. The composition should also comply with the specific requirements of the textile finishing compositions, such as washing durability (i.e. the maintenance of the characteristics imparted to the textile by the finishing composition after repeated cycles of washing), high affinity for the textile fibers, stability during storage, chemical treatment, and following fixation to the textile, and non-modification of the textile color.

SUMMARY OF THE INVENTION

[0009] Accordingly, it is an object of the present invention to provide a silicone-free and fluorine-free textile finishing composition comprising:

i) from about 10.0 wt-% to about 30.0 wt-% 1,2,3-propanetriol, preferably of vegetal origin;
ii) from about 0.05 wt-% to about 10.0 wt-% of a surfactant;
iii) from about 1.0 wt-% to about 10 wt-% of a fatty acid ester containing finishing agent selected from an oil of vegetal origin, a wax of vegetal origin, a beeswax, and an esterquat, with the proviso that if the fatty acid ester containing finishing agent is a wax of vegetal origin or a beeswax, the composition further comprises a wax extender;

iv) optionally a thickening agent and/or a biocide and/or a pH adjusting agent; and
v) water up to 100 wt-%; wherein the wt-% are based on the total weight of the composition.

[0010] Preferably, the composition claimed and described herein is an ink jet printable composition, preferably a piezoelectric drop-on-demand ink jet printable composition.

[0011] Another aspect according to the present invention is directed to a process for treatment of a textile in a textile finishing process with the inventive composition, preferably comprising the following steps:

a) applying one or more of the inventive compositions on a textile, preferably on a side of said textile or on one or more regions of a side of said textile;
b) drying the textile to obtain a dried textile, preferably by exposing the textile to an air having a temperature from about 120 °C to about 140 °C; and
c) calendaring the dried textile for at least 10 seconds at a temperature from about 140 °C to about 220 °C, preferably from about 180 °C to about 220 °C.

[0012] Also claimed and described herein is a finished textile obtained by the process according to the present invention and a garment comprising said finished textile obtained.

DETAILED DESCRIPTION OF THE INVENTION

[0013] Thus, it is an object according to the present invention to address the need for a textile finishing composition containing health- and environmentally- friendly ingredients that is applicable to the textile by processes other than padding, and which complies with the specific requirements of textile finishing compositions, such as washing durability, high affinity for the textile fibers, stability during storage, chemical treatment, and following fixation to the textile, and non-modification of the textile color (the composition *per se* is colorless i.e. no color is detectable by the naked eye, and following fixation does not modify the color of the treated textile).

[0014] The present invention will be described in more detail below.

[0015] Where the present description refers to "preferred" embodiments/features, combinations of these "preferred" embodiments/features are also deemed to be disclosed as long as the specific combination of the "preferred" embodiments/features is technically meaningful.

[0016] Unless otherwise stated, the following definitions shall apply in this specification:
As used herein, the term "a", "an", "the" and similar terms used in the context of the present invention (especially in the context of the claims) are to be construed to cover both the singular and plural unless otherwise indicated herein or clearly contradicted by the context.

[0017] As used herein, the term "and/or" means that either all or only one of the elements of said group may be present. For example, "A and/or B" means "only A, or only B, or both A and B". In the case of "only A", the term also covers the possibility that B is absent, i.e. "only A, but not B".

[0018] As used herein, the terms "including", "containing" and "comprising" are used herein in their open-ended, non-limiting sense. It is understood that the various embodiments, preferences and ranges may be combined at will. Thus, for instance a solution comprising a compound A may include other compounds besides A. However, the term "comprising" also covers, as a particular embodiment thereof, the more restrictive meanings of "consisting essentially of" and "consisting of, so that for instance "a solution comprising A, B and optionally C" may also (essentially) consist of A and B, or (essentially) consist of A, B and C. As used herein, the transitional phrase "consisting essentially of" (and grammatical variants) is to be interpreted as encompassing the recited materials or steps and those that do not materially affect the basic and novel characteristic (s) of the claimed invention. Thus, the term "consisting essentially of" should not be interpreted as equivalent of "comprising".

[0019] As used herein, the term "about" means that the amount or value in question may be the specific value designated or some other value in its neighborhood. Generally, the term "about" denoting a certain value is intended to denote a range within $\pm$ 5 % of the value. As one example, the phrase "about 100" denotes a range of 100 $\pm$ 5, i.e. the range from 95 to 105. Preferably, the range denoted by the term "about" denotes a range within $\pm$ 3 % of the value, more preferably $\pm$ 1 %. Generally, when the term "about" is used, it can be expected that similar results or effects according to the invention can be obtained within a range of $\pm$5 % of the indicated value.

[0020] Surprisingly, it has been found that a silicone-free and fluorine-free textile finishing composition comprising:

i) from about 10.0 wt-% to about 30.0 wt-% 1,2,3-propanetriol, preferably of vegetal origin;
ii) from about 0.05 wt-% to about 10.0 wt-% of a surfactant, preferably a biodegradable surfactant;
iii) from about 1.0 wt-% to about 10 wt-% of a fatty acid ester containing finishing agent selected from an oil of vegetal origin, a wax of vegetal origin, a beeswax, and an esterquat, with the proviso that if the fatty acid ester derivative is

a wax of vegetal origin or a beeswax, the composition further comprises a wax extender; and
iv) optionally a thickening agent and/or a biocide and/or a pH adjusting agent; and
v) water up to 100 wt-%; with the wt-% being based on the total weight of the composition may be used as a textile finishing composition for imparting to the textile softness, water-repellence and/or improved wicking properties. Advantageously, the majority of the ingredients contained by the composition are natural and biodegradable. Further, the composition does not contain silicones and fluorinated compounds, which are known to be non-biodegradable and even toxic. The textile finishing compositions claimed and described herein are colorless i.e. they do not contain pigments and/or dyes having a color detectable by the naked eye.

[0021] As well known to the skilled person, finishing agents are substances that change a property, other than a color, of a textile.

[0022] The term "silicone-free composition" refers to a composition that does not contain a silicone/polysiloxane. As used herein, the term "silicone" and "polyxiloxanes" encompasses all polymers containing a polysiloxane moiety including, but not limited to, silicones/polysiloxanes oils, modified polysiloxanes, such as epoxy or/and amino-modified polysiloxanes, and polyether-modified polysiloxanes, and linear multiblock polysiloxane copolymers.

[0023] The term "silicone-free composition" refers to a composition that does not contain a fluorinated compound, such as a per- or polyfluoroalkyl substance (PFAS).

[0024] The inventive composition may contain up to 1.0 wt-% of a thickening agent. As well known to the skilled person, a thickening agent or a thickener is a substance that increases the viscosity of a liquid without substantially changing its other properties. A person skilled in the art is in a position to adjust the amount of the thickening agent so as to obtain the viscosity required for the textile finishing composition. Preferably, the thickening agent is a polysaccharide (e.g. starches, vegetable gums) of vegetal origin. Examples of suitable thickening agents include, but are not limited to, carob (also known as locust bean gum or carob gum containing at least 75% galactomannan), such as commercially available Carob EXC 25 from HEIQ - Switzerland, guar gum, carrageenan, and alginin. Advantageously, the thickening agent is commercially available and easily dispersible in water upon mixing.

[0025] Further, the inventive composition may contain up to 0.5 wt-% of a biocide. The biocide prevents biodeterioration of the textile, assists in preventing spread of infectious diseases without requiring the need for frequent sterilization and ensures the stability of the textile finishing composition for at least 12 months. Any conventionally used biocide in textile industry is suitable to be used in the textile finishing composition according to the present invention. Such biocides include, but are not limited to, 1,2-benzisothiazolin-3-one (commercially available at Zeneca Specialties as a solution sold under the commercial name Proxel GXL), organo-copper compounds, organo-tin compounds, chlorinated phenols, silver-based microbial agents and metal-based inorganic compounds, such as zinc oxide, zinc salts and cupric salts.

[0026] Preferably, the textile finishing composition has a pH value of between 5 and 9. The pH value depends on the intended use (e.g. softening, water-repellency) and the stability conditions of the finishing composition, as well as on the performance and effect obtained in the fabric. If required, the textile finishing composition may further contain up to 0.5 wt-% a pH adjusting agent, preferably of vegetal origin. Preferably, the pH adjusting agent is selected from acetic acid, citric acid, ascorbic acid, malic acid, etc. Preferably, citric acid is used for adjusting the pH value of the composition in the pH value range from 5 to 7, while acetic acid is used for adjusting the pH value of the composition in the pH value range from 7 to 9.

[0027] The textile finishing composition according to the present invention may be applied to the textile by coating, spraying or ink jet printing.

