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(71) Applicant: **L'OREAL** [FR/FR]; 14, rue Royale, F-75008 Paris (FR).

(72) Inventors: **KERGOSIEN, Guillaume**; 20, rue Alexis MANEYROL, F-92370 Chaville (FR). **RIACHI, Carl**; 98 rue Brillat Savarin, F-75013 Paris (FR). **LE PAPE, Marina**; 15 rue Henri Martin, F-94200 Ivry- Sur Seine (FR).

(74) Agents: **DOMENEGO, Bertrand** et al.; Cabinet Lavoix, 2, place d'Estienne d'Orves, F-75009 Paris (FR).

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(54) Title: NAIL MAKEUP METHOD WITH PHOTOCROSSLINKABLE VARNISH COMPOSITIONS

(57) Abstract: The present invention relates to a makeup and/or care method of a nail and/or false nail, comprising a step for applying, onto a nail or false nail, a photocrosslinkable cosmetic composition C1, the composition C1 comprising in a physiologically acceptable medium at least one photocrosslinkable compound comprising at least two (meth)acrylate functions and at least one carboxylic acid function, at least one volatile solvent S in a proportion greater than or equal to 30% in relation to the total weight of the composition C1, and at least one photoinitiator.



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NAIL MAKEUP METHOD WITH PHOTOCROSSLINKABLE VARNISH COMPOSITIONS

5 The present invention relates to a makeup method of a nail and/or false nail by applying photocrosslinkable varnish compositions.

 Nail varnish compositions may be used as a base for the varnish (or *base-coat*), as a nail makeup product, or as a finishing composition (or *top-coat*) to be applied on the nail makeup product, or as a cosmetic nail care product. These
10 compositions may be applied onto natural nails as well as onto false nails.

 In the field of nail varnishes, liquid cosmetic compositions are known, which are used by first applying a coat onto the nail and then subjecting said coat to the action of light radiation, inducing *in situ* polymerization and/or crosslinking reactions within said coat, resulting in generally crosslinked polymeric networks. Such
15 photocrosslinkable compositions, commonly referred to as "UV gels" and generally based on (meth)acrylate monomer type crosslinkable compounds, are suitable for obtaining a satisfactory stability of the coat applied on the nail, and are described for example in CA 1 306 954, US 5 456 905, US 7 375 144 and FR 2 823 105.

 Some products substantially free from (meth)acrylate monomers are also on
20 the market. However, these products pose performance problems particularly in respect of makeup quality and varnish stability over time.

 The aim of the present invention is to provide a novel method using photocrosslinkable compositions which do not have the drawbacks of the
aforementioned alternative compositions.

25 In particular, the aim of the present invention is to provide a novel makeup method using photocrosslinkable compositions, preferably substantially free from (meth)acrylate monomers, which have a satisfactory stability and a high gloss in relation to the photocrosslinkable compositions currently available, notably those substantially free from (meth)acrylate monomers.

30 The aim of the present invention is to provide a novel makeup method using photocrosslinkable compositions, preferably substantially free from (meth)acrylate monomers, which are easy to use.

 Another aim of the invention is to obtain photocrosslinkable compositions suitable for providing coats having the following properties: stability over time (with a
35 mild etching or without any etching of the nail or false nail before applying the

composition), easy makeup removal, high cosmeticity, outstanding makeup result (homogeneous deposition, easy to apply, comfortable to wear) and/or high gloss.

The present invention relates to a makeup and/or care method of a nail and/or false nail, comprising the following steps:

5 a) applying, onto a nail or false nail, a photocrosslinkable cosmetic composition C1 preferably comprising less than 10% by weight of (meth)acrylate monomer in relation to said composition C1, whereby a coat consisting of at least one layer of said composition C1 is deposited;

the composition C1 comprising in a physiologically acceptable medium:

- 10
- at least one photocrosslinkable compound comprising at least two (meth)acrylate functions and at least one carboxylic acid function,
 - at least one volatile solvent S in a proportion greater than or equal to 30% in relation to the total weight of the composition C1, and
 - at least one photoinitiator,

