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(54) Title: COMPOSITION AND PROCESS FOR DYEING KERATIN FIBERS

(57) Abstract: A composition comprises: a) at least one protein with a molecular weight of at least 10 kDa; b) at least one organic solvent; and c) at least one pigment. A process for dyeing keratin fibers such as the hair comprises applying the composition onto the keratin fibers.

COMPOSITION AND PROCESS FOR DYEING KERATIN FIBERS

TECHNICAL FIELD

The present invention relates to a composition. In particular, the present invention relates to a composition for dyeing keratin fibers such as the hair. The present invention also relates to a process for dyeing keratin fibers such as the hair.

BACKGROUND ART

Many people have for a long time sought to modify the color of their hair, and especially to mask their grey hair.

In the field of dyeing keratin fibers, in particular human keratin fibers, it is already known practice to dye hair keratin fibers via various techniques using direct dyes or pigments for non-permanent dyeing, or dye precursors for permanent dyeing.

There are essentially three types of process for dyeing the hair:

a) "permanent" dyeing, the function of which is to afford a substantial modification to the natural color and which uses oxidation dyes which penetrate into the hair fibers and form the dye via an oxidative condensation process;

b) non-permanent, semi-permanent or direct dyeing, which does not use the oxidative condensation process and withstands four or five shampoo washes; it consists of dyeing the hair with dye compositions containing direct dyes;

c) temporary dyeing, which gives rise to a modification of the natural color of the hair that remains from one shampoo wash to the next, and which serves to enhance or correct a shade that has already been obtained. It may also be likened to a "makeup" process.

The temporary dyeing method consists of using pigments. Specifically, the use of pigment on the surface of keratin fibers generally makes it possible to obtain visible colourings on dark hair, since the surface pigment masks the natural color of the fibers.

However, some products for temporary dyeing the hair on the market have the drawback of transferring, i.e. of becoming at least partly deposited, leaving marks, on certain supports with which they may be placed in contact and in particular clothing or the skin.

In addition, compositions for temporarily dyeing and/or making up the hair may also lead to a hair feel that is uncosmetic and/or not natural; the hair thus dyed may in particular lack softness and/or suppleness and/or strand separation.

Thus, there is a need to develop a composition for dyeing keratin fibers such as the hair with good cosmetic properties on keratin fibres such as the hair such as softness and suppleness while retaining keratin fibres such as the hair with good strand separation and having transfer-resistant properties.

SUMMARY OF THE INVENTION

One aim of the present application is to provide a composition for dyeing keratin fibers such as the hair, with good cosmetic properties on the keratin fibers such as the hair such as softness and suppleness while retaining the keratin fibers such as the hair with good strand separation and having transfer-resistant properties.

Another aim of the present application is to provide a process for dyeing the hair.

Thus, the present invention provides a composition, preferably for dyeing keratin fibers such as the hair, comprising:

a) at least one protein with a molecular weight of at least 10 kDa;

b) at least one organic solvent; and

c) at least one colouring agent chosen from pigments, direct dyes, and mixtures thereof.

Preferably, the composition according to the present invention is a composition for dyeing the hair.

The present invention also relates to a process for dyeing keratin fibers such as the hair comprising applying the composition as described above onto the keratin fibers such as the hair.

The inventors found that the composition according to the present invention makes it possible to obtain colored coating on the hair having good strand separation, being softer and more supple and which are easy to disentangle.

After the application of the composition to keratin fibers, such as the hair, the composition has good transfer resistance and deposition onto the supports with which the composition is brought into contact, such as the skin and/or clothing, is limited.

Other subjects and characteristics, aspects and advantages of the present

invention will emerge even more clearly on reading the detailed description and the examples that follow.

DETAILED DESCRIPTION OF THE INVENTION

Unless otherwise defined, all technical and scientific terms used herein have the same meaning as commonly understood by those skilled in the art the present invention belongs to. When the definition of a term in the present description conflicts with the meaning as commonly understood by those skilled in the art the present invention belongs to, the definition described herein shall apply.

As used herein, unless otherwise indicated, the limits of a range of values are included within this range, in particular, in the expressions "between ... and ..." and "from ... to ...".

Moreover, the expression "at least one" used in the present description is equivalent to the expression "one or more".

Throughout the instant application, the term "comprising" is to be interpreted as encompassing all specifically mentioned features as well as optional, additional, unspecified ones. As used herein, the use of the term "comprising" also discloses the embodiment wherein no features other than the specifically mentioned features are present (*i.e.* "consisting of").

Unless otherwise specified, all numerical values expressing amount of ingredients and the like which are used in the description and claims are to be understood as being modified by the term "about". Accordingly, unless indicated to the contrary, the numerical values and parameters described herein are approximate values which are capable of being changed according to the desired purpose as required.

As used herein, molecular weight indicates weight-average molecular weight.

All percentages in the present invention refer to weight percentage, unless otherwise specified.

The term "keratinous fibers" or "keratin fibers" here means fibers containing keratin as a main constituent element, and examples thereof include hair, eyelash, eyebrow, and the like.

For the purposes of the present invention and unless otherwise indicated:

- an "*alkyl*" radical denotes a linear or branched saturated radical containing, for example, from 1 to 30 carbon atoms;

- an "*aminoalkyl*" radical denotes an alkyl radical as defined previously, said alkyl radical comprising an NH2 group;
- a "*hydroxyalkyl*" radical denotes an alkyl radical as defined previously, said alkyl radical comprising an OH group;
- an "*alkylene*" radical denotes a linear or branched divalent saturated C1-C10 hydrocarbon-based group such as methylene, ethylene or propylene;
- a "*cycloalkyl*" or "*alicycloalkyl*" radical denotes a cyclic saturated monocyclic or polycyclic, preferably monocyclic, hydrocarbon-based group comprising from 1 to 3 rings, preferably 2 rings, and comprising from 3 to 40 carbon atoms, in particular comprising from 3 to 24 carbon atoms, more particularly from 3 to 20 carbon atoms, even more particularly from 3 to 12 carbon atoms, preferably between 5 and 10 carbon atoms, such as cyclopropyl, cyclopentyl, cyclohexyl, cycloheptyl or norbornyl, or isobornyl, in particular cyclopropyl, cyclopentyl or cyclohexyl, it being understood that the cycloalkyl radical may be substituted with one or more (C1-C4)alkyl groups such as methyl; preferably, the cycloalkyl radical is then an isobornyl group;
- an "*aryl*" radical is a monocyclic, bicyclic or tricyclic, fused or non-fused, unsaturated and aromatic hydrocarbon-based cyclic radical, comprising from 6 to 30 carbon atoms, preferably between 6 and 14 carbon atoms, more preferentially between 6 and 12 carbon atoms; preferably, the aryl group comprises 1 ring of 6 carbon atoms such as phenyl, naphthyl, anthryl, phenanthryl and biphenyl, it being understood that the aryl radical may be substituted with one or more (C1-C4)alkyl groups such as methyl, preferably tolyl, xylyl, or methylnaphthyl; preferably, the aryl group represents a phenyl;
- an "*aryloxy*" radical denotes an aryl-oxy radical with "aryl" as defined previously;
- an "*alkoxy*" radical denotes an alkyl-oxy radical with "alkyl" as defined previously.

The composition according to the present invention comprises:

a) at least one protein with a molecular weight of at least 10 kDa;

b) at least one organic solvent; and

c) at least one colouring agent chosen from pigments, direct dyes, and mixtures thereof.

Protein

The composition of the present invention comprises at least one protein with a molecular weight of at least 10 kDa.

As used herein, 1 kDa equals to 1000 g/mol.

Said protein may be of animal or plant origin.

Said protein may be hydrolysed or non- hydrolysed protein.

Preferably, the composition according to the invention comprises at least one non-hydrolysed protein with a molecular weight of at least 10kDa.

The term "hydrolysed protein" as used here denotes the product of the hydrolysis of homogeneous or heterogeneous proteins, or of the respective components thereof, of the derivatives thereof, or of the combinations thereof.

The term "non-hydrolysed protein" as used here denotes the protein is not hydrolysed.

The sources of proteins useful for the composition of the present invention include, without being limited thereto, plants and the respective components thereof, seeds, animal bones, connective tissue, animal keratin, bovine and porcine collagen, human hair, wool, silk, elastin, reticulin, milk, egg, wheat, corn, soy, oat, casein, albumin, or any collagen or keratin substance, or derivatives thereof.

Preferably, the protein is selected from silk protein, pea protein, soy protein, wheat protein, corn protein, collagen and mixtures thereof, which are non-hydrolysed.

More preferably, the protein is selected from corn protein, collagen and mixtures thereof which are non-hydrolysed, even more preferably from corn protein, especially zein, which is non-hydrolysed.

Preferably, the protein has a molecular weight of at least 15 kDa.

According to preferred embodiments, the composition of the present invention comprises at least one protein selected from corn protein, collagen, and mixtures thereof, the proteins are non-hydrolysed and have a molecular weight of at least 10 kDa.

According to even preferred embodiments, the composition of the present invention comprises at least one protein selected from corn protein, collagen, and mixtures thereof, the proteins are non-hydrolysed and have a molecular weight of at least 15 kDa.

Mention may be made of Arorganic-zein sold by the company AROMA HOLLY LIMITED.

Advantageously, the protein is present in the composition of the present invention in an amount ranging from 0.1 wt.% to 20 wt.%, preferably 0.5 wt.% to 15 wt.%, more preferably from 1 wt.% to 10 wt.%, even more preferably from 1.5 wt.% to 8

wt.% relative to the total weight of the composition.

Organic solvents

The composition of the present invention comprises at least one organic solvent.