[0028] In a preferred embodiment, the textile finishing composition claimed herein is an ink jet printable composition, preferably a piezoelectric drop-on-demand ink jet printable composition. The piezoelectric drop-on-demand ink jet printable compositions have a viscosity from 2 cP to 10 cP, more preferably from 6 to 7 cP, at 25 °C and a shear rate 200-400 s^{-1}. To avoid clogging of the printhead, the particle size of the solid ingredients potentially present in the textile finishing compositions is preferably lower than 1 μm. As used herein, particle size lower than 1 μm is intended to refer to D99 diameter lower than 1 μm. The use of the inkjet printing, preferably piezoelectric drop-on-demand inkjet printing, enables selective application of a well-defined amount of the finishing composition on a side of the textile, or on one or more regions of a side of the textile. Owing to the accurate dosing of the textile finishing composition achieved by inkjet printing, the volume of applied textile finishing composition is significantly lower (4 to 6 times lower) than the one required for finishing by padding, and a constant deposit of the finishing composition is applied on the entire surface to be treated, leading to a high performance that is not reachable by padding processes. Further, the volume of wastewater produced in the finishing process is reduced by a factor 4 to 6 compared to the padding finishing process. Also, the consumed energy is significantly reduced with the present finishing process. Advantageously, the compositions claimed and described herein are ready-to-use i.e. they do not require a preparation on-site and before each finishing process as it is the case for finishing processes including a padding step. The textile finishing compositions claimed and described herein are compatible with commercially available industrial textile printers (e.g. Panthera D8 or Panthera S4 from Swiss Performance Chemicals; LaRIO from MS Printing Solutions), which require significantly less space and human inter-

vention than the currently available industrial textile padder.

[0029] A preferred embodiment according to the present invention is directed to a textile finishing composition as claimed and described herein containing

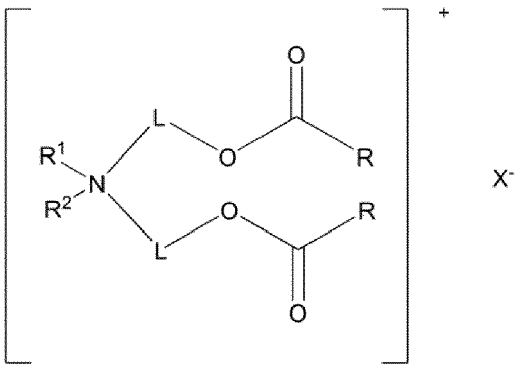
iii-1) from about 1.0 wt-% to about 6.0 wt-% of an oil of a vegetal origin. Such textile finishing composition is particularly useful for imparting to the textile improved softness and/or wicking properties. The term "oil of vegetal origin" encompasses any oil or triglyceride extracted from plants, e.g. from fruits or seeds. Examples of suitable oils, include but are not limited to, almond oil, babassu oil, borage oil, canola oil, coconut oil, corn oil (maize oil), cottonseed oil, flaxseed oil, grape seed oil, hazelnut oil, oat oil, olive oil, palm oil, palm kernel oil, peanut oil, rapeseed oil, safflower oil, sesame oil, linseed oil, soybean oil, tucum oil, sunflower oil, walnut oil, apricot oil, sweet almond oil, avocado oil, baobab oil, blueberry seed oil, calendula oil, camellia oil, cherry kernel oil, cranberry seed oil, hemp oil, jojoba oil, kukur nut oil, macadamia nut oil, manketti oil, melon seed oil, moringe oil, peach kernel oil, pistachio oil, raspberry seed oil, rice bran oil, rosehip oil, soya oil, wheat germ oil, yangu oil, algae oil; their hydrogenated derivatives, and mixtures thereof. In a preferred embodiment, the oil of vegetal origin is selected from rapeseed oil, linseed oil, algae oil; their hydrogenated derivatives, and mixtures thereof.

[0030] An alternative preferred embodiment according to the present invention relates to a textile finishing composition as claimed and described herein containing

iii-2) from about 6.5 wt-% to about 10 wt-% of a wax of a vegetal origin or a beeswax, and from about 1.5 wt-% from about 4.5 wt-% of a wax extender. Such finishing composition is particularly useful for imparting water repellence to the textile. Advantageously, the composition claimed and described herein is also free of paraffin wax, a non-biodegradable ingredient widely used in water-repellent textile finishing compositions. The term "wax of vegetal origin" encompasses all waxes originating from plants. Examples of suitable vegetable waxes, include, but are not limited to: carnauba wax, soy wax, jojoba wax, candelilla wax, rice-bran wax, sugar cane wax, and mixtures/blends thereof. As well known in the art, carnauba wax (also called palm wax) is a common plant wax type harvested from the leaves of the plant by drying the leaves and beating them to loosen the wax. The Carnauba wax contains aliphatic esters (approx. 40 wt-%), diesters of 4-hydroxycinnamic acid (approx. 21.0 wt-%), ω-hydroxycarboxylic acids (approx. 13.0 wt-%), and fatty alcohols (approx. 12 wt%). The compounds are predominantly derived from acids and alcohols in the C26-C30 range. Preferably, the wax of vegetal origin is candelilla wax. Candelilla wax comes from the small leaves of Candelilla shrubs native to northern Mexico and the southwestern U.S. It is harvested by immersing the whole plant in acidified boiling water. The wax then floats to the surface of the boiling water. As well known in the art, a wax extender is a substance used in combination with a wax to improve the performance of said wax e.g. by increasing the water-repellency of the treated textile or the wash durability. Preferably, the wax extender is a urethane or an emulsion of Carnauba wax in 1,2,3-propanetriol.

[0031] A further alternative preferred embodiment is directed to a textile finishing composition as claimed and described herein containing

iii-3) from about 4.0 wt-% to about 7.5 wt-% of an esterquat. This textile finishing composition is particularly suitable for providing long-term softness and improved wicking properties (i.e. the softness/wicking property is maintained after multiple washings) to the treated textiles. As known to the skilled person, an "esterquat" or "ester quat" is a quaternary ammonium salt of an alkanol- and/or alkyl-amine esterified with an average of two fatty acid moieties per molecule. In the composition claimed and described herein, the esterquat is preferably a compound of formula (I)



(I)

wherein

R-C(O) represents the residue of a fatty acid having from about 12 to about 24, preferably from about 14 to about

22, more preferably from about 16 to 20 carbon atoms;
R^1 is an alkyl group of 1 to 4 carbon atoms,
R^2 is an alkyl group of 1 to 4 carbon atoms or a hydroxyalkyl group of 1 to 4 carbon atoms,
-L- is an alkylene of 1 to 4 carbon atoms, and
X^- is a salt forming anion.

The salt forming cation X- renders the esterquat soluble or dispersible in water, and is preferably selected from a halide, e.g. a chloride, a bromide or an iodide; a sulfate, a methosulfate, a nitrite, a nitrate, a phosphate, and a carboxylate, e.g. an acetate, an adipate, a proprionate. Examples of suitable commercially available esterquats, include, but are not limited to bis-(oleic isopropyl ester) dimethyl ammonium methosulfate (supplier: Evonik; commercial name: REWOQUAT® CR 3099) .

[0032] The textile finishing composition claimed and described herein contains from about 10.0 wt-% to about 30.0 wt-%, preferably from about 15.0 wt-% to about 30.0 wt-%, 1,2,3-propanetriol. The used 1,2,3-propanetriol is preferably of vegetal origin e.g. derived from from soybean, coconut, palm or corn oils. The 1,2,3-propanetriol in the specified amount renders the compositions stable during the shell-life (at least 12 months) and ejectable by inkjet printing, particularly piezoelectric drop-on-demand inkjet printing.

[0033] Further, the inventive textile finishing composition contains from about 0.05 wt-% to about 10.0 wt-% of a surfactant. The term "surfactant" is known in the field. It particularly includes compounds that reduce surface tension and / or improve dispersion properties. A person skilled in the art is in a position to identify surfactants suitable for compositions printable by (piezoelectric drop-on-demand) ink jet. The term includes cationic, anionic, nonionic and zwitterionic surfactants. Preferably, the surfactant is biodegradable and/or obtained from renewable raw materials. Examples of suitable commercially available surfactants include, but are not limited to, rhamnolipids (e.g. biosurfactant REWOFERM® RL 100 commercially available from Evonik), sophorolipids (e.g. biosurfactant REWOFERM® SL ONE commercially available from Evonik), sorbitane monooleate (commercially available under the commercial name Span® 80 from Sigma Aldrich), polyethylene glycol sorbitan monooleate (e.g. Tween® 80 commercially available from Sigma Aldrich), sodium dioctylsulfosuccinate, ethoxylated 2,4,7,9-tetramethyl-5-decyne-4,7-diol, and mixtures thereof (e.g. Surfinol® PSA 336 commercially available from Evonik which is a blend of sodium dioctylsulfosuccinate and ethoxylated 2,4,7,9-tetramethyl-5-decyne-4,7-diol) .