15 b) exposing the coated nail or false nail obtained following step a) to UV or visible light radiation, whereby photocrosslinking is carried out to obtain a crosslinked layer C'1;

20 c) applying, onto the nail or false nail coated with the crosslinked layer C'1, obtained following step b), a photocrosslinkable cosmetic composition C2 preferably comprising less than 10% by weight of (meth)acrylate monomer in relation to said composition C2, whereby a coat consisting of at least one layer of said composition C2 is deposited;

the composition C2 comprising in a physiologically acceptable medium:

- 25
- at least one photocrosslinkable urethane di(meth)acrylate compound at a content by weight greater than or equal to 65% in relation to the total dry extract weight of C2, and
 - at least one volatile solvent S';

30 d) exposing the coated nail or false nail obtained following step c) to UV or visible light radiation, whereby photocrosslinking is carried out to obtain a crosslinked layer C'2.

35 According to one embodiment, the compositions C1 and C2 according to the invention are photocrosslinkable compositions comprising a reduced quantity of (meth)acrylate monomer. In this way, they comprise preferably less than 5%, or less than 2%, or more preferentially less than 1%, by weight of (meth)acrylate monomer in relation to the total weight of said composition.

According to one advantageous embodiment, the compositions C1 and C2 are substantially free from (meth)acrylate monomer. Advantageously, the compositions C1 and C2 are completely free from (meth)acrylate monomer.

The term "(meth)acrylate monomer" refers to a compound comprising a single (meth)acrylate function according to the formula $H_2C=C(R)-C(O)-O-$, where $R = H$ or CH_3 .

Physiologically acceptable medium

The compositions C1 and C2 according to the invention comprise a physiologically acceptable medium.

The term "physiologically acceptable medium" refers to a medium that is particularly suitable for the application of a composition of the invention onto keratin matter.

The physiologically acceptable medium is generally suitable for the nature of the support to which the composition should be applied, and also for the way in which the composition is to be packaged.

Photocrosslinkable compound of C1

The composition C1 comprises at least one photocrosslinkable compound as defined above. It may thus comprise a single photocrosslinkable compound or a mixture of a plurality of photocrosslinkable compounds.

According to one embodiment, the compositions C1 comprise a single photocrosslinkable compound as defined hereinafter.

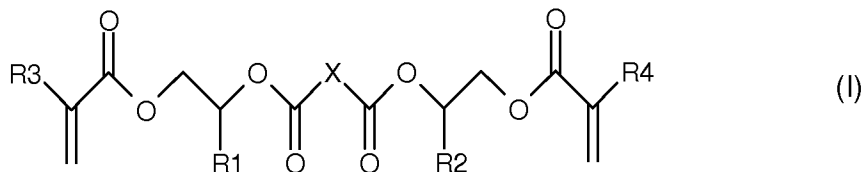
Within the scope of the present invention, the term "photocrosslinkable compound" refers to an organic compound suitable for crosslinking under the action of a light ray, resulting in a crosslinked polymer network.

These compounds are defined by the presence of at least one carboxylic acid function, i.e. one $-COOH$ function, and at least two (meth)acrylate functions, i.e. $H_2C=C(R)-C(O)-O-$ functions, where $R = H$ or CH_3 .

According to one embodiment, these photocrosslinkable compounds comprise at least two carboxylic acid functions and at least two (meth)acrylate, preferably methacrylate, functions.

According to one embodiment, these photocrosslinkable compounds comprise at least two carboxylic acid functions and four (meth)acrylate functions, preferably four methacrylate functions.