Preferably, the organic solvent is selected from C2-C8 monoalcohols, C2-C8 glycols, C2-C8 fatty acids, and mixtures thereof.

As used herein, C2-C8 monoalcohols can be saturated or unsaturated, and linear or branched.

Preferably, the organic solvent is selected from saturated, linear or branched, C2-C6 monoalcohol, for example, ethanol, propanol, butanol, isopropanol, isobutanol.

As used herein, C2-C8 glycols can be saturated or unsaturated, and linear or branched.

Preferably, the organic solvent is selected from saturated, linear or branched, C2-C6 glycols, for example, ethylene glycol, propylene glycol, butylene glycol, isoprene glycol, hexylene glycol, caprylyl glycol.

As used herein, C2-C8 fatty acids can be saturated or unsaturated, and linear or branched, optionally a hydrogen atom linked to a carbon atom is substituted by a hydroxyl group. As examples of C2-C8 fatty acids, mention can be made of acetic acid, lactic acid, citric acid, butyric acid, valeric acid, pentanoic acid, caproic acid, heptylic acid, caprylic acid.

More preferably, the organic solvent is selected from ethanol, propylene glycol, acetic acid, lactic acid, and mixtures thereof.

Advantageously, the organic solvent is present in the composition of the present invention in an amount ranging from 5 wt.% to 90 wt.%, preferably from 10 wt.% to 85 wt.%, more preferably from 20 wt.% to 80 wt.%, relative to the total weight of the composition.

In some preferred embodiments, the organic solvent is selected from C2-C8 monoalcohol, especially ethanol, being present in the composition of the present invention in an amount ranging from 10 wt. % to 85 wt. %, preferably from 15 wt. % to 80 wt.%, more preferably from 20 wt. % to 70 wt.%, relative to the total weight of the composition.

In some preferred embodiments, the organic solvent is selected from C2-C8 glycols, especially propylene glycol, being present in the composition of the

present invention in an amount ranging from 10 wt. % to 85 wt. %, preferably from 15 wt. % to 80 wt.%, more preferably from 20 wt. % to 70 wt.%, relative to the total weight of the composition.

The presence of organic solvent can improve the dissolution of protein and can improve dyeing time.

Colouring agents

The composition of the present invention comprises at least one colouring agent chosen from pigments, direct dyes, and mixtures thereof.

Pigments

Preferably, the colouring agent is chosen from pigments.

Preferably, the composition according to the invention comprises one or more pigments.

The term "pigment" refers to any pigment that gives colour to keratinous materials. Their solubility in water at 25 °C and at atmospheric pressure (760 mmHg) is less than 0.05 wt.%, and preferably less than 0.01 wt.%.

The pigments that may be used are notably chosen from the organic and/or mineral pigments known in the art, notably those described in Kirk-Othmer's Encyclopedia of Chemical Technology and in Ullmann's Encyclopedia of Industrial Chemistry.

They may be natural, of natural origin, or non-natural.

These pigments may be in pigment powder or paste form. They may be coated or uncoated.

The pigments may be chosen, for example, from mineral pigments, organic pigments, lakes, pigments with special effects such as nacres or glitter flakes, and mixtures thereof.

The pigment may be a mineral pigment. The term "mineral pigment" refers to any pigment that satisfies the definition in Ullmann's encyclopaedia in the chapter on inorganic pigments. Mention may be made, among the inorganic pigments of use in the present invention, of iron oxides, chromium oxides, manganese violet, ultramarine blue, chromium hydrate, ferric blue and titanium oxide.

The pigment may be an organic pigment. The term "organic pigment" refers to any pigment that satisfies the definition in Ullmann's encyclopaedia in the chapter on organic pigments.

The organic pigment may notably be chosen from nitroso, nitro, azo, xanthene, pyrene, quinoline, anthraquinone, triphenylmethane, fluorane, phthalocyanine, metal-complex, isoindolinone, isoindoline, quinacridone, perinone, perylene, diketopyrrolopyrrole, indigo, thioindigo, dioxazine, triphenylmethane and quinophthalone compounds.

In particular, the white or coloured organic pigments may be chosen from carmine, carbon black, aniline black, azo yellow, quinacridone, phthalocyanine blue, the blue pigments codified in the Color Index under the references CI 42090, 69800, 69825, 74100, 74160, the yellow pigments codified in the Color Index under the references CI 11680, 11710, 19140, 20040, 21100, 21108, 47000, 47005, the green pigments codified in the Color Index under the references CI 61565, 61570, 74260, the orange pigments codified in the Color Index under the references CI 11725, 45370, 71105, the red pigments codified in the Color Index under the references CI 12085, 12120, 12370, 12420, 12490, 14700, 15525, 15580, 15620, 15630, 15800, 15850, 15865, 15880, 26100, 45380, 45410, 58000, 73360, 73915, 75470, the pigments obtained by oxidative polymerization of indole or phenol derivatives as described in patent FR 2 679 771.

Examples that may also be mentioned include pigment pastes of organic pigments, such as the products sold by the company Hoechst under the names:

- Cosmenyl Yellow 10G: Yellow 3 pigment (CI 11710);
- Cosmenyl Yellow G: Yellow 1 pigment (CI 11680);
- Cosmenyl Orange GR: Orange 43 pigment (CI 71105);
- Cosmenyl Red R: Red 4 pigment (CI 12085);
- Cosmenyl Carmine FB: Red 5 pigment (CI 12490);
- Cosmenyl Violet RL: Violet 23 pigment (CI 51319);
- Cosmenyl Blue A2R: Blue 15.1 pigment (CI 74160);
- Cosmenyl Green GG: Green 7 pigment (CI 74260);
- Cosmenyl Black R: Black 7 pigment (CI 77266).

The pigments in accordance with the invention may also be in the form of composite pigments, as described in patent EP 1 184 426. These composite pigments may be composed notably of particles including an inorganic core, at least one binder for attaching the organic pigments to the core, and at least one organic pigment which at least partially covers the core.

The organic pigment may also be a lake. The term "lake" refers to dyes adsorbed onto insoluble particles, the assembly thus obtained remaining insoluble during use.

The mineral substrates onto which the dyes are adsorbed are, for example, alumina, silica, calcium sodium borosilicate or calcium aluminium borosilicate and aluminium.

Among the dyes, mention may be made of carminic acid. Mention may also be made of the dyes known under the following names: D&C Red 21 (CI 45 380), D&C Orange 5 (CI 45 370), D&C Red 27 (CI 45 410), D&C Orange 10 (CI 45 425), D&C Red 3 (CI 45 430), D&C Red 4 (CI 15 510), D&C Red 33 (CI 17 200), D&C Yellow 5 (CI 19 140), D&C Yellow 6 (CI 15 985), D&C Green 5 (CI 61 570), D&C Yellow 10 (CI 77 002), D&C Green 3 (CI 42 053), D&C Blue 1 (CI 42 090).

An example of a lake that may be mentioned is the product known under the following name: D&C Red 7 (CI 15 850:1).

The pigment may also be a pigment with special effects. The term "pigments with special effects" means pigments that generally create a coloured appearance (characterized by a certain shade, a certain vivacity and a certain level of luminance) that is non-uniform and that changes as a function of the conditions of observation (light, temperature, angles of observation, etc.). They thereby differ from coloured pigments, which afford a standard uniform opaque, semi-transparent or transparent shade.

Several types of pigments with special effects exist: those with a low refractive index, such as fluorescent or photochromic pigments, and those with a higher refractive index, such as nacres, interference pigments or glitter flakes.

Examples of pigments with special effects that may be mentioned include nacreous pigments such as mica covered with titanium or with bismuth oxychloride, coloured nacreous pigments such as mica covered with titanium and with iron oxides, mica covered with iron oxide, mica covered with titanium and notably with ferric blue or with chromium oxide, mica covered with titanium and with an organic pigment as defined previously, and also nacreous pigments based on bismuth oxychloride. Nacreous pigments that may be mentioned include the nacres Cellini sold by BASF (mica-TiO2-lake), Prestige sold by Eckart (mica-TiO2), Prestige Bronze sold by Eckart (mica-Fe2O3) and Colorona sold by Merck (mica-TiO2-Fe2O3).

Mention may also be made of the gold-coloured nacres sold notably by the company BASF under the name Brilliant gold 212G (Timica), Gold 222C (Cloisonne), Sparkle gold (Timica), Gold 4504 (Chromalite) and Monarch gold 233X (Cloisonne); the bronze nacres sold notably by the company Merck under the name Bronze fine (17384)

(Colorona) and Bronze (17353) (Colorona) and by the company BASF under the name Super bronze (Cloisonne); the orange nacres sold notably by the company BASF under the name Orange 363C (Cloisonne) and Orange MCR 101 (Cosmica) and by the company Merck under the name Passion orange (Colorona) and Matte orange (17449) (Microna); the brown nacres sold notably by the company BASF under the name Nu-antique copper 340XB (Cloisonne) and Brown CL4509 (Chromalite); the nacres with a copper tint sold notably by the company BASF under the name Copper 340A (Timica); the nacres with a red tint sold notably by the company Merck under the name Sienna fine (17386) (Colorona); the nacres with a yellow tint sold notably by the company BASF under the name Yellow (4502) (Chromalite); the red nacres with a gold tint sold notably by the company BASF under the name Sunstone G012 (Gemtone); the pink nacres sold notably by the company BASF under the name Tan opale G005 (Gemtone); the black nacres with a gold tint sold notably by the company BASF under the name Nu antique bronze 240 AB (Timica), the blue nacres sold notably by the company Merck under the name Matte blue (17433) (Microna), the white nacres with a silvery tint sold notably by the company Merck under the name Xirona Silver, and the golden-green pink-orange nacres sold notably by the company Merck under the name Indian summer (Xirona), and mixtures thereof.