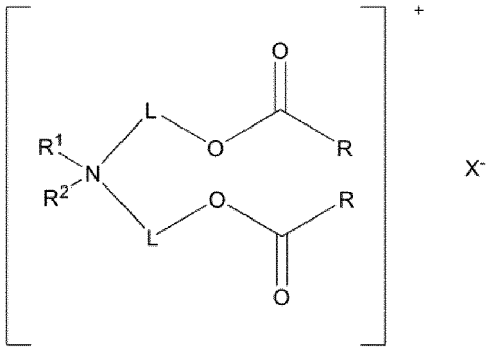
[0034] A preferred embodiment according to the present invention is directed to a water-repellent finishing composition, preferably an inkjet printable water-repellent finishing composition, more preferably a piezoelectric drop-on-demand inkjet printable water-repellent finishing composition comprising

i) from about 20.0 wt-% to about 30.0 wt-% 1,2,3-propanetriol, preferably of vegetal origin;
ii) from about 0.2 wt-% to about 1.0 wt-% of a surfactant as described herein;
iii-2) from about 6.5 wt-% to about 10 wt-% of a wax of vegetal origin as described herein or a beeswax, and from about 1.5 wt-% from about 4.5 wt-% of a wax extender as described herein;
iv) optionally a thickening agent as described herein and/or a biocide as described herein and/or a pH adjusting agent as described herein; and
v) water up to 100 wt-%.

The water-repellent finishing composition exhibits excellent water-repellence, storage stability and wash durability. The water-repellent composition contains preferably from about 0.5 wt-% to about 1.0 wt-% of a thickening agent, such as carob (also known as locust bean gum or carob gum containing at least 75% galactomannan). Preferably, the wax of vegetal origin is candelilla wax and/or the wax extender is an urethane or an emulsion of Carnauba wax in 1,2,3-propanetriol, and/or the surfactant is Surfinol® PSA 336.

[0035] A further preferred embodiment according to the present invention is directed to a textile finishing composition, preferably an inkjet printable textile finishing composition, more preferably a piezoelectric drop-on-demand inkjet printable textile finishing composition comprising

i) from about 12.0 wt-% to about 20.0 wt-% 1,2,3-propanetriol, preferably of vegetal origin;
ii) from about 0.5 wt-% to about 2.5 wt-% of a surfactant as described herein;
iii-3) from about 4.0 wt-% to about 7.5 wt-% of an esterquat as described herein, wherein preferably the esterquat is a compound of formula (I)



(I)

wherein

R-C(O) represents the residue of a fatty acid having from about 12 to about 24, preferably from about 14 to about 22, more preferably from about 16 to 20 carbon atoms;
R^1 is an alkyl group of 1 to 4 carbon atoms,
R^2 is an alkyl group of 1 to 4 carbon atoms or a hydroxyalkyl group of 1 to 4 carbon atoms,
-L- is an alkylene of 1 to 4 carbon atoms, and
X^- is a salt forming anion;

iv) optionally a thickening agent as described herein and/or a biocide as described herein and/or a pH adjusting agent as described herein; and
v) water up to 100 wt-%.

The combination of 1,2,3-propanetriol, surfactant and esterquat in the specific amounts provides softness, improved wicking properties and wash durability to the textile, and confers stability to the textile finishing composition under storage conditions. In the present finishing composition, it is further preferred that

- the surfactant is selected from Span® 80, Tween® 80, Surfinol® PSA 336, and mixtures thereof; and/or
- the esterquat is bis-(oleic isopropyl ester) dimethyl ammonium methosulfate (supplier: Evonik; commercial name: REWOQUAT® CR 3099); and/or
- the composition contains from about 0.05 wt-% to about 2.00 wt-%, preferably from about 0.05 wt-% to about 1.00 wt-%, more preferably from about 0.05 wt-% to about 0.5 wt-% of a pH adjusting agent, such as citric acid or acetic acid; and/or
- the compositions do not contain a thickening agent.

[0036] Another preferred textile composition according to the present invention comprises

i) from about 15.0 wt-% to about 30.0 wt-% 1,2,3-propanetriol, preferably of vegetal origin;
ii) from about 0.05 wt-% to about 10.0 wt-% of a surfactant as described herein;
iii-1) from about 1.0 wt-% to about 6.0 wt-% of an oil of vegetal origin as described herein;
iv) optionally a thickening agent as described herein and/or a biocide as described herein and/or a pH adjusting agent as described herein; and
v) water up to 100 wt-%. The present finishing composition provides improved softness and/or wicking properties to the textile, is stable under storage conditions and is wash durable. A more preferred embodiment is directed to a textile softening composition, preferably an inkjet printable textile softening composition, more preferably to a piezoelectric drop-on-demand inkjet printable textile softening composition, which preferably comprises:

i) from about 17.0 wt-% to about 30.0 wt-% 1,2,3-propanetriol, preferably of vegetal origin;
ii) from about 0.05 wt-% to about 0.8 wt-% of a surfactant as described herein;
iii-1) from about 1.0 wt-% to about 3.0 wt-% of an oil of vegetal origin as described herein;
iv) optionally a thickening agent as described herein and/or a biocide as described herein and/or a pH adjusting agent as described herein; and
v) water up to 100 wt-%. In the present textile softening composition it is further preferred that:

- the oil of vegetal origin is hydrogenated rapeseed; and/or
- the surfactant is Surfinol® PSA 336; and/or
- the composition contains from about 0.1 wt-% to about 0.6 wt-% of a thickening agent, such as carob (also known as locust bean gum or carob gum containing at least 75% galactomannan); and/or
- the composition contains from about 0.05 wt-% to about2.00 wt-%, preferably from about 0.05 wt-% to about 1.00 wt-%, more preferably from about 0.05 wt-% to about 0.5 wt-% of a pH adjusting agent, such as citric acid or acetic acid.

A further preferred embodiment relates to a textile composition for improving the wicking properties of a textile, preferably printable by inkjet, more preferably printable by piezoelectric drop-on-demand inkjet, wherein said composition preferably comprises:

i) from about 15.0 wt-% to about 25.0 wt-% 1,2,3-propanetriol, preferably of vegetal origin;
ii) from about 4.5 wt-% to about 10.0 wt-% of a surfactant as described herein;
iii-1) from about 2.0 wt-% to about 6.0 wt-% of an oil of vegetal origin as described herein;
iv) optionally a thickening agent as described herein and/or a biocide as described herein and/or a pH adjusting agent as described herein; and
v) water up to 100 wt-%. In the present composition it is further preferred that:

- the oil of vegetal origin is selected from linseed oil, algae oil, and mixtures thereof; and/or
- the surfactant is selected from Span® 80, Tween® 80, Surfinol® PSA 336,and mixtures thereof; and/or
- the composition contains from about 0.1 wt-% to about 1.0 wt-%, preferably from about 0.1 wt-% to about 0.5 wt-% of a thickening agent, such as carob (also known as locust bean gum or carob gum containing at least 75% galactomannan.

[0037] To be printable by piezoelectric drop-on-demand inkjet, the compositions claimed and described herein must have a viscosity from 2 cP to 10 cP, more preferably from 6 to 7 cP, at 25 °C and a shear rate 200-400 s^{-1}.

[0038] A second aspect according to the present invention is directed to a kit for finishing a textile comprising:

- a first silicone-free and fluorine free inkjet, preferably piezoelectric drop-on-demand inkjet, printable composition comprising from about 20.0 wt-% to about 30.0 wt-% 1,2,3-propanetriol, preferably of vegetal origin; from about 0.2 wt-% to about 1.0 wt-% of a surfactant as described herein; from about 6.5 wt-% to about 10 wt-% of a wax of vegetal origin as described herein or a beeswax; optionally a thickening agent as described herein and/or a biocide as described herein and/or a pH adjusting agent as described herein; and water up to 100 wt-%; and
- a second silicone-free and fluorine free inkjet, preferably piezoelectric drop-on-demand inkjet, printable composition comprising: from about 20.0 wt-% to about 30.0 wt-% 1,2,3-propanetriol, preferably of vegetal origin; from about 0.2 wt-% to about 1.0 wt-% of a surfactant as described herein; from about 1.5 wt-% from about 4.5 wt-% of a wax extender as described herein; optionally a thickening agent as described herein and/or a biocide as described herein and/or a pH adjusting agent as described herein; and water up to 100 wt-%.