According to one embodiment, the photocrosslinkable compound of C1 is of formula (I):



wherein:

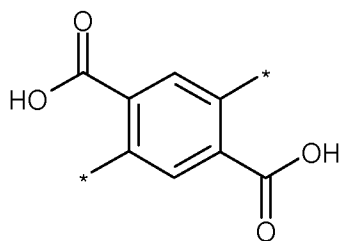
– R1 and R2, identical or different, represent a hydrogen atom, or a methyl group, or a group of formula (II):



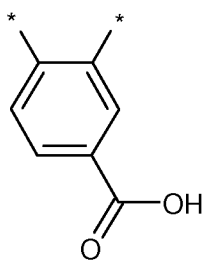
where R5 represents a hydrogen atom or a methyl group;

– R3 and R4, identical or different, represent a hydrogen atom or a methyl group;

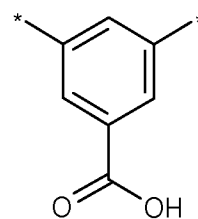
– X represents a radical of any of the following formulae (III), (IV), (V), (VI), (VII), (VIII), (IX), or (X):



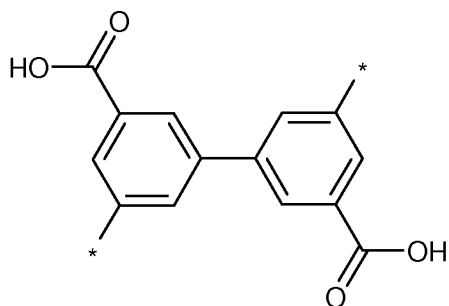
(III)



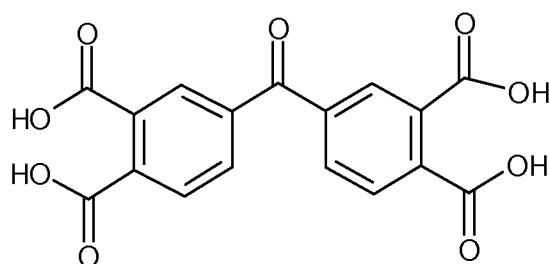
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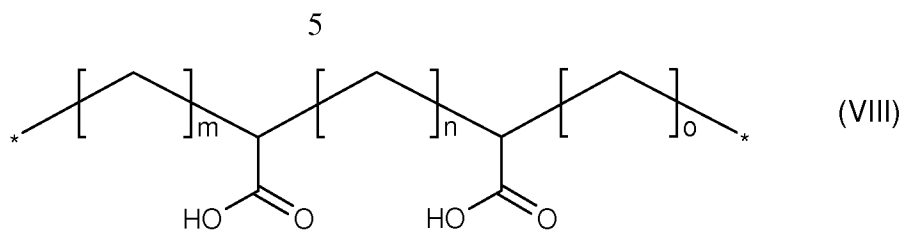
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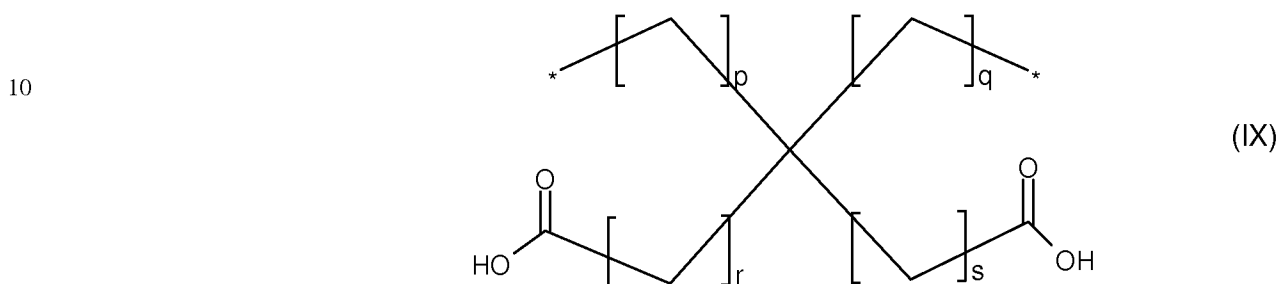


(VII)



5

where m, n, and o, identical or different, represent an integer between 0 and 10;



15

where p, q, r and s, identical or different, represent an integer between 0 and 10;



where R6, R7 and R8, identical or different, represent a hydrogen atom or a hydroxyl group.