Still as examples of nacreous agents, mention may also be made of particles including a borosilicate substrate coated with titanium oxide.

Particles comprising a glass substrate coated with titanium oxide are notably sold under the name Metashine MC1080RY by the company Toyal.

Finally, examples of nacres that may also be mentioned include polyethylene terephthalate glitter flakes, notably those sold by the company Meadowbrook Inventions under the name Silver 1P 0.004X0.004 (silver glitter flakes). It is also possible to envisage multilayer pigments based on synthetic substrates, such as alumina, silica, calcium sodium borosilicate, calcium aluminium borosilicate and aluminium.

The pigments with special effects may also be chosen from reflective particles, i.e. notably from particles whose size, structure, notably the thickness of the layer(s) of which they are made and their physical and chemical nature, and surface state, allow them to reflect incident light. This reflection may, where appropriate, have an intensity sufficient to create at the surface of the composition or of the mixture, when it is applied to the support to be made up, highlight points that are visible to the naked eye, i.e. brighter points that contrast with their environment, making them appear to sparkle.

The reflective particles may be selected so as not to significantly alter the colouring effect generated by the colouring agents with which they are combined, and more particularly so as to optimize this effect in terms of colour rendition. They may more particularly have a yellow, pink, red, bronze, orange, brown, gold and/or coppery colour or tint.

These particles may have varied forms and may notably be in platelet or globular form, in particular in spherical form.

The reflective particles, whatever their form, may or may not have a multilayer structure and, in the case of a multilayer structure, may have, for example, at least one layer of uniform thickness, notably of a reflective material.

When the reflective particles do not have a multilayer structure, they may be composed, for example, of metal oxides, notably titanium or iron oxides obtained synthetically.

When the reflective particles have a multilayer structure, they may include, for example, a natural or synthetic substrate, notably a synthetic substrate at least partially coated with at least one layer of a reflective material, notably of at least one metal or metallic material. The substrate may be made of one or more organic and/or inorganic materials.

More particularly, it may be chosen from glasses, ceramics, graphite, metal oxides, aluminas, silicas, silicates, notably aluminosilicates and borosilicates, and synthetic mica, and mixtures thereof, this list not being limiting.

The reflective material may include a layer of metal or of a metallic material.

Reflective particles are notably described in documents JP-A-09188830, JP-A-10158450, JP-A-10158541, JP-A-07258460 and JP-A-05017710.

Again as an example of reflective particles including a mineral substrate coated with a layer of metal, mention may also be made of particles including a silver-coated borosilicate substrate.

Particles with a silver-coated glass substrate, in the form of platelets, are sold under the name Microglass Metashine REFSX 2025 PS by the company Toyal. Particles with a glass substrate coated with nickel/chromium/molybdenum alloy are sold under the names Crystal Star GF 550 and GF 2525 by this same company.

Use may also be made of particles comprising a metal substrate, such as silver, aluminium, iron, chromium, nickel, molybdenum, gold, copper, zinc, tin, magnesium, steel, bronze or titanium, said substrate being coated with at least one layer of at least

one metal oxide, such as titanium oxide, aluminium oxide, iron oxide, cerium oxide, chromium oxide, silicon oxides and mixtures thereof.

Examples that may be mentioned include aluminium powder, bronze powder or copper powder coated with SiO2 sold under the name Visionaire by the company Eckart.

Mention may also be made of pigments with an interference effect which are not attached to a substrate, such as liquid crystals (Helicones HC from Wacker) or interference holographic glitter flakes (Geometric Pigments or Spectra f/x from Spectratek). Pigments with special effects also comprise fluorescent pigments, whether these are substances that are fluorescent in daylight or that produce an ultraviolet fluorescence, phosphorescent pigments, photochromic pigments, thermochromic pigments and quantum dots, sold, for example, by the company Quantum Dots Corporation.

The variety of pigments that may be used in the present invention makes it possible to obtain a wide range of colours, and also particular optical effects such as metallic effects or interference effects.

The size of the pigment used in the composition according to the present invention is generally between 10 nm and 200 μm, preferably between 20 nm and 80 μm and more preferentially between 30 nm and 50 μm.

The pigments may be dispersed in the composition by means of a dispersant.

The dispersant serves to protect the dispersed particles against their agglomeration or flocculation. This dispersant may be a surfactant, an oligomer, a polymer or a mixture of several thereof, bearing one or more functionalities with strong affinity for the surface of the particles to be dispersed. In particular, they may become physically or chemically attached to the surface of the pigments. These dispersants also contain at least one functional group that is compatible with or soluble in the continuous medium. In particular, esters of 12-hydroxystearic acid in particular and of C8 to C20 fatty acid and of polyols such as glycerol or diglycerol are used, such as poly(12-hydroxystearic acid) stearate with a molecular weight of approximately 750 g/mol, such as the product sold under the name Solsperse 21 000 by the company Avecia, polyglyceryl-2 dipolyhydroxystearate (CTFA name) sold under the reference Dehymyls PGPH by the company Henkel, or polyhydroxystearic acid such as the product sold under the reference Arlacel P100 by the company Uniqema, and mixtures thereof.

As other dispersants that may be used in the compositions of the invention, mention may be made of quaternary ammonium derivatives of polycondensed fatty acids, for instance Solsperse 17 000 sold by the company Avecia, and polydimethylsiloxane/oxypropylene mixtures such as those sold by the company Dow Corning under the references DC2-5185 and DC2-5225 C.

The pigments used in the composition may be surface-treated with an organic agent.

Thus, the pigments surface-treated beforehand that are useful in the context of the invention are pigments which have been completely or partially subjected to a surface treatment of chemical, electronic, electrochemical, mechanochemical or mechanical nature with an organic agent, such as those described notably in Cosmetics and Toiletries, February 1990, Vol. 105, pages 53-64, before being dispersed in the composition in accordance with the invention. These organic agents may be chosen, for example, from waxes, for example carnauba wax and beeswax; fatty acids, fatty alcohols and derivatives thereof, such as stearic acid, hydroxystearic acid, stearyl alcohol, hydroxystearyl alcohol and lauric acid and derivatives thereof; anionic surfactants; lecithins; sodium, potassium, magnesium, iron, titanium, zinc or aluminium salts of fatty acids, for example aluminium stearate or laurate; metal alkoxides; polyethylene; (meth)acrylic polymers, for example polymethyl methacrylates; polymers and copolymers containing acrylate units; alkanolamines; silicone compounds, for example silicones, notably polydimethylsiloxanes; organofluorine compounds, for example perfluoroalkyl ethers; fluorosilicone compounds.

The surface-treated pigments that are useful in the composition may also have been treated with a mixture of these compounds and/or may have undergone several surface treatments.

The surface-treated pigments that are useful in the context of the present invention may be prepared according to surface-treatment techniques that are well known to those skilled in the art, or may be commercially available as is.

Preferably, the surface-treated pigments are coated with an organic layer.

The organic agent with which the pigments are treated may be deposited on the pigments by evaporation of solvent, chemical reaction between the molecules of the surface agent or creation of a covalent bond between the surface agent and the pigments.

The surface treatment may thus be performed, for example, by chemical reaction

of a surface agent with the surface of the pigments and creation of a covalent bond between the surface agent and the pigments or the fillers. This method is notably described in patent US 4 578 266.

An organic agent covalently bonded to the pigments will preferably be used.

The agent for the surface treatment may represent from 0.1 wt.% to 50 wt.% relative to the total weight of the surface-treated pigment, preferably from 0.5 wt.% to 30 wt.% and even more preferentially from 1 wt.% to 20 wt.% relative to the total weight of the surface-treated pigment.

Preferably, the surface treatments of the pigments are chosen from the following treatments:

- a PEG-silicone treatment, for instance the AQ surface treatment sold by LCW;
- a methicone treatment, for instance the SI surface treatment sold by LCW;
- a dimethicone treatment, for instance the Covasil 3.05 surface treatment sold by LCW;
- a dimethicone/trimethyl siloxysilicate treatment, for instance the Covasil 4.05 surface treatment sold by LCW;
- a magnesium myristate treatment, for instance the MM surface treatment sold by LCW;
- an aluminium dimyristate treatment, such as the MI surface treatment sold by Miyoshi;
- a perfluoropolymethyl isopropyl ether treatment, for instance the FHC surface treatment sold by LCW;
- an isostearyl sebacate treatment, for instance the HS surface treatment sold by Miyoshi;
- a perfluoroalkyl phosphate treatment, for instance the PF surface treatment sold by Daito;
- an acrylate/dimethicone copolymer and perfluoroalkyl phosphate treatment, for instance the FSA surface treatment sold by Daito;
- a polymethylhydrogenosiloxane/perfluoroalkyl phosphate treatment, for instance the FS01 surface treatment sold by Daito;
- an acrylate/dimethicone copolymer treatment, for instance the ASC surface treatment sold by Daito;
- an isopropyl titanium triisostearate treatment, for instance the ITT surface treatment sold by Daito;

- an acrylate copolymer treatment, for instance the APD surface treatment sold by Daito;

- a perfluoroalkyl phosphate/isopropyl titanium triisostearate treatment, for instance the PF + ITT surface treatment sold by Daito.

According to a particular embodiment of the invention, the dispersant is present with organic or mineral pigments in submicron-sized particulate form.

The term "submicron" or "submicronic" refers to pigments having a particle size that has been micronized by a micronization method and having a mean particle size of less than a micrometre (μm), in particular between 0.1 and 0.9 μm, and preferably between 0.2 and 0.6 μm.