The first silicone-free and fluorine free inkjet, preferably piezoelectric drop-on-demand inkjet, printable composition and the second silicone-free and fluorine free inkjet, preferably piezoelectric drop-on-demand inkjet, printable composition are printed simultaneously on a side of a textile, or on one or more regions of a side of a textile and mix on the surface of the textile. Following drying of the textile and calendaring as described herein, the finished textile exhibits improved water-repellency and wash durability.

[0039] A third aspect according to the present invention is directed to a process for treatment of a textile in a textile finishing process with the composition claimed and described, preferably comprising the following steps:

a) applying one or more of the compositions described herein on a textile;
b) drying the textile to obtain a dried textile, preferably by exposing the textile to an air having a temperature from about 120 °C to about 140 °C; and
c) calendaring the dried textile for at least 10 seconds at a temperature from about 140 °C to about 220 °C, preferably from about 180 °C to about 220 °C.

[0040] Preferably, the finishing process claimed and described herein does not contain a padding step. Hence, at step a) the one or more finishing compositions are preferably applied to the textile by coating, spraying or ink jet printing.

[0041] In a preferred embodiment, the one or more compositions are applied by inkjet printing, preferably piezoelectric drop-on-demand inkjet printing. The use of inkjet printing enables selective application of a well-defined amount of the

one or more finishing compositions on a side of the textile, or on one or more regions of a side of the textile. Thus, the inventive finishing process allows for finishing of a single side of the textile or of certain regions of a side of a textile. This selective finishing cannot be achieved by padding. As well known in the art, the term "side" refers to the front side or the back side of a textile. Moreover, the present finishing process enables the simultaneous application of several finishing compositions. Owing to the accurate dosing of the textile finishing compositions achieved by inkjet printing, the volume of applied textile finishing composition is significantly lower than the one required for finishing by padding and a constant volume of finishing composition is applied on the entire surface to be treated. Further, the volume of wastewater produced in the finishing process and the consumed energy are significantly reduced compared to the padding finishing process.

[0042] In a preferred embodiment, the one or more compositions are applied by piezoelectric drop-on-demand inkjet printing. The low drop volume (5 pL, 7 pL, 12 pL, 18 pL) ejected by and the precise deposit achieved with a piezoelectric drop-on-demand inkjet printhead, results in a uniform (constant wet deposit on the entire treated surface of the textile) finishing of the textile.

[0043] At step b) of the inventive finishing process, the textile is subjected to drying to evaporate the water contained in the finishing compositions and provide a dried textile. This step is preferably achieved by exposure of the coated/sprayed/inkjet printed textile to an air having a temperature from about 120 °C to about 140 °C. The exposure time depends on the surface density (g/m^2) of the deposited finishing composition and the used temperature and is preferably lower than 3 minutes, more preferably lower than 2 minutes, much preferably about 1 minute.

[0044] The dried textile is subsequently calendared for at least 10 seconds, preferably for about 30 seconds, at a temperature from about 140 °C to about 220 °C, preferably from about 180 °C to about 220 °C. This step ensures the fixation of the finishing agent to the fibers of the textile and is faster than the conventionally used fixation step for padding-based finishing process using a high temperature (HT) fixation frame, which requires about 60 seconds at 120 °C. The HT frame/machine currently used in the textile industry is a large installation (length of the heated tunnel is between 10 to 20 meters) requiring a lot of space. Thus, the calendar (rotary heat press roll to roll) (e.g. commercially available calendar roll to roll model RTR-2760-H, Supplier: Eastsign) used in the present process occupies also significantly lower space than the industrial available HT frame/machine.

[0045] A preferred process according to the present invention comprises the following steps:

a) applying by piezoelectric drop-on-demand inkjet printing one or more of the compositions described herein on a side of a textile, or on one or more regions of a side of a textile;
b) drying the textile to obtain a dried textile by exposure to an air having a temperature from about 120 °C to about 140 °C; and
c) calendaring the dried textile for at least 10 seconds at a temperature from about 140 °C to about 220 °C, preferably from about 180 °C to about 220 °C. The present finishing process may be conducted using a commercially available industrial textile printer Panthera D8 (Supplier: Swiss Performance Chemicals) and a calendar. The industrial textile printer Panthera D8 and the calendar require significantly less space than the currently available industrial textile padder and the corresponding HT fixation frame.

[0046] A further aspect according to the present invention is directed to a process for treatment of a textile in a textile finishing process comprising the steps:

- applying by inkjet, preferably by piezoelectric drop-on demand inkjet, printing the first silicone-free and fluorine-free inkjet, preferably piezoelectric drop-on-demand inkjet, printable composition described herein, and the second silicone-free and fluorine-free inkjet, preferably piezoelectric drop-on-demand inkjet, printable composition described herein on a side of a textile, or on one or more regions of a side of a textile;
- drying the textile to obtain a dried textile, preferably by exposing the textile to an air having a temperature from about 120 °C to about 140 °C; and
- calendaring the dried textile for at least 10 seconds at a temperature from about 140 °C to about 220 °C, preferably from about 180 °C to about 220 °C. The first composition and the second composition are printed simultaneously on a side of a textile, or on one or more regions of a side of a textile and mix on the surface of the textile. Following drying and calendaring of the textile, the finished textile exhibits improved water-repellency and wash durability.

[0047] As used herein, the term "textile" is intended to encompass all forms of textile substrates, including woven, knitted and nonwoven textile substrates. The term is intended to exclude fibrous substrates having two-dimensional rigidity such as carpets, paper and cardboard. The fibrous substrates, although sometimes referred as textiles, are internally linked in such a way that they maintain a substantially fixed two-dimensional form. Even though they may be flexible in a third dimension they are not generally free to stretch or distort within the plane of the fiber layer, as is inherent in a true textile. Preferably, the textile is more than 100 meters (e.g. 500 meters) in length and can be provided on a roll

having a width of greater than 1 meter. Preferably, the textile described herein is a woven, knitted or nonwoven fabric. The fabric contains synthetic and/or natural fibers, preferably selected from cellulose fibers, elastane fibers, polyamide fibers and polyester fibers.

[0048] A fourth aspect according to the present invention is directed to a finished textile obtained by the process claimed and described herein, and a garment comprising said finished textile. The finished textile and the garment thereof exhibits softness, water-repellence and/or improved wicking properties, as well as wash durability.

[0049] To further illustrate the invention, the following **examples** are provided. These examples are provided with no intend to limit the scope of the invention.

RT: 20 °C - 25 °C;

I. Preparation of textile finishing compositions according to the invention

[0050] The following textile finishing compositions have been prepared as follows

Example 1: Water-repellent finishing composition

[0051] A 1000 kg batch textile water-repellent finishing composition having the composition depicted in the table below was prepared as follows:

In a first step, an emulsion was obtained by introducing the following ingredients in a high energy dispenser (2000 L capacity) and stirring at the indicated speed and temperature for the indicated time period:

1) vegetal 1,2,3-propanetriol (107.28 kg) - stirring for about 30 min at 2 m/s and RT;
2) Candelilla wax (86.4 kg) - stirring for about 90 min at 5 m/s and RT;
3) Candelilla wax extender (21.6 kg) - stirring for about 90 min at 5 m/s and RT;
4) Proxel™ GXL (0.72 kg) - stirring for about 15 min at 5 m/s and RT;
5) water (504 kg) - stirring for about 45 min at 5 m/s and RT.

[0052] In a second step, the following ingredients were added stepwise to the emulsion obtained in the first step and the stirring was continued for the indicated time to provide the textile finishing composition printable by piezoelectric drop-on-demand inkjet.

1) vegetal 1,2,3-propanetriol (150 kg) - stirring for about 30 min at 5 m/s and RT;
2) carob thickening agent, 20 wt-% dispersion in water (20 kg) - stirring for about 45 min at 5 m/s and RT;
3) Proxel™ GXL (1 kg)- stirring for about 30 min at 10 m/s and RT;
4) Surfinol® PSA 336 (5 kg) - stirring for about 30 min at 10 m/s and RT;
5) water (104 kg) - stirring for about 60 min at 10 m/s and RT.