25

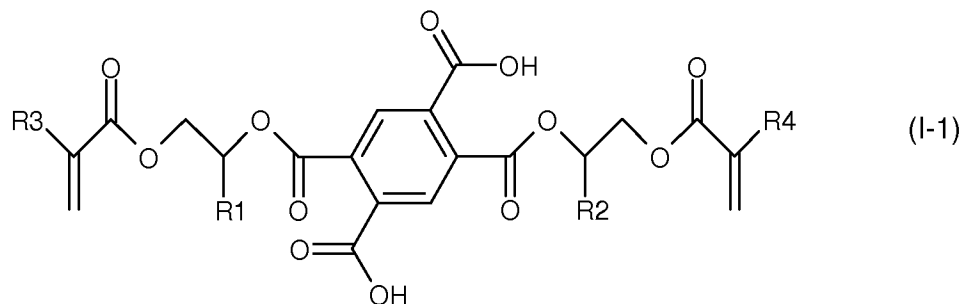
In the above formulae, the * symbols represent the binding sites of the -X-radical.

According to one embodiment, the photocrosslinkable compound of C1 is of formula (I) as defined above, wherein the radical X is an aromatic radical, particularly an arylene radical, and preferably a phenylene radical.

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Preferably, the photocrosslinkable compound of C1 is of formula (I-1):



10 where R1, R2, R3 and R4 are as defined above in formula (I).

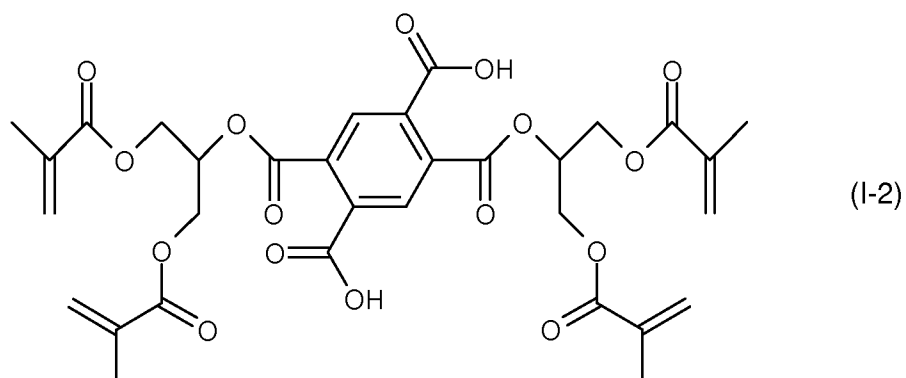
According to one embodiment, the photocrosslinkable compound of C1 is of the formula (I) or (I-1) as defined above, wherein R3 and R4 are methyl groups.

15 According to one embodiment, the photocrosslinkable compound of C1 is of the formula (I) or (I-1) as defined above, wherein R1 and R2, identical or different, represent a group of formula (II-1):



20 Preferentially, the photocrosslinkable compound of C1 is of formula (I-2):

(I-2):



30

According to one embodiment, the composition C1 has a content of photocrosslinkable compound(s) as defined above ranging from 1% to 10%, and preferably from 2% to 7%, by weight in relation to the total weight of C1.

Volatile solvent S of C1

The composition C1 comprises at least one volatile solvent S. It may thus comprise a single solvent or a mixture of a plurality of volatile solvents.

5 The mass solvent S content is preferably between 40% and 80%, preferably between 50% and 70%.

10 The term "volatile solvent" refers to a solvent capable of evaporating on contact with keratin matter, in less than one hour, at ambient temperature and at atmospheric pressure.

The volatile solvent(s) according to the invention are liquid solvents at ambient temperature, having a vapor pressure different to zero, at ambient temperature and atmospheric pressure, particularly ranging from 0.13 Pa to 40,000 Pa (from 10^{-3} to 300 mm Hg), particularly ranging from 1.3 Pa to 13,000 Pa (from 0.01 to 100 mm Hg), and more specifically ranging from 1.3 Pa to 1300 Pa (from 0.01 to 10 mm Hg).