According to one embodiment, the dispersant and the pigment(s) are present in an amount (dispersant: pigment), according to a weight ratio, of between 1:4 and 4:1, particularly between 1.5:3.5 and 3.5:1 or better still between 1.75:3 and 3:1.

The dispersant(s) may therefore have a silicone backbone, such as silicone polyether and dispersants of amino silicone type. Among the suitable dispersants that may be mentioned are:

- aminosilicones, i.e. silicones comprising one or more amino groups such as those sold under the names and references: BYK LPX 21879 by BYK, GP-4, GP-6, GP-344, GP-851, GP-965, GP-967 and GP-988-1, sold by Genesee Polymers,

- silicone acrylates such as Tego® RC 902, Tego® RC 922, Tego® RC 1041, and Tego® RC 1043, sold by Evonik,

- polydimethylsiloxane (PDMS) silicones bearing carboxyl groups such as X-22162 and X-22370 by Shin-Etsu, epoxy silicones such as GP-29, GP-32, GP-502, GP-504, GP-514, GP-607, GP-682, and GP-695 by Genesee Polymers, or Tego® RC 1401, Tego® RC 1403, Tego® RC 1412 by Evonik.

According to a particular embodiment, the dispersant(s) are of amino silicone type and are cationic.

Preferably, the pigment(s) are chosen from mineral, mixed mineral-organic or organic pigments.

In one variant of the invention, the pigment(s) are organic pigments, preferentially organic pigments surface-treated with an organic agent chosen from silicone compounds.

In another variant of the invention, the pigment(s) are mineral pigments.

Direct dye

The composition according to the invention may comprise one or more direct dyes.

The term "direct dye" means natural and/or synthetic dyes, other than oxidation dyes. These are dyes that will spread superficially on the fiber.

They may be ionic or nonionic, preferably cationic or nonionic.

Examples of suitable direct dyes that may be mentioned include azo direct dyes; (poly)methine dyes such as cyanines, hemicyanines and styryls; carbonyl dyes; azine dyes; nitro(hetero)aryl dyes; tri(hetero)arylmethane dyes; porphyrin dyes; phthalocyanine dyes and natural direct dyes, alone or in the form of mixtures.

Among the natural direct dyes that may be used according to the invention, mention may be made of lawsone, juglone, alizarin, purpurin, carminic acid, kermesic acid, purpurogallin, protocatechaldehyde, indigo, isatin, curcumin, spinulosin, apigenidin and orceins. Use may also be made of extracts or decoctions containing these natural dyes and notably henna-based poultices or extracts.

The colouring agent(s) may be present in a total content ranging from 0.001 wt.% to 20 wt.% and preferably from 0.005 wt.% to 15 wt.% relative to the total weight of the composition according to the invention.

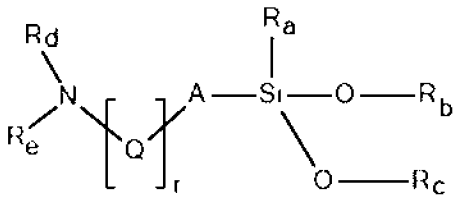
The pigment(s) may be present in a total content ranging from 0.05 wt.% to 20 wt.%, preferably from 0.1 wt.% to 15 wt.% and better still from 0.5 wt.% to 10 wt.%, relative to the total weight of the composition according to the invention.

The direct dye(s) may be present in a total content ranging from 0.001 wt.% to 10 wt.% relative to the total weight of the composition, preferably from 0.005 wt.% to 5 wt.% relative to the total weight of the composition according to the invention.

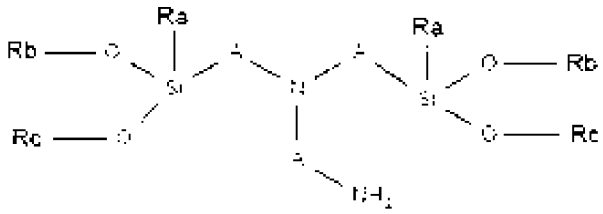
Alkoxysilane

The composition according to the invention may comprise at least one alkoxysilane.

According to a preferred embodiment, the composition comprises at least one alkoxysilane chosen from the compounds of formula (I) or of formula (I') below, oligomers thereof and/or mixtures thereof:



(I)



(I')

in which:

- R_a represents an alkyl group containing from 1 to 20 carbon atoms, preferably from 1 to 10 carbon atoms, more preferentially from 1 to 4 carbon atoms and in particular from 1 to 2 carbon atoms such as a methyl, said alkyl group being optionally substituted with an aryl group; an alkoxy group containing from 1 to 10 carbon atoms, preferably from 1 to 4 carbon atoms and in particular from 1 to 2 carbon atoms such as an ethoxy; or an aryl group containing from 6 to 12 carbon atoms;

- R_b and R_c, which may be identical or different, represent a hydrogen atom; an alkyl group containing from 1 to 20 carbon atoms, preferably from 1 to 6 carbon atoms and notably from 1 to 4 carbon atoms, notably an ethyl group, it being understood that if Ra does not represent an alkoxy group, then Rb and Rc cannot simultaneously represent a hydrogen atom;

- R_d and R_e, which may be identical or different, represent a hydrogen atom; an alkyl group containing from 1 to 20 carbon atoms, preferably from 1 to 6 carbon atoms and notably from 1 to 4 carbon atoms; a cycloalkyl group containing from 3 to 20 carbon atoms; an aryl group containing from 6 to 12 carbon atoms; an aminoalkyl group containing from 1 to 20 carbon atoms;

- A independently represents a linear or branched alkylene group containing from 1 to 10 carbon atoms, which may be interrupted with at least one heteroatom chosen from O, S, NH or a carbonyl group (CO), preferably NH;

- Q represents a carbonyl group (CO);

- r denotes an integer ranging from 0 to 1.

Among the alkoxysilanes of formula (I), oligomers thereof and/or mixtures

thereof, mention may notably be made of 3-aminopropyltriethoxysilane (APTES), 3-aminopropylmethyldiethoxysilane (APMDES), 3-ureidopropyltrimethoxysilane and N-cyclohexylaminomethyltriethoxysilane.

APTES may be purchased, for example, from the company Dow Corning under the name Xiameter OFS-6011 Silane or from the company Momentive Performance Materials under the name Silsoft A-1100 or from the company Shin-Etsu under the name KBE-903.

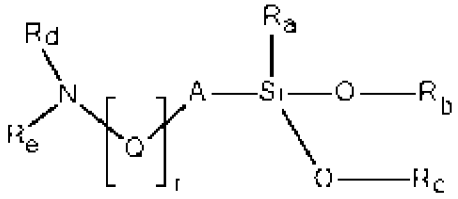
The compounds of formula (I) may also denote Dynasylan SIVO 210 or Dynasylan 1505 sold by the company Evonik.

3-Ureidopropyltrimethoxysilane may be purchased, for example, from the company Gelest under the reference SIU9058.0.

N-Cycloheylaminomethyltriethoxysilane may be purchased, for example, from the company Wacker under the name Geniosil XL 926.

Among the alkoxysilanes of formula (I′), oligomers thereof and/or mixtures thereof, mention may notably be made of N,N-bis[3-(trimethoxysilyl)propyl]ethylenediamine (CAS RN: 74956-86-8), N1,N1-bis[3-(triethoxysilyl)propyl]-1,2-ethanediamine (CAS RN: 457065-96-2), 1,2-ethanediamine, N1-[3-(triethoxysilyl)propyl]-N1-[3-(trimethoxysilyl)propyl]- (CAS RN: 1638528-78-5), and mixtures thereof.

Preferably, the alkoxysilane(s), oligomers thereof and/or mixtures thereof are chosen from the compounds of formula (I) below:



(I)

in which:

- R_a represents an alkyl group containing from 1 to 10 carbon atoms, notably from 1 to 4 carbon atoms and in particular from 1 to 2 carbon atoms, preferably a methyl, or an alkoxy group containing from 1 to 4 carbon atoms, preferably from 1 to 2 carbon atoms, preferably an ethoxy;

- R_b and R_c, which may be identical or different, represent an alkyl group containing from 1 to 10 carbon atoms, preferably from 1 to 4 carbon atoms, such as an ethyl;

- R_d and R_e, which are identical, represent a hydrogen atom or Rd denotes a hydrogen atom and Re denotes a C5-C6 cycloalkyl radical such as cyclohexyl;

- A independently represents a linear or branched alkylene group containing from 1 to 10 carbon atoms, which may be interrupted with at least one heteroatom chosen from O, S and NH or a carbonyl group (CO), preferably NH;

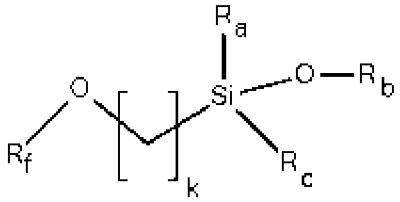
- r denotes an integer equal to 0.

Preferably, the alkoxysilane(s), oligomers thereof and/or mixtures thereof are chosen from the compounds of formula (I) in which Ra represents an ethoxy group, Rb and Rc are identical and represent an ethyl, Rd and Re represent a hydrogen atom, A represents a propylene and r denotes an integer equal to 0.

According to a preferred embodiment, the alkoxysilane of formula (I), oligomers thereof and/or mixtures thereof, is 3-aminopropyltriethoxysilane (APTES).