Ingredient	Commercial name/Supplier	Wt-%
Vegetal 1,2, 3-propanetriol (CAS Nr. 56-81-5)	Pricerine™ 9091 (Croda)	25.7
Candelilla wax (CAS Nr. 8006-44-8)		8.6
Candelilla wax extender: aliphatic blocked isocynate		2.2
Blend of sodium dioctylsulfo succinate and ethoxylated 2,4,7,9-tetramethyl-5-decyne-4,7-diol surfactants	Surfinol® PSA 336 (Evonik)	0.5
Carob thickening agent	Carob EXC 25 -HEIQ - Switzerland	0.4
20% aqueous dipropylene glycol solution of 1,2-benzisothiazolin-3-one (biocide)	Proxel™ GXL	0.1
water		62.5

Example 2: Textile softening finishing composition

[0053] A 1000 kg batch textile softening composition having the composition depicted in the table below was prepared as follows:

In a first step, an emulsion was obtained by introducing the following ingredients in a high energy dispenser (2000 L

capacity) and stirring at the indicated speed and temperature for the indicated time period:

1) vegetal 1,2,3-propanetriol (86.4 kg) - stirring for about 30 min at 2 m/s and RT;
2) citric acid (1.44 kg) - stirring for about 30 min at 2 m/s and RT;
3) carob thickening agent (1.44 kg) - stirring for about 45 min at 5 m/s and RT;
4) Proxel™ GXL (0.72 kg) - stirring for about 30 min at 5 m/s and RT;
5) hydrogenated rapeseed oil (14.4 kg)- stirring for about 60 min at 5 m/s and RT;
6) water (615.6 kg) - stirring for about 45 min at 5 m/s and RT.

[0054] In a second step, the following ingredients were added stepwise to the emulsion obtained in the first step and the stirring was continued for the indicated time to provide the textile finishing composition printable by piezo inkjet.
1) vegetal 1,2,3-propanetriol (150 kg) - stirring for about 30 min at 5 m/s and RT;
2) carob thickening agent, 20 wt-% dispersion in water (1 kg) - stirring for about 45 min at 5 m/s and RT;
3) Proxel™ GXL (1 kg)- stirring for about 15 min at 5 m/s and RT;
4) Surfinol® PSA 336 (5 kg) - stirring for about 15 min at 5 m/s and RT;
5) water (123 kg) - stirring for about 45 min at 10 m/s and RT.

Ingredient	Commercial name/Supplier	Wt-%
Vegetal 1,2,3-propanetriol (CAS Nr. 56-81-5)	Pricerine™ 9091 (Croda)	23.6
Hydrogenated rapeseed oil		1.4
Blend of sodium dioctylsulfo succinate and ethoxylated 2,4,7,9-tetramethyl-5-decyne-4,7-diol surfactants	Surfinol® PSA 336 (Evonik)	0.5
Carob thickening agent	Carob EXC 25 (HEIQ - Switzerland)	0.2
20% aqueous dipropylene glycol solution of 1,2-benzisothiazolin-3-one (biocide)	Proxel™ GXL	0.1
Citric acid (CAS Nr. : 77-92-9; pH adjusting agent)		0.1
water		74.1

Example 3: Textile finishing composition for improved softening and wicking properties

[0055] A 1000 kg batch textile softening composition having the composition depicted in the table below was prepared as follows:
In a first step, an emulsion was obtained by introducing the following ingredients in a high energy dispenser (2000 L capacity) and stirring at the indicated speed and temperature for the indicated time period:

1) REWOQUAT® CR 3099 (54.29 kg) - stirring for about 30 min at 2 m/s and RT;
2) Span® 80 (1.10 kg) - stirring for about 30 min at 2 m/s and RT;
3) Tween® 80 (4.35 kg) - stirring for about 30 min at 2 m/s and RT;
4) water having a temperature of 35 °C (490.30 kg) - stirring for about 60 min at 2 m/s and 35 °C.

[0056] In a second step, the following ingredients were added stepwise to the emulsion obtained in the first step and the stirring was continued for the indicated time to provide the textile finishing composition printable by piezo inkjet.
1) vegetal 1,2,3-propanetriol (150 kg) - stirring for about 30 min at 5 m/s and RT;
2) Surfinol® PSA 336 (5 kg)- stirring for about 10 min at 5 m/s and RT;
3) Proxel™ GXL (1 kg)- stirring for about 10 min at 5 m/s and RT;
4) water (294 kg) - stirring for about 45 min at 10 m/s and RT.

Ingredient	Commercial name/Supplier	Wt-%
Vegetal 1,2, 3-propanetriol (CAS Nr. 56-81-5)	Pricerine™ 9091 (Croda)	15.0

(continued)

Ingredient	Commercial name/Supplier	Wt-%
bis- (oleic isopropyl ester) dimethyl ammonium methosulfate (esterquat)	REWOQUAT® CR 3099 (Evonik)	5.4
(Z)-Sorbitan-mono-9-octadecenoat (CAS NR.: 1338-43-8)	Span® 80 (Sigma Aldrich)	0.1
Polyoxyethylen-Sorbitan-Monooleat (9005-65-6)	Tween® 80 (Sigma Aldrich)	0.4
Blend of sodium dioctylsulfo succinate and ethoxylated 2,4,7,9-tetramethyl-5-decyne-4,7-diol surfactants	Surfinol® PSA 336 (Evonik)	0.5
20% aqueous dipropylene glycol solution of 1,2-benzisothiazolin-3-one (biocide)	Proxel™ GXL	0.1
water		78.5

Example 4: Textile finishing composition for improved wicking properties

[0057] A 1000 kg batch textile softening composition having the composition depicted in the table below was prepared as follows:
In a first step, an emulsion was obtained by introducing the following ingredients in a high energy dispenser (2000 L capacity) and stirring at the indicated speed and temperature for the indicated time period:

1) vegetal 1,2,3-propanetriol (62.62 kg) - stirring for about 15 min at 2 m/s and RT;
2) BST-001 (6.18 kg) - stirring for about 20 min at 2 m/s and 45 °C;
3) BST-020 (35.02 kg) - stirring for about 15 min at 2 m/s and RT;
4) Span® 80 (15.70 kg) - stirring for about 30 min at 5 m/s rpm and RT;
5) Tween® 80 (40.33 kg)- stirring for about 30 min at 5 m/s and RT;
6) water (664.14 kg) - stirring for about 90 min at 10 m/s and RT.

[0058] In a second step, the following ingredients were added stepwise to the emulsion obtained in the first step and the stirring was continued for the indicated time to provide the textile finishing composition printable by piezo inkjet.
1) vegetal 1,2,3-propanetriol (150 kg) - stirring for about 15 min at 5 m/s and RT;
2) carob thickening agent, 20 wt-% dispersion in water (20 kg) - stirring for about 45 min at 5 m/s and RT;
3) Proxel™ GXL (1 kg)- stirring for about 10 min at 5 m/s and RT;
4) Surfinol® PSA 336 (5 kg) - stirring for about 30 min at 5 m/s and RT.

Ingredient	Commercial name/Supplier	Wt-%
Vegetal 1,2,3-propanetriol (CAS Nr. 56-81-5)	Pricerine™ 9091 (Croda)	21.3
Linseed oil	BST-001 (Beyond Surface Technologies - Muttenz)	0.6
Algae oil	BST-020 (Beyond Surface Technologies - Muttenz)	3.5
(Z)-Sorbitan-mono-9-octadecenoat (CAS NR.: 1338-43-8)	Span® 80 (Sigma Aldrich)	1.6
Polyoxyethylen-Sorbitan-Monooleat (9005-65-6)	Tween® 80 (Sigma Aldrich)	4.0
Blend of sodium dioctylsulfo succinate and ethoxylated 2,4,7,9-tetramethyl-5-decyne-4,7-diol surfactants	Surfinol® PSA 336 (Evonik)	0.5
Carob thickening agent	Carob EXC 25 (HEIQ - Switzerland)	0.4
20% aqueous dipropylene glycol solution of 1,2-benzisothiazolin-3-one (biocide)	Proxel™ GXL	0.1

(continued)

Ingredient	Commercial name/Supplier	Wt-%
water		68.0

Example 5: Kit for improving the water-repellency properties of a textile

[0059] A 1000 kg batch of a first silicone-free and fluorine-free composition having the composition depicted in the table below was prepared as follows:
The following ingredients were introduced stepwise (i.e. one after the other in the indicated order) in a high energy dispenser (2000 L capacity) and stirred at the indicated speed and temperature for the indicated time period:
1) vegetal 1,2,3-propanetriol (280 kg) - stirring for about 30 min at 2 m/s and RT;
2) Candelilla wax (92 kg) - stirring for about 90 min at 5 m/s and RT;
3) carob thickening agent, 20 wt-% dispersion in water (20 kg) - stirring for about 45 min at 5 m/s and RT;
4) Proxel™ GXL (2 kg) - stirring for about 15 min at 5 m/s and RT;
5) Surfinol® PSA 336 (5 kg) - stirring for about 45 min at 5 m/s and RT;
6) water (601 kg) - stirring for about 60 min at 10 m/s and RT. First silicone-free and fluorine-free composition