The alkoxysilane(s) of formula (I) or of formula (I′), oligomers thereof and/or mixtures thereof may be present in a total amount ranging from 0.1 wt.% to 30 wt.%, preferably from 0.3 wt.% to 20 wt.%, preferentially from 0.5 wt.% to 15 wt.%, better still from 0.8 wt.% to 10 wt.% and even better still from 0.8 wt.% to 5 wt.%, relative to the total weight of composition.

According to another preferred embodiment, the composition according to the invention comprises at least one alkoxysilane of formula (II) below, oligomers thereof and/or mixtures thereof:



(II)

in which:

- R_a represents an alkyl group containing from 1 to 20 carbon atoms, preferably from 1 to 10 carbon atoms, more preferentially from 1 to 4 carbon atoms and in particular from 1 to 2 carbon atoms such as a methyl, said alkyl group being optionally substituted with an aryl group; an alkoxy group containing from 1 to 10 carbon atoms, preferably from 1 to 4 carbon atoms and in particular from 1 to 2 carbon atoms such as an ethoxy; or an aryl group containing from 6 to

12 carbon atoms;

- R_b represents a hydrogen atom or an alkyl group containing from 1 to 20 carbon atoms, preferably from 1 to 6 carbon atoms and notably from 1 to 4 carbon atoms, notably an ethyl group;

- R_c represents an alkyl group containing from 1 to 20 carbon atoms, preferably from 1 to 10 carbon atoms, more preferentially from 1 to 4 carbon atoms and in particular from 1 to 2 carbon atoms such as a methyl, said alkyl group being optionally substituted with an aryl group; an alkoxy group containing from 1 to 10 carbon atoms, preferably from 1 to 4 carbon atoms and in particular from 1 to 2 carbon atoms such as an ethoxy; or an aryl group containing from 6 to 12 carbon atoms;

it being understood that if R_a and R_c do not represent an alkoxy group, then Rb cannot represent a hydrogen atom;

- k denotes an integer ranging from 0 to 5, preferably ranging from 0 to 3;

- R_f represents a hydrogen atom; an alkyl group containing from 1 to 10 carbon atoms and notably from 1 to 4 carbon atoms; or a group of formula (IIa) below:



(IIa)

in which Rn represents a hydroxyl group (OH); an alkyl group containing from 1 to 10 carbon atoms, preferably a methyl.

Among the alkoxysilanes of formula (II), oligomers thereof and/or mixtures thereof, mention may notably be made of tetraethoxysilane (TEOS), methyltrimethoxysilane (MTMS), methyltriethoxysilane (MTES), dimethyldiethoxysilane (DMDES), diethyldiethoxysilane, dipropyldiethoxysilane, propyltriethoxysilane, isobutyltriethoxysilane, phenyltriethoxysilane, phenylmethyldiethoxysilane, diphenyldiethoxysilane, benzyltriethoxysilane, benzylmethyldiethoxysilane, dibenzyldiethoxysilane, acetoxymethyltriethoxysilane and mixtures thereof.

TEOS may be purchased, for example, from the company Evonik under the name Dynasylan® A or Dynasylan® A SQ.

MTES may be purchased, for example, from the company Evonik under the name Dynasylan® MTES.

DMDES may be purchased, for example, from the company Gelest under the reference SID3404.0.

Preferably, the alkoxysilane(s) of formula (II), oligomers thereof and/or mixtures thereof are such that:

- R_a represents an alkoxy group containing from 1 to 10 carbon atoms, preferably from 1 to 4 carbon atoms and in particular from 1 to 2 carbon atoms such as a methoxy or an ethoxy; or an alkyl group containing from 1 to 10 carbon atoms optionally substituted with an aryl group, preferably 1 to 2 carbon atoms optionally substituted with an aryl group;
- R_b represents an alkyl group containing from 1 to 10 carbon atoms, preferably from 1 to 4 carbon atoms, in particular from 1 to 2 carbon atoms, such as a methyl or an ethyl;
- R_c represents an alkoxy group containing from 1 to 10 carbon atoms, preferably from 1 to 4 carbon atoms and in particular from 1 to 2 carbon atoms, such as a methoxy or an ethoxy;
- k denotes an integer ranging from 0 to 3, preferably equal to 0;
- R_f represents a hydrogen atom or an alkyl group containing from 1 to 10 carbon atoms and notably from 1 to 4 carbon atoms, such as a methyl or an ethyl.

More preferentially, the alkoxysilane(s) of formula (II), oligomers thereof and/or mixtures thereof are such that:

- R_a represents an alkyl group containing from 1 to 10 carbon atoms, preferably from 1 to 4 carbon atoms, in particular from 1 to 2 carbon atoms, such as a methyl or an ethyl;
- R_b represents an alkyl group containing from 1 to 10 carbon atoms, preferably from 1 to 4 carbon atoms, in particular from 1 to 2 carbon atoms, such as a methyl or an ethyl;
- R_c represents an alkoxy group containing from 1 to 10 carbon atoms, preferably from 1 to 4 carbon atoms and in particular from 1 to 2 carbon atoms, such as a methoxy or an ethoxy;
- k denotes an integer equal to 0;
- R_f represents an alkyl group containing from 1 to 10 carbon atoms and notably from 1 to 4 carbon atoms, such as a methyl or an ethyl.

According to a preferred embodiment, the alkoxysilane of formula (II), oligomers thereof and/or mixtures thereof, is methyltrimethoxysilane (MTMS) or

methyltriethoxysilane (MTES).

The alkoxysilane(s) of formula (II), oligomers thereof and/or mixtures thereof may be present in a total amount ranging from 0.1 wt.% to 30 wt.%, preferably from 0.3 wt.% to 20 wt.%, preferentially from 0.5 wt.% to 15 wt.%, better still from 0.8 wt.% to 10 wt.% and even better still from 0.8 wt.% to 5 wt.%, relative to the total weight of composition.

Preferably, the composition according to the invention comprises at least one alkoxysilane of formula (I), oligomers thereof and/or mixtures thereof, more preferably 3-aminopropyltriethoxysilane (APTES).

According to one preferred embodiment, the alkoxysilane(s) is (are) present in a total amount ranging from 0.1 wt.% to 30 wt.%, preferably from 0.3 wt.% to 20 wt.%, preferentially from 0.5 wt.% to 15 wt.%, better still from 0.8 wt.% to 10 wt.% and even better still from 0.8 wt.% to 5 wt.%, relative to the total weight of composition.

According to one preferred embodiment, the alkoxysilane(s) of formula (I), oligomers thereof and/or mixtures thereof is (are) present in a total amount ranging from 0.1 wt.% to 30 wt.%, preferably from 0.3 wt.% to 20 wt.%, preferentially from 0.5 wt.% to 15 wt.%, better still from 0.8 wt.% to 10 wt.% and even better still from 0.8 wt.% to 5 wt.%, relative to the total weight of composition.

Film-Forming polymer

The composition of the present invention may comprise at least one film-forming polymer other than protein.

Preferably, the film-forming polymer is chosen from hydrophilic film-forming polymer(s), hydrophobic film-forming polymer(s), and mixtures thereof.

For the purposes of the invention, the term "polymer" means a compound corresponding to the repetition of one or more units (these units being derived from compounds known as monomers). This or these unit(s) are repeated at least twice and preferably at least three times.

The term "hydrophobic polymer" is intended to mean a polymer having a solubility in water at 25°C of less than 1% by weight.

The term "hydrophilic polymer" is intended to mean a polymer having a solubility in water at 25°C of greater than or equal to 1% by weight.

The term "film-forming" polymer is intended to mean a polymer that is capable of forming, by itself or in the presence of an auxiliary film-forming agent, a macroscopically continuous film on a support, notably on keratin materials, and preferably a cohesive film.

According to a preferred embodiment, the film-forming polymer(s) is chosen from hydrophobic film-forming polymer(s).

In a particularly preferred embodiment, the hydrophobic film-forming polymer is a polymer chosen from the group comprising:

- film-forming polymers that are soluble in an organic solvent medium, in particular liposoluble polymers; this means that the polymer is soluble or miscible in the organic medium and forms a single homogeneous phase when it is incorporated into the medium;
- film-forming polymers that are dispersible in an organic solvent medium, which means that the polymer forms an insoluble phase in the organic medium, the polymer remaining stable and/or compatible once incorporated into this medium. In particular, such polymers may be in the form of non-aqueous dispersions of polymer particles, preferably dispersions in silicone oils or hydrocarbon-based oils; in one embodiment, the non-aqueous polymer dispersions comprise polymer particles stabilized on their surface with at least one stabilizer; these non-aqueous dispersions are often referred to as NADs;
- film-forming polymers in the form of aqueous dispersions of polymer particles, which means that the polymer forms an insoluble phase in water, the polymer remaining stable and/or compatible once incorporated into the water, the polymer particles possibly being stabilized on their surface with at least one stabilizer. These polymer particles are often referred to as latexes; in this case, the composition must comprise an aqueous phase.

Among the hydrophobic film-forming polymers that may be used in the composition of the present invention, mention may be made of synthetic polymers, of radical type or of polycondensate type, polymers of natural origin, and mixtures thereof.

Hydrophobic film-forming polymers that may be mentioned in particular include acrylic polymers, polyurethanes, polyesters, polyamides, polyureas, cellulose-based polymers such as nitrocellulose, silicone polymers, polymers of acrylamide type, and polyisoprenes.

Non-ionic, amphoteric, anionic or cationic hydrophobic film-forming polymers may be used.

The hydrophobic film-forming polymer may be chosen from acrylic polymers.

The acrylic polymer may be a styrene/acrylate copolymer and notably a polymer chosen from copolymers of at least one styrene monomer, at least one C1-C22 alkyl (meth)acrylate monomer, and optionally one or more salts of (meth)acrylic acid.