Ingredient	Commercial name/Supplier	Wt-%
Vegetal 1,2, 3-propanetriol (CAS Nr. 56-81-5)	Pricerine™ 9091 (Croda)	28
Candelilla wax (CAS Nr. 8006-44-8)		9.2
Blend of sodium dioctylsulfo succinate and ethoxylated 2,4,7,9-tetramethyl-5-decyne-4,7-diol surfactants	Surfinol® PSA 336 (Evonik)	0.5
Carob thickening agent	Carob EXC 25 - HEIQ - Switzerland	0.4
20% aqueous dipropylene glycol solution of 1,2-benzisothiazolin-3-one (biocide)	Proxel™ GXL	0.2
water		61.7

[0060] A 1000 kg batch of a second silicone-free and fluorine-free composition having the composition depicted in the table below was prepared as follows:
The following ingredients were introduced stepwise (i.e. one after the other in the indicated order) in a high energy dispenser (2000 L capacity) and stirred at the indicated speed and temperature for the indicated time period:

1) vegetal 1,2,3-propanetriol (280 kg) - stirring for about 30 min at 2 m/s and RT;
2) Candelilla extender (32 kg) - stirring for about 90 min at 5 m/s and RT;
3) carob thickening agent, 20 wt-% dispersion in water (22 kg) - stirring for about 45 min at 10 m/s and RT;
4) Proxel™ GXL (2 kg) - stirring for about 15 min at 10 m/s and RT;
5) Surfinol® PSA 336 (5 kg) - stirring for about 45 min at 10 m/s and RT;
6) water (659 kg) - stirring for about 60 min at 10 m/s and RT.

Second silicone-free and fluorine-free composition

[0061]

Ingredient	Commercial name	Wt-%
Vegetal 1,2, 3-propanetriol (CAS Nr. 56-81-5)	Pricerine™ 9091 (Croda)	28
Candelilla wax extender: aliphatic blocked isocynate		3.2

(continued)

Ingredient	Commercial name	Wt-%
Blend of sodium dioctylsulfo succinate and ethoxylated 2,4,7,9-tetramethyl-5-decyne-4,7-diol surfactants	Surfinol® PSA 336 (Evonik)	0.5
Carob thickening agent	Carob EXC 25 - HEIQ - Switzerland	0.4
20% aqueous dipropylene glycol solution of 1,2-benzisothiazolin-3-one (biocide)	Proxel™ GXL	0.2
water		67.7

II. Manufacturing of textiles finished with textile finishing compositions according to the invention

[0062] The finishing process was performed using a commercially available industrial textile printer Panthera D8 (Supplier: Swiss Performance Chemicals) and subsequent calendar roll to roll (Model RTR-2760-H, Supplier: Eastsign). The Panthera D8 printer is equipped with 8 water-based Kyocera KJ4B-0300, DOD IJ Piezo Print heads.

1. Evaluation of the wicking properties of a textile finished with the textile finishing composition according to example 4

[0063] The textile finishing composition according to example 4 was printed by piezoelectric drop-on-demand ink jet (printing resolution 600x600dpi, 2 passes; printing speed 250 m^2/h; wet deposit: 15 g/m^2) on a surface of a white color textile (Reference number: W-2017-992; 100 % PES; knitted) and of a pink color textile (Reference number: W-2017-993; 100 % PES; knitted). The printed textiles were dried by exposure to hot air (120 °C) for 90 seconds. Subsequently, the dried textiles were calendared for 35 sec at 205 °C to provide the finished textiles T1 and T2 according to the present invention (T1 - white color, T2 - pink color).

[0064] For comparative purposes,

- a sample of the white color textile and of the pink color textile was printed as described above. To dry and fix the finishing composition to the textiles, said printed textile were kept in an oven at 100 °C for 1 minute. Comparative finished textiles C1 and C2 (C1 - white color, C2 - pink color) were obtained;
- a sample of the white color textile (the sample was not treated with a finishing composition) was finished by drying in an oven at 100 °C for 1 minute to provide the comparative textile C3;
- a sample of the white textile was finished using a standard finishing composition for improving the wicking properties of textiles and a finishing process including a padding step, a drying step by exposure to IR, and a fixation step by using a high temperature fixation frame. Comparative sample C4 was obtained.

[0065] The wicking properties of the finished textiles T1, T2, C1 - C4 were evaluated in the water drop test method AATCC 79, where the absorption time in seconds was measured prior to washing, and after 1, 5 and 10 washings (laundering test ISO 5077/3759/6330; Detergent ECE 98 -20 g), respectively.

[0066] The water drop test method AATTCC79, also known as absorption time - dropping test, is conventionally used in the textile industry to measure the absorption time of a drop of water by the textile fabric. To measure the absorption time, the textile fabric is held in a mandrel and a drop of water (0.1 mL) is deposited with a micropipette on the surface of the fabric. The time required by the textile fabric to absorb the drop (absorption time) is measured. The absorption time is a measure of the wicking propeties of the textile fabric.

The measured absorption time (seconds) is presented in the Table below:

	Finished textile					
	T1	**T2**	C1	C2	C3	C4
Prior to washing	<1	<1	6.78	3.08	33.67	1.7
After 1st washing	<1	<1	6.85	3.15	34.77	1.7
After 5th washing	<1	<1	7.34	3.45	34.85	1.9

(continued)

	Finished textile					
	T1	**T2**	C1	C2	C3	C4
After 10th washing	<1	<1	10.90	4.86	35.60	2.01

[0067] The two finished textile fabrics T1 and T2 according to the present invention present better wicking properties and wash durability (absorption time lower than 1 second even after 10 washings) than the finished textile fabric C4 finished by padding with a standard padding composition. The comparable properties of the finished textile fabrics T1 and T2 show the versatility of the textile finishing composition and the textile finishing process. Comparison of the adsorption time measured for the finished textiles C1 and C2 and the finished textiles T1 and T2 demonstrates that the calendaring step is essential for fixing the finishing composition to the textile fabric. Comparative finished textile C3 that was not printed with a textile finishing composition presents poor wicking properties as evidenced by the absorption time superior to 30 seconds.

2. Evaluation of the wicking properties of a textile finished with the textile finishing composition according to example 3

[0068] The textile finishing composition according to example 3 was printed by piezoelectric drop-on-demand ink jet (printing resolution 600x600dpi, 2 passes; printing speed 250 m^2/h; wet deposit: 15 g/m^2) on a surface of the three different textile fabrics indicated below. The printed textiles were dried by exposure to hot air (120 °C) for 90 seconds. Subsequently, the dried textiles were calendared for 35 sec at 205 °C to provide the finished textiles **T3** - **T5** (T3 - finished 1st fabric, T4 - finished 2nd fabric, and T5 - finished 3rd fabric) .

1st fabric	Single Jersey, 245 g/m^2	87% cotton and 13% spandex
2nd fabric	Single Jersey plated,140 g/m^2	61% cotton and 39% POLYESTER
3rd fabric	Single Jersey, 125 g/m^2	60% cotton and 40% POLYESTER

[0069] The wicking properties of the finished textiles T4 - T5 were evaluated in the above-described water drop test method AATCC 79, and in the test method for vertical wicking rate of textiles AATCC 197 (effects were measured at 30 minutes).

[0070] Test method AATCC 197 is generally used in textile industry to evaluate the ability of fabric specimens to transport liquid vertically when a cut edge is submerged. The determined vertical wicking rate represents a measure of the textile wicking properties. Cut edges of samples of the finished textiles T3 - T5 (14.0 x 2.5 cm) were submerged in water for 30 minutes. The samples were submerged both in the warp and in the weft direction. The height of the water absorbed by the samples (wicking distance) after 30 min was measured. Wicking distances at 30 minutes superior to 13 cm are indicative of textile fabrics having excellent absorbency and wicking behavior.

[0071] The results of the tests are summarized in the Table below:

	Absorption time measured in test method AATCC 79 (seconds)	Wicking distance (cm) measured at 30 minutes in test method AATCC 197	
		Warp	Weft
Finished 1st fabric **T3**	< 1	15.3	17.1
Finished 2nd fabric **T4**	< 1	17.0	14.3
Finished 3rd fabric **T5**	< 1	17.0	16.3

[0072] Finished textile fabrics T3 - T5 according to the present invention show excellent absorbency (AATCC 79, absorption time < 1 second). Finished textile fabrics T3 - T5 also show excellent wicking behavior (AATCC 197) and meet the absorbency requirements of at least 13 cm for the wicking height at 30 minutes. The tests conducted in two

directions of the fabric in warp and weft illustrate the excellent wicking behavior of the finished textile fabric according to the present invention. The wicking properties of the three tested textile fabrics are comparable, showing the versatility of the textile finishing composition and of the finishing process.