As styrene monomers that may be used in the invention, examples that may be mentioned include styrene and a-methylstyrene, and in particular styrene.

The C1-C22 alkyl (meth)acrylate monomer is in particular a C10-C22 alkyl (meth)acrylate and more particularly a C12-C20 alkyl (meth)acrylate. The C1-C22 alkyl (meth)acrylate monomer may be chosen from methyl acrylate, methyl methacrylate, ethyl acrylate, propyl acrylate, butyl acrylate, butyl methacrylate, hexyl acrylate, octyl acrylate, 2-ethylhexyl acrylate, lauryl (meth)acrylate, stearyl (meth)acrylate, and nonadecanyl (meth)acrylate.

As examples of salts of (meth)acrylic acid, mention can be made of sodium (meth)acrylic acid, potassium (meth)acrylic acid, and ammonium (meth)acrylic acid.

The acrylic polymer used may be in the form of aqueous dispersion.

As acrylic polymer in aqueous dispersion, use may be made according to the invention of:

- the aqueous dispersions of acrylic polymer sold under the names Acronal DS-6250® by the company BASF, Neocryl A-45®, Neocryl XK-90®, Neocryl A-1070®, Neocryl A-1090®, Neocryl BT-62®, Neocryl A-1079® and Neocryl A-523® by the company DSM, Joncryl 95® and Joncryl 821 1® by the company BASF, Daitosol 5000 AD® (INCI name: Acrylates copolymer) or Daitosol 5000 SJ® (INCI name: Acrylates/ethylhexyl acrylate copolymer) by the company Daito Kasey Kogyo; Syntran 5760 CG® (INCI name: Styrene/acrylates/ammonium methacrylate copolymer) by the company Interpolymer.

Preferably, the composition according to the invention comprises an aqueous dispersion of film-forming acrylic polymer.

The hydrophobic film-forming polymer may also be chosen from the homopolymers and copolymers that may be obtained from amides of acid monomers; mention may be made of (meth)acrylamides, and notably N-alkyl(meth)acrylamides, in particular of C2-C12 alkyl, such as N-ethylacrylamide, N-

t-butylacrylamide or N-octylacrylamide; N-(C1-C4)dialkyl(meth)acrylamides and perfluoroalkyl (meth)acrylates.

Mention may also be made of the copolymers of which the CTFA (4th Ed., 1991) name is Octylacrylamide/Acrylates/Butylaminoethyl Methacrylate Copolymer, such as the products sold under the name Amphomer® or Lovocryl® 47 by the company National Starch, and also the copolymers with the CTFA name Acrylates/Octylacrylamide Copolymer, such as the products sold under the name Dermacryl® LT or Dermacryl® 79 by the company National Starch.

Copolymers of unsaturated ethylenic acid esters of alkoxylated fatty alcohols may also be used according to the invention. Such unsaturated ethylenic acid esters are in particular of acrylic acid, methacrylic acid and itaconic acid, and such alkoxylated fatty alcohols are in particular steareth-20 and ceteth-20.

Mention will be made for example of Aculyn®22 (Acrylates/Steareth-20 Methacrylate Copolymer), Aculyn®28 (Acrylates/Beheneth-25 Methacrylate Copolymer), Structure 2001® (Acrylates/Steareth-20 Itaconate Copolymer), Structure 3001® (Acrylates/Ceteth-20 Itaconate Copolymer), Structure Plus® (Acrylates/Aminoacrylates/C10-30 Alkyl PEG-20 Itaconate Copolymer), Carbopol® 1342, 1382, Ultrez 20, Ultrez 21 (Acrylates/C10-30 Alkyl Acrylate Crosspolymer), Synthalen W2000® (Acrylates/Palmeth-25 Acrylate Copolymer) or Soltex OPT (Acrylates/C12-22 Alkyl Methacrylate Copolymer) sold by the company Dow Chemical.

The hydrophobic film-forming polymer may also be chosen from homopolymers and copolymers obtained from vinyl monomers. Mention may be made of homopolymers or copolymers of N-vinylpyrrolidone, vinylcaprolactam, vinyl-N-(C1-C6)alkylpyrroles, vinyloxazoles, vinylthiazoles, vinylpyrimidines or vinylimidazoles.

As examples of vinylpyrrolidone copolymers that may be used in the invention, mention may be made of the VP/vinyl laurate copolymer, the VP/vinyl stearate copolymer, the butylated polyvinylpyrrolidone (PVP) copolymer, the VP/hexadecene copolymer sold by ISP under the name Ganex V216, the VP/eicosene copolymer sold by ISP under the name Ganex V220, the VP/triacontene copolymer or the VP/acrylic acid/lauryl methacrylate copolymer.

The hydrophobic film-forming polymer may also be chosen from homopolymers and copolymers that may be obtained from olefins such as

ethylene, propylene, butenes, isoprene, butadienes.

The hydrophobic film-forming polymer may also be chosen from polyurethanes.

The polyurethanes that may be used in the composition of the present invention are those described in patent applications EP 0 751 162, EP 0 637 600, EP 0 648 485, FR 2 743 297, and EP 0 656 021, WO 94/03510, EP 0 619 111 and WO2020074493A1.

Preferred polyurethanes useful for the composition of the present invention include Polyurethane-1, Polyurethane-6, Polyurethane-32, Polyurethane-34, Polyurethane-35, Polyurethane-48, Polyurethane-93, and Polyurethane-99.

As commercial products of polyurethanes, mention may be made of the products sold under the names Luviset PUR® and Luviset® Si PUR by the company BASF (INCI names Polyurethane-1 and Polyurethane-6 respectively), the name BAYCUSAN CQ E 1000 by the company COVESTRO (INCI names Polyurethane-93. Preferably, the film-forming polymer(s) according to the invention is chosen from acrylic polymer, polyurethane, polyester, polyamide and mixtures thereof.

More preferably, the hydrophobic film-forming polymer(s) according to the invention is chosen from acrylic polymer, polyurethane, and mixtures thereof.

More preferably, the film-forming polymer is selected from Polyurethane-1, Polyurethane-6, Polyurethane-32, Polyurethane-34, Polyurethane-35, Polyurethane-48, Polyurethane-93, Polyurethane-99, styrene/acrylate copolymers, and mixtures thereof.

Even more preferably, the film-forming polymer is selected from Polyurethane-93, Polyurethane-99, styrene/acrylates/ammonium methacrylate copolymers and mixtures thereof.

Most preferably, the film-forming polymer is selected from Polyurethane-93, styrene/acrylates/ammonium methacrylate copolymer, and mixtures thereof.

Advantageously, the film-forming polymer is present in the composition of the present invention in an amount ranging from 0.1 wt.% to 10 wt.%, preferably from 0.2 wt.% to 5 wt.%, more preferably from 0.3 wt.% to 3 wt.%, relative to the total weight of the composition.

Water

Preferably, the composition of the present invention further comprises water.

Advantageously, water is present in the composition of the present invention in an amount ranging from 5 wt. % to 80 wt. %, preferably from 10 wt. % to 70 wt.%, more preferably from 15 wt. % to 60 wt.%, relative to the total weight of the composition.

Preferably, the weight ratio of the organic solvent to water is from 0.5:1 to 5:1.

In some preferred embodiments, the composition of the present invention comprises at least one C2-C8 monoalcohol, especially ethanol, and water, wherein the weight ratio of C2-C8 monoalcohol to water is from 0.5:1 to 2:1.

In some preferred embodiments, the composition of the present invention comprises at least one C2-C8 glycol, especially propylene glycol, and water, wherein the weight ratio of C2-C8 glycol to water is 0.5:1 to 2:1.

Surfactants

The composition of the present invention may comprise at least one surfactant.

Preferably, the composition of the present invention comprises at least one cationic surfactant, more preferably chosen from tertiary amidoamines.

Preferably, the cationic surfactant is chosen from compounds represented by formula (III):

$R_1C(O)NH-(CH_2)_X-NR_2R_3$ (III)

wherein

- R_1 represents a C8-26 linear or branched alkyl;
- R_2 and R_3, each independently, represents a hydrogen atom, or C1-4 linear or branched alkyl,
- x=1 to 5, and
- it is understood that if R_2 represents a hydrogen atom, then R_3 cannot represent a hydrogen atom and if R_3 represents a hydrogen atom, then R_2 cannot represent a hydrogen atom.

Preferably, R_1 is a C10-24 linear or branched alkyl, more preferably, R_1 is an C12-22 linear or branched alkyl.

Non-limiting examples of R_1 is C12 alkyl (lauryl), C13 alkyl, C14 alkyl (myristyl), C15 alkyl, C16 alkyl (cetyl, or palmityl), C17 alkyl, C18 alkyl (stearyl), C19 alkyl, C20 alkyl (arachidyl), C21 alkyl, C22 alkyl (behenyl), and the isomer of those group, such as isostearyl.

Preferably, R_2 and R_3, each independently, represents hydrogen atom or C1-4 linear or branched alkyl.

Non-limiting examples of C1-4 linear or branched alkyl is methyl, ethyl, propyl, isopropyl, butyl, isobutyl, sec-butyl, tert-butyl.

Preferably, R_2 and R_3, each independently, represents C1-3 linear or branched alkyl, and more preferably, R_2 and R_3, each independently, represents C1-2 linear or branched alkyl.

Preferably, x is equal to 2 to 4, more preferably, x is equal to 2 or 3.

In the present invention, it is understood that if R_2 represents a hydrogen atom, then R_3 cannot represent a hydrogen atom and if R_3 represents a hydrogen atom, then R_2 cannot represent a hydrogen atom.