3. Evaluation of the softness properties of a textile finished with the textile finishing composition according to example 2

[0073] The textile finishing composition according to example 2 was printed by piezoelectric drop-on-demand ink jet printing resolution 600x600dpi, 2 passes; printing speed 250 m^2/h; wet deposit: 15 g/m^2) on a surface of a variety of different textile fabrics including 100% cotton twill at a density of 160 g/m^2 and a fabric garment blend 70% cotton/30%polyester at a density of 110 g/m^2. The printed textile fabrics were dried by exposure to hot air (120 °C) for 90 seconds and subsequently, calendared for 35 sec at 205 °C to provide the finished textile.

[0074] Following finishing, the softness of the finished fabric was evaluated by an expert by hand touch prior to washing and after 5, 10 and 20 washings, respectively. Compared to the untreated textile, the finished textile exhibit an excellent softness. The softness is maintained after 5, 10 and 20 washings.

4. Evaluation of the water-repellency of a textile finished with the textile finishing composition according to example 1

[0075] The textile finishing composition according to example 1 was printed by piezoelectric drop-on-demand ink jet (printing resolution 600x600dpi, 2 passes; printing speed 250 m^2/h; wet deposit: 15 g/m^2) on a surface of the three different textile fabrics indicated below. The printed textiles were dried by exposure to hot air (120 °C) for 1 minute. Subsequently, the dried textiles were calendared for 3 minutes at 205 °C to provide the finished textiles **T6** - **T8** according to the present invention (T6 - finished textile fabric A, T7 - finished textile fabric B, T8 - finished textile fabric C).

Textile fabric	Color	Composition		Density g/m2
A	light grey	88% polyamide/12% elastane	woven	180
B	kaki	72% polyamide/20% wool/8% elastane	woven	200
C	medium grey	94% polyamide/6 % elastane	woven	180

[0076] The water repellence of the finished textiles T6 - T8 and of the corresponding untreated textile A-C was evaluated in the AATCC 22 test method using the commercially available spray rating tester TF160 (supplier: Testex). Three samples were evaluated for each of the textile fabrics A, B and C. During the experiment, the sample of finished fabric held in a mandrel is sprayed with water. The sample is oriented at 45° with respect to the nozzle head of the spray rating tester and positioned at a distance of 150 mm under the nozzle. At the end of the experiment, the appearance of the sprayed finished fabric is compared with the appearance of the finished fabric (not sprayed) by an expert and based on visual standards, a visual rating is given to the finished fabric. A visual rating of 100 indicates that the textile fabric preserves its initial aspect (i.e. no visually detectable difference between the appearance of the textile fabric prior and after the spraying) and no water was absorbed by the textile fabric during the experiment i.e. the textile fabric has excellent water repellence. The results of the visual rating are summarized in the table below:

Textile fabric A	Sample 1	Sample 2	Sample 3
Untreated fabric	95	90	85
Finished fabric prior to washing	100	100	100
After 1st wash	100	100	100
After 5th wash	100	100	100
After 10th wash	100	100	90
After 20th wash	100	100	90

Textile fabric B	Sample 1	Sample 2	Sample 3
Untreated fabric	95	95	90
Finished fabric prior to washing	100	100	100
After 1st wash	100	100	100
After 5th wash	100	100	100
After 10th wash	100	100	100
After 20th wash	100	100	100

Textile fabric C	Sample 1	Sample 2	Sample 3
Untreated fabric	100	95	90
Finished fabric prior to washing	100	100	100
After 1st wash	100	100	100
After 5th wash	100	100	100
After 10th wash	100	100	100
After 20th wash	100	95	90

[0077] As shown by the above table, the finished textiles according to the present invention provide excellent water repellency even after 20 washings. The rating of "100" indicates no absorption of water by the tested fabric. The water repellency does not decrease after 1 wash, 5x washes, lOx washes and 20x washes, which confirms the excellent wash durability of the finishing obtained with the inventive finishing process. Comparable results were obtained for the three fabrics attesting the versatility of the water-repellent finishing composition and the finishing process according to the present invention.

5. Evaluation of the reliability of the finishing composition

[0078] The reliability of the textile finishing compositions according to examples 1 to 4 and of the textile finishing process was tested on a piezoelectric drop-on-demand inkjet printer Panthera S4 (supplier: Swiss Performance Chemicals) equipped with 4 water-based DOD IJ Piezo Kyocera KJ4B-0300 printheads and on a piezoelectric drop-on-demand inkjet printer Panthera D8 (supplier: Swiss Performance Chemicals) equipped with 8 water-based DOD IJ Piezo Kyocera KJ4B-0300 printheads.To visualize the quality of the printing, a magenta sublimation ink (SwissJet SP7 from Swiss Perfomance Chemicals, Switzerland) was added to each of the textile finishing compositions according to examples 1 to 4 (99 wt-% textile finishing composition; 1 wt-% magenta sublimation ink).

[0079] The so obtained finishing compositions were printed bidirectionally at 240 m^2/h on a white color textile fabric (Natt6 2/1, 100% PES, 218 g/m^2) without using automatic cleaning up program. Different lengths (20 m, 100 m, 200 m, and 500 m) of textile were printed and the quality of the printing was visually checked. A prime test was conducted prior to printing each of the desired lengths (20 m, 100 m, 200 m and 500 m) to check whether all nozzles are correctly ejecting, as well as after printing each of the desired lengths to detect potential nozzles clogging.

[0080] The above-summarized printing procedure was repeated after leaving the finishing compositions in the printer for 3 days.

[0081] After exposure to hot air (120 °C) for 90 seconds and subsequent calendaring for 35 sec at 205 °C, the printed textile was examined. No errors were detected on the printed textile. Moreover, no nozzles clogging occurred.

Claims

1. A silicone-free and fluorine-free textile finishing composition comprising:

i) from about 10.0 wt-% to about 30.0 wt-% 1,2,3-propanetriol;
ii) from about 0.05 wt-% to about 10.0 wt-% of a surfactant;

iii) from about 1.0 wt-% to about 10 wt-% of a fatty acid ester containing finishing agent selected from an oil of vegetal origin, a wax of vegetal origin, a beeswax, and an esterquat, with the proviso that if the fatty acid ester containing finishing agent is a wax of vegetal origin or a beeswax, the composition further comprises a wax extender;
iv) optionally a thickening agent and/or a biocide and/or a pH adjusting agent; and
v) water up to 100 wt-%; wherein the wt-% are based on the total weight of the composition.

2. The composition according to claim 1, wherein said composition is an ink jet printable composition, preferably a piezoelectric drop-on-demand ink jet printable composition.

3. The composition according to claim 1 or 2, wherein said composition comprises

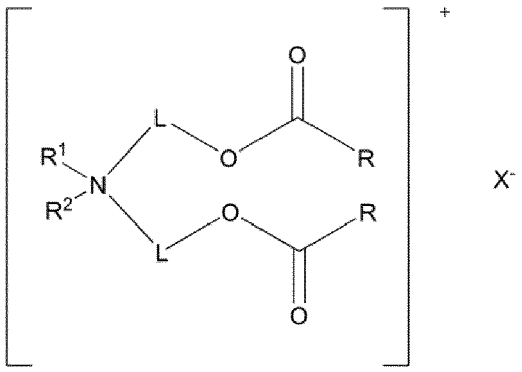
iii-1) from about 1.0 wt-% to about 6.0 wt-% of an oil of a vegetal origin; or
iii-2) from about 6.5 wt-% to about 10 wt-% of a wax of a vegetal origin or a beeswax, and from about 1.5 wt-% to about 4.5 wt-% of a wax extender; or
iii-3) from about 4.0 wt-% to about 7.5 wt-% of an esterquat.

4. The composition according to any one of claims 1 to 3, wherein the composition is a water-repellent finishing composition comprising

i) from about 20.0 wt-% to about 30.0 wt-% 1,2,3-propanetriol;
ii) from about 0.2 wt-% to about 1.0 wt-% of a surfactant;
iii-2) from about 6.5 wt-% to about 10 wt-% of a wax of vegetal origin or a beeswax, and from about 1.5 wt-% from about 4.5 wt-% of a wax extender;
iv) optionally a thickening agent and/or a biocide and/or a pH adjusting agent; and
v) water up to 100 wt-%.

5. The composition according to any one of claims 1 to 3, wherein the composition comprises

i) from about 12.0 wt-% to about 20.0 wt-% 1,2,3-propanetriol;
ii) from about 0.5 wt-% to about 2.5 wt-% of a surfactant;
iii-3) from about 4.0 wt-% to about 7.5 wt-% of an esterquat, wherein preferably the esterquat is a compound of formula (I)



(I)

wherein

R-C(O) represents the residue of a fatty acid having from about 12 to about 24, preferably from about 14 to about 22, more preferably from about 16 to 20 carbon atoms;
R^1 is an alkyl group of 1 to 4 carbon atoms,
R^2 is an alkyl group of 1 to 4 carbon atoms or a hydroxyalkyl group of 1 to 4 carbon atoms,
-L- is an alkylene of 1 to 4 carbon atoms, and

X- is a salt forming anion;

iv) optionally a thickening agent and/or a biocide and/or a pH adjusting agent; and
v) water up to 100 wt-%.

6. The composition according to any one of claims 1 to 3, wherein the composition comprises

i) from about 15.0 wt-% to about 30.0 wt-% 1,2,3-propanetriol;
ii) from about 0.05 wt-% to about 10.0 wt-% of a surfactant;
iii-1) from about 1.0 wt-% to about 6.0 wt-% of an oil of vegetal origin;
iv) optionally a thickening agent and/or a biocide and/or a pH adjusting agent; and
v) water up to 100 wt-%.

7. The composition according to claim 6, wherein the composition is a textile softening composition.

8. The composition according to claim 7, wherein the composition comprises

i) from about 17.0 wt-% to about 30.0 wt-% 1,2,3-propanetriol;
ii) from about 0.05 wt-% to about 0.8 wt-% of a surfactant;
iii-1) from about 1.0 wt-% to about 3.0 wt-% of an oil of vegetal origin;
iv) optionally a thickening agent and/or a biocide and/or a pH adjusting agent; and
v) water up to 100 wt-%.

9. The composition according to claim 6, wherein the composition comprises

i) from about 15.0 wt-% to about 25.0 wt-% 1,2,3-propanetriol;
ii) from about 4.5 wt-% to about 10.0 wt-% of a surfactant;
iii-1) from about 2.0 wt-% to about 6.0 wt-% of an oil of vegetal origin;
iv) optionally a thickening agent and/or a biocide and/or a pH adjusting agent; and
v) water up to 100 wt-%.

10. A process for treatment of a textile in a textile finishing process with the composition according to any one of the claims 1 to 9, preferably comprising the following steps:

a) applying one or more compositions according to any one of the claims 1 to 9, on a textile;
b) drying the textile to obtain a dried textile, preferably by exposing the textile to an air having a temperature from about 120 °C to about 140 °C; and
c) calendaring the dried textile for at least 10 seconds at a temperature from about 140 °C to about 220 °C, preferably from about 180 °C to about 220 °C.

11. The process according to claim 10, wherein the process does not contain a padding step.

12. The process according to claim 10 or 11, wherein step a) comprises applying one or more compositions according to any one of the claims 1 to 9 on a side of the textile, or on one or more regions of a side of the textile.

13. The process according to any one of claims claim 10 to 12, wherein at step a) the one or more compositions are applied by inkjet printing, preferably piezoelectric drop-on-demand inkjet printing.

14. The process according to any one of claims 10 to 13, wherein the textile is a woven, knitted or nonwoven fabric.

15. A finished textile obtained by the process according to any one of the claims 10 to 14, or a garment comprising a finished textile obtained by the process according to any one of the claims 10 to 14.

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EUROPEAN SEARCH REPORT

Application Number
EP 23 15 1889

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	EP 3 549 989 B1 (AGFA NV [BE]) 1 December 2021 (2021-12-01) * paragraph [0001] - paragraph [0050]; claims 1-15; example 9; table 3 *	1-3,6-15	INV. D06M13/02 D06M13/148 D06M13/224 D06M13/372 D06M13/46 D06M13/525 D06M13/53 D06P5/30 D06M23/16 D06M13/463 D06M13/184 D06M13/395 D06M15/03 D06M15/564
X	HUANG ET AL: "Microencapsulation of extract containing shikonin using gelatin-acacia coacervation method: A formaldehyde-free approach", COLLOIDS AND SURFACES B: BIOINTERFACES, ELSEVIER AMSTERDAM, NL, vol. 58, no. 2, 19 June 2007 (2007-06-19), pages 290-297, XP022121451, ISSN: 0927-7765, DOI: 10.1016/J.COLSURFB.2007.04.013 * page 291 - page 296; table 3 *	1,3,6,7	

TECHNICAL FIELDS SEARCHED (IPC)

D06M
D06P

~~The present search report has been drawn up for all claims~~

Place of search	Date of completion of the search	Examiner
The Hague	16 June 2023	Massella, Daniele

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

EPO FORM 1503 03.82 (P04C01)

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Application Number
EP 23 15 1889

CLAIMS INCURRING FEES

The present European patent application comprised at the time of filing claims for which payment was due.

☐ Only part of the claims have been paid within the prescribed time limit. The present European search report has been drawn up for those claims for which no payment was due and for those claims for which claims fees have been paid, namely claim(s):

☐ No claims fees have been paid within the prescribed time limit. The present European search report has been drawn up for those claims for which no payment was due.

LACK OF UNITY OF INVENTION

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

see sheet B

☐ All further search fees have been paid within the fixed time limit. The present European search report has been drawn up for all claims.

☐ As all searchable claims could be searched without effort justifying an additional fee, the Search Division did not invite payment of any additional fee.

☐ Only part of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the inventions in respect of which search fees have been paid, namely claims:

☒ None of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims, namely claims:

6-9(completely); 1-3, 10-15(partially)

☐ The present supplementary European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims (Rule 164 (1) EPC).

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LACK OF UNITY OF INVENTION
SHEET B

Application Number
EP 23 15 1889

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

1. claims: 6-9(completely); 1-3, 10-15(partially)

Group 1: Claims 1-i, 2-i, 3-i, 6-9 10-i, 11-i, 12-i, 13-i, 14-i, 15-i directed to " A silicone-free and fluorine-free textile finishing composition comprising: i) from about 10.0 wt-% to about 30.0 wt-% 1,2,3-propanetriol; ii) from about 0.05 wt-% to about 10.0 wt-% of a surfactant; iii) from about 1.0 wt-% to about 10 wt-% of a fatty acid ester containing finishing agent selected from an oil of vegetal origin,iv) optionally a thickening agent and/or a biocide and/or a pH adjusting agent; v) water up to 100 wt-%; wherein the wt-% are based on the total weight of the composition".

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2. claims: 4(completely); 1-3, 10-15(partially)

Group 2: Claims 1-ii, 2-ii, 3-ii, 4, 10-ii, 11-ii, 12-ii, 13-ii, 14-ii, 15-ii directed to " A silicone-free and fluorine-free textile finishing composition comprising: i) from about 10.0 wt-% to about 30.0 wt-% 1,2,3-propanetriol; ii) from about 0.05 wt-% to about 10.0 wt-% of a surfactant; iii) from about 1.0 wt-% to about 10 wt-% of a fatty acid ester containing finishing agent selected from a wax of vegetal origin, a beeswax, with the proviso that, the composition further comprises a wax extenderiv) optionally a thickening agent and/or a biocide and/or a pH adjusting agent; v) water up to 100 wt-%; wherein the wt-% are based on the total weight of the composition".

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3. claims: 5(completely); 1-3, 10-15(partially)

Group 3:Claims 1-iii, 2-iii, 3-iii, 5, 10-iii, 11-iii, 12-iii, 13-iii, 14-iii, 15-iii directed to " A silicone-free and fluorine-free textile finishing composition comprising: i) from about 10.0 wt-% to about 30.0 wt-% 1,2,3-propanetriol; ii) from about 0.05 wt-% to about 10.0 wt-% of a surfactant; iii) from about 1.0 wt-% to about 10 wt-% of a fatty acid ester containing finishing agent selected from an esterquat. iv) optionally a thickening agent and/or a biocide and/or a pH adjusting agent; v) water up to 100 wt-%; wherein the wt-% are based on the total weight of the composition".

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 23 15 1889

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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16-06-2023

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 3549989 B1	01-12-2021	CN 111902495 A	06-11-2020
		EP 3549989 A1	09-10-2019
		US 2021040342 A1	11-02-2021
		WO 2019192949 A1	10-10-2019

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REFERENCES CITED IN THE DESCRIPTION

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Non-patent literature cited in the description

- *CHEMICAL ABSTRACTS,* 56-81-5 **[0052] [0054] [0056] [0058] [0059] [0061]**
- *CHEMICAL ABSTRACTS,* 8006-44-8 **[0052] [0059]**
- *CHEMICAL ABSTRACTS,* 77-92-9 **[0054]**
- *CHEMICAL ABSTRACTS,* 1338-43-8 **[0056] [0058]**