Preferably, the cationic surfactant is chosen from C8-26 linear or branched fatty acid amidopropyl tertiary amines and C8-26 linear or branched fatty acid amidoethyl tertiary amines

Non-limiting examples of the cationic surfactant include behenamidopropyl dimethylamine, isostearamidopropyl dimethylamine, myristamidopropyl dimethylamine, palmitamidopropyl dimethylamine, stearamidopropyl dimethylamine, lauramidopropyl dimethylamine, behenamidoethyl dimethylamine, isostearamidoethyl dimethylamine, myristamidoethyl dimethylamine, palmitamidoethyl dimethylamine, stearamidoethyl dimethylamine, lauramidoethyl dimethylamine, and mixtures thereof.

More preferably, the composition comprises at least one cationic surfactant chosen from C12-22 linear or branched fatty acid amidopropyl tertiary amines, even more preferably selected from C12-22 linear fatty acid amidopropyl tertiary amines, such as behenamidopropyl dimethylamine, myristamidopropyl dimethylamine, palmitamidopropyl dimethylamine, stearamidopropyl dimethylamine, and lauramidopropyl dimethylamine.

Advantageously, the cationic surfactant is present in the composition of the present invention in an amount ranging from 0.01 wt. % to 10 wt. %, preferably from 0.1 wt. % to 8 wt.%, more preferably from 0.5 wt. % to 6 wt.%, even more preferably from 1 wt.% to 4 wt.%, relative to the total weight of the composition.

Adjuvants

The composition according to the present invention may also comprise one or more cosmetic adjuvants.

For example, the composition may comprise one or more additives that are well known in the art, such as antioxidants, pH adjusters, and preserving agents.

A person skilled in the art can select these optional additional compounds and their amounts such that the advantageous properties intrinsically associated with the invention are not, or are not substantially, adversely affected by the envisaged addition(s).

According to a preferred embodiment, the composition according to the present invention comprises, relative to the total weight of the composition,

a) from 0.1 wt.% to 20 wt.% of at least one protein selected from silk protein, pea protein, soy protein, wheat protein, corn protein, collagen, and mixtures thereof, the proteins are non-hydrolysed and have a molecular weight of at least 10 kDa;

b) from 5 wt.% to 90 wt.%, of at least one organic solvent selected from ethanol, propylene glycol, acetic acid, lactic acid, and a mixture thereof; and

c) from 0.05 wt.% to 20 wt.% of at least one pigment.

According to a particularly preferred embodiment, the composition according to the present invention comprises, relative to the total weight of the composition,

a) from 1.5 wt.% to 8 wt.% of at least one corn protein which is non-hydrolysed and have a molecular weight of at least 15 kDa;

b) from 20 wt.% to 80 wt.% of at least one organic solvent selected from ethanol, propylene glycol, acetic acid, lactic acid, and mixtures thereof; and

c) from 0.5 wt.% to 10 wt.% of at least one pigment chosen from mineral, mixed mineral-organic or organic pigments.

Preparation and Use

The composition according to the present invention can be prepared by conventional methods in the cosmetic field and can be used for dyeing the hair.

According to the second aspect, the present invention provides a process for dyeing keratin fibers such as the hair comprising applying the composition as described above onto the keratin fibers such as the hair.

The process may be repeated several times in order to obtain the desired coloration.

EXAMPLES

The following examples are given by way of illustration of the present invention and shall not be interpreted as limiting the scope.

Main raw materials used, trade names and suppliers thereof were listed in Table 1.

Table 1

INCI Name	Trade Name	Supplier
Zein (molecular weight of at least 10 kDa)	Arorganic-zein	AROMA HOLLY LIMITED
RED 30	COVASOP RED W 3773	SENSIENT
Hydroxypropyltrimonium hydrolyzed wheat protein (molecular weight strictly lower than 10 kDa)	GLUADIN WQT P	BASF
Collagen powder (molecular weight of at least 10 kDa)	COLLUME POWDER	GELTOR
Polyurethane-93 (containing 30% of active material)	BAYCUSAN CQ E 1000	COVESTRO (BAYER)
Aminopropyl triethoxysilane	XIAMETER OFS-6011 SILANE	DOW

Invention Examples 1-5 and Comparative Example 1

Compositions according to invention examples (IE) 1-5 and comparative example (CE) 1 were prepared with the components listed in Table 2 (the contents were expressed as weight percentages of ingredients relative to the total weight of each composition, unless otherwise indicated – AM: Active material):

Table 2

Components	IE. 1	IE.2	IE.3	IE.4	IE.5	CE. 1
Ethanol	44	44	-	43	43	44
Water	qsp 100	qsp 100	qsp 100	qsp 100	qsp 100	qsp 100
Lactic acid	-	-	63	-	0.3	-
Zein	5	-	5	5	5	-
Stearamidopropyl dimethylamine	-	-	-	-	1	-
Aminopropyl triethoxysilane	-	-	-	1	-	-

Polyurethane-93	-	-	-	0.5	-	-
Collegan powder	-	5	-	-	-	-
Hydroxypropyltrimonium hydrolyzed wheat protein	-	-	-	-	-	5
RED 30 / CI 73360	2.4 AM	2.4 AM	2.4 AM	3 AM	2.4 AM	2.4 AM

Compositions of invention examples 1-5 are compositions according to the present invention.

Composition of comparative example 1 does not comprise at least one protein with a molecular weight of at least 10 kDa.

Preparation procedure:

The compositions listed above were prepared as follows:

1. mixing organic solvents and water with stirring under room temperature for 2 minutes to obtain a solvent mixture;

2. pre-heating the solvent mixture in a water bath of 50°C for 5 minutes;

3. adding protein and film-forming polymer (if present) into the solvent mixture in a water bath of 50°C with stirring for 5 minutes to obtain a homogenous system;

4. adding aminopropyl triethoxysilane (if presents) into the homogenous system with stirring for 5 minutes; and

5. adding the colouring agent into the homogenous system with stirring for 5 minutes to obtain a homogenous composition.

Evaluation:

Each composition was evaluated in terms of hair softness, detangling ability, and transfer resistance delivered by the composition.

Hair Softness

1.5 g of the sample to be tested was applied onto a 3g swatch of bleached hair and then the swatch of hair was blow-dried. Next, the swatch was bent and scored according to the following standard by the 6 professional hairdressers and the scores were averaged:

5: soft as natural hair;

4: slightly harder than natural hair, easy to bend and comb;

3: slightly hard to bend and comb;

2: very hard to bend and comb; and

1: super hard and cannot be bend or comb.

Detangling ability

1.5 g of the sample to be tested was applied onto a 3g swatch of bleached hair and then the swatch of hair was blow-dried. Next, 6 professional hairdressers inserted their fingers into the hair swatch and the fingers slid from the root to the tip of the hair to measure the detangling ability, then the scores were given according to the following standard and the scores were averaged:

1: cannot be combed at all;

2: hard to comb with a lot friction

3: can be combed with medium friction

4: easily comb with low friction

5: easily comb with no friction at all

Transfer resistance

1.5 g of the sample to be tested was applied onto a 3g swatch of bleached hair and then the swatch of hair was blow-dried. Next, the swatch of hair was wiped using a wiping cloth and the color stain on the swatch was scored according to the following standard by 6 professional hairdressers, then the scores were averaged:

1: almost all color transfer to the wiping cloth;

2: a lot of color stain in the wiping cloth;

3: with color stain in the wiping cloth, but the color level is acceptable;

4: a little color stain in the wiping cloth but not obvious;

5: no color stain in the wiping cloth.

The evaluation results for compositions of invention examples 1-5 and comparative example 1 were summarized in Table 3.

Table 3

Properties	IE. 1	IE.2	IE.3	IE.4	IE.5	CE. 1
Hair Softness	4.6	4.4	3.8	4.4	4.8	3.1
Detangling ability	4.7	4.4	4.6	4.3	4.9	2.2
Transfer resistance	3.8	3.6	4.2	4.3	3.9	1.7

It can be seen from Table 3 that the compositions according to the present invention comprising at least one protein with a molecular weight of at least 10 kDa makes it possible to obtain colored coating hairs having good strand separation, with soft feeling, and which are easy to disentangle.

Moreover, after the application of the composition to the hair, the composition has good transfer resistance.

CLAIMS

1. A composition, preferably for dyeing keratin fibers such as the hair, comprising:

a) at least one protein with a molecular weight of at least 10 kDa;

b) at least one organic solvent; and

c) at least one colouring agent chosen from pigments, direct dyes, and mixtures thereof.

2. The composition according to claim 1, wherein the protein is selected from silk protein, pea protein, soy protein, wheat protein, collagen, corn protein, and mixtures thereof, which are non-hydrolysed, more preferably, the protein is selected from corn protein, collagen and mixtures thereof, which are non-hydrolysed, even more preferably from corn protein which is non-hydrolysed.

3. The composition according to claim 1 or 2, wherein the protein has a molecular weight of at least 15 kDa.

4. The composition according to any of claims 1-3, wherein the protein is present in an amount ranging from 0.1 wt.% to 20 wt.%, preferably 0.5 wt.% to 15 wt.%, more preferably from 1 wt.% to 10 wt.%, even more preferably from 1.5 wt.% to 8 wt.% relative to the total weight of the composition.

5. The composition according to any of claims 1-4, wherein the organic solvent is selected from C2-C8 monoalcohols, C2-C8 glycols, C2-C8 fatty acids, and mixtures thereof, preferably selected from ethanol, propylene glycol, acetic acid, lactic acid, and mixtures thereof.

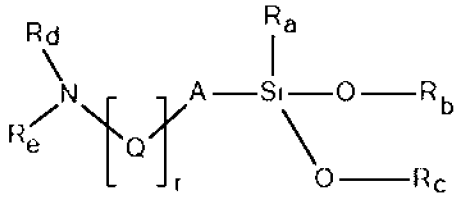
6. The composition according to any of claims 1-5, wherein the organic solvent is present in an amount ranging from 5 wt.% to 90 wt.%, preferably from 10 wt.% to 85 wt.%, more preferably from 20 wt.% to 80 wt.%, relative to the total weight of the composition.

7. The composition according to any of claims 1-6, wherein the composition

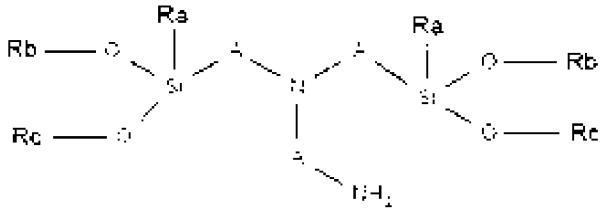
comprises one or more pigments chosen from mineral, mixed mineral-organic or organic pigments.

8. The composition according to any of claims 1-7, wherein the colouring agent is present in a total content ranging from 0.001 wt.% to 20 wt.% and preferably from 0.005 wt.% to 15 wt.% relative to the total weight of the composition, preferably the pigment(s) are present in a total content ranging from 0.05 wt.% to 20 wt.%, preferably from 0.1 wt.% to 15 wt.% and better still from 0.5 wt.% to 10 wt.%, relative to the total weight of the composition.

9. The composition according to any of claims 1-8, wherein the composition comprises at least one alkoxysilane, preferably chosen from the compounds of formula (I) or of formula (I') below, oligomers thereof and/or mixtures thereof:



(I)



(I')

in which:

- R_a represents an alkyl group containing from 1 to 20 carbon atoms, preferably from 1 to 10 carbon atoms, more preferentially from 1 to 4 carbon atoms and in particular from 1 to 2 carbon atoms such as a methyl, said alkyl group being optionally substituted with an aryl group; an alkoxy group containing from 1 to 10 carbon atoms, preferably from 1 to 4 carbon atoms and in particular from 1 to 2 carbon atoms such as an ethoxy; or an aryl group containing from 6 to 12 carbon atoms;

- R_b and R_c, which may be identical or different, represent a hydrogen atom; an alkyl group containing from 1 to 20 carbon atoms, preferably from 1 to 6 carbon atoms and notably from 1 to 4 carbon atoms, notably an ethyl group, it

being understood that if Ra does not represent an alkoxy group, then Rb and Rc cannot simultaneously represent a hydrogen atom;

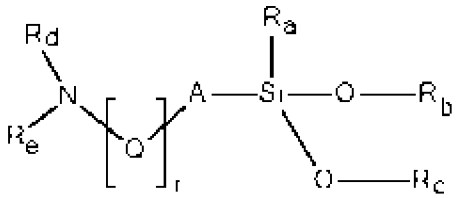
- R_d and R_e, which may be identical or different, represent a hydrogen atom; an alkyl group containing from 1 to 20 carbon atoms, preferably from 1 to 6 carbon atoms and notably from 1 to 4 carbon atoms; a cycloalkyl group containing from 3 to 20 carbon atoms; an aryl group containing from 6 to 12 carbon atoms; an aminoalkyl group containing from 1 to 20 carbon atoms;

- A independently represents a linear or branched alkylene group containing from 1 to 10 carbon atoms, which may be interrupted with at least one heteroatom chosen from O, S, NH or a carbonyl group (CO), preferably NH;

- Q represents a carbonyl group (CO);

- r denotes an integer ranging from 0 to 1.

10. The composition according to claim 9, wherein the alkoxysilane(s), oligomers thereof and/or mixtures thereof are chosen from the compounds of formula (I) below:



(I)

in which:

- R_a represents an alkyl group containing from 1 to 10 carbon atoms, notably from 1 to 4 carbon atoms and in particular from 1 to 2 carbon atoms, preferably a methyl, or an alkoxy group containing from 1 to 4 carbon atoms, preferably from 1 to 2 carbon atoms, preferably an ethoxy;

- R_b and R_c, which may be identical or different, represent an alkyl group containing from 1 to 10 carbon atoms, preferably from 1 to 4 carbon atoms, such as an ethyl;

- R_d and R_e, which are identical, represent a hydrogen atom or Rd denotes a hydrogen atom and Re denotes a C5-C6 cycloalkyl radical such as cyclohexyl;

- A independently represents a linear or branched alkylene group containing from 1 to 10 carbon atoms, which may be interrupted with at least one heteroatom chosen from O, S and NH or a carbonyl group (CO), preferably NH;

- r denotes an integer equal to 0.

11. The composition according to any of claims 9 or 10, wherein the alkoxysilane(s), oligomers thereof and/or mixtures thereof are chosen from the compounds of formula (I) in which Ra represents an ethoxy group, Rb and Rc are identical and represent an ethyl, Rd and Re represent a hydrogen atom, A represents a propylene and r denotes an integer equal to 0.

12. The composition according to any of claims 9 to 11, wherein the alkoxysilane is present in a total amount ranging from 0.1 wt.% to 30 wt.%, preferably from 0.3 wt.% to 20 wt.%, preferentially from 0.5 wt.% to 15 wt.%, better still from 0.8 wt.% to 10 wt.% and even better still from 0.8 wt.% to 5 wt.%, relative to the total weight of composition.

13. The composition according to any of claims 1-12, further comprises at least one film-forming polymer other than protein, preferably chosen from hydrophobic film-forming polymer(s), more preferably selected from acrylic polymer, polyurethane, and mixtures thereof.

14. The composition according to claim 13, wherein the film-forming polymer is selected from Polyurethane-1, Polyurethane-6, Polyurethane-32, Polyurethane-34, Polyurethane-35, Polyurethane-48, Polyurethane-93, Polyurethane-99, styrene/acrylate copolymers, and mixtures thereof, preferably selected from Polyurethane-93, Polyurethane-99, styrene/acrylates/ammonium methacrylate copolymers and mixtures thereof, more preferably selected from Polyurethane-93, styrene/acrylates/ammonium methacrylate copolymers and mixtures thereof, preferably the film-forming polymer is present in an amount ranging from 0.1 wt.% to 10 wt.%, preferably from 0.2 wt.% to 5 wt.%, more preferably from 0.3 wt.% to 3 wt.%, relative to the total weight of the composition.

15. The composition according to any of claims 1-13, further comprising one or more cationic surfactant, preferably chosen from tertiary amidoamines, preferably in an amount ranging from 0.01 wt. % to 10 wt. %, preferably from 0.1 wt. % to 8 wt.%, more preferably from 0.5 wt. % to 6 wt.%, even more preferably from 1 wt. % to 4 wt.%,

relative to the total weight of the composition.

16. The composition according to claim 1, comprising, relative to the total weight of the composition,

a) from 0.1 wt.% to 20 wt.% of at least one protein selected from silk protein, pea protein, soy protein, wheat protein, corn protein, collagen, and mixtures thereof, the proteins are non-hydrolysed and have a molecular weight of at least 10 kDa;

b) from 5 wt.% to 90 wt.% of at least one organic solvent selected from ethanol, propylene glycol, acetic acid, lactic acid, and a mixture thereof; and

c) from 0.05 wt.% to 20 wt.% of at least one pigment.

17. A process for dyeing keratin fibers such as the hair comprising applying the composition according to any of claims 1-16 onto keratin fibers such as the hair.

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2023/140081

A. CLASSIFICATION OF SUBJECT MATTER

A61K8/87(2006.01)i; A61K8/65(2006.01)i; A61K8/64(2006.01)i; A61Q5/10(2006.01)i; A61Q5/00(2006.01)i

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC:A61K,A61Q

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

DWPI, VEN, WOTXT, USTXT, EPTXT, JPTXT, CNTXT, DUXIU, ISI Web of Knowledge, PUBMED: silk protein, pea protein, soy protein, wheat protein, collagen, corn protein, kDa, molecular weight, colour protect, transfer, soft, dye, hair, keratin fibers, hydrolyse, non-hydrolysed, alkoxysilane, polyurethane, aminopropyl triethoxysilane, zein

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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X	JP 2009274968 A (FUJI FILM CO., LTD.) 26 November 2009 (2009-11-26) claims1,2,6,10,paragraphs 34-35,45,96-99,106-107	1-17
X	CN 102333516 A (BASF.SE) 25 January 2012 (2012-01-25) paragraphs 207-211	4,6-8,17
X	US 2005129652 A1 (KELLER,W. et al.) 16 June 2005 (2005-06-16) paragraphs 50,57,85	1,2,16,17
Y	US 2008168608 A1 (GREGORY, P. et al.) 17 July 2008 (2008-07-17) paragraph 75	1-17
Y	CN 101332163 A (OREAL) 31 December 2008 (2008-12-31) claims 1,4-10, page 10 paragraph 1	1-17

☑ Further documents are listed in the continuation of Box C. ☑ See patent family annex.

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"A" document defining the general state of the art which is not considered to be of particular relevance
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"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
15 August 2024	**20 August 2024**

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C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	SHUKLA, R. et al. "Zein: the industrial protein from corn" *Industrial Crops and Products,* Vol. 13, No. 31, 31 December 2001 (2001-12-31), pages 171-192	1-17

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Information on patent family members

International application No.
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				WO	2004112732	A3	24 March 2005
				WO	2004112745	A1	29 December 2004
				ES	2348981	T3	21 December 2010
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International application No.
PCT/CN2023/140081

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