15 Preferably, the solvents S are chosen from polar solvents.

The term "polar" solvent, according to the present invention, refers to a solvent, or an oil, wherein the solubility parameter calculated over the melting point δ_a thereof is different to 0 (J/cm^3)^{1/2}.

20 The definition and calculation of HANSEN three-dimensional solubility parameters are described in the article by C. M. HANSEN: "The three dimensional solubility parameters" J. Paint Technol. 39, 105 (1967).

According to the Hansen space:

25 - δ_D characterizes the LONDON dispersion forces derived from the formation of dipoles induced during molecular shocks;

- δ_p characterizes the DEBYE interaction forces between permanent dipoles and the KEESOM interaction forces between induced dipoles and permanent dipoles;

30 - δ_h characterizes the specific interaction forces (such as hydrogen, acid/base, donor/acceptor bonds, etc.); and

- δ_a is determined by the equation: $\delta_a = (\delta_p^2 + \delta_h^2)^{1/2}$.

The parameters δ_p , δ_h , δ_D et δ_a are expressed in (J/cm^3)^{1/2}.

In particular, the term "polar" solvent refers to a solvent wherein the chemical structure is essentially formed from, or consists of, carbon and hydrogen atoms, and

comprising at least one highly electronegative heteroatom such as an oxygen, nitrogen, silicon or phosphorus atom.

Preferably, this polar volatile solvent is chosen from the group consisting of C3-C6 esters and ketones and mixtures thereof.

As an example of a polar volatile solvent, mention may be made of acetone, methylethylketone, methylisobutylketone, cyclohexanone and alkyl acetates wherein the alkyl group comprises from 2 to 5 carbon atoms, such as methyl acetate, ethyl acetate, propyl acetate, n-propyl acetate, isopropyl acetate, n-butyl acetate, isobutyl acetate and tert-butyl acetate.

Preferably, the polar volatile solvent is C3-C5, and more preferentially chosen from the group consisting of ethyl acetate, n-propyl acetate, isopropyl acetate and mixtures thereof.

According to one preferred embodiment, the solvent S is a mixture of acetone, butyl acetate and ethyl acetate.

Photoinitiator

The composition C1 comprises at least one photoinitiator.

It may comprise a single photoinitiator or a mixture of a plurality of photoinitiators.

According to one embodiment, the composition C1 comprises two photoinitiators.

The photoinitiators suitable for use according to the present invention are known in the art and are described, for example in "Les photoinitiateurs dans la réticulation des revêtements", G. Li Bassi, Double Liaison – Chimie des Peintures, No. 361, November 1985, p.34-41; "Applications industrielles de la polymérisation photoinduite", Henri Strub, L'Actualité Chimique, February 2000, p.5-13; and "Photopolymères: considérations théoriques et réaction de prise", Marc, J.M. Abadie, Double Liaison – Chimie des Peintures, No. 435–436, 1992, p.28-34.

These photoinitiators include:

- α -hydroxyketones, marketed for example under the names DAROCUR® 1173 and 4265, IRGACURE® 184, 2959, and 500 by BASF, and ADDITOL® CPK by CYTEC,

- α -aminoketones, marketed for example under the names IRGACURE® 907 and 369 by BASF,

- aromatic ketones marketed for example under the name ESACURE® TZT by LAMBERTI. Mention may also be made of thioxanthenes marketed for example

under the name ESACURE® ITX by LAMBERTI, and quinones. These aromatic ketones generally require the presence of a hydrogen donor compound such as tertiary amines and particularly alkanolamines. Mention may particularly be made of the tertiary amine ESACURE® EDB marketed by LAMBERTI.

5 - α -dicarbonyl derivatives of which the most common is benzyl dimethyl ketal marketed under the name IRGACURE® 651 by BASF. Further commercial products are marketed by LAMBERTI under the name ESACURE® KB1, and

10 - acylphosphine oxides, such as for example bis-acylphosphine oxides (BAPO) marketed for example under the names IRGACURE® 819, 1700, and 1800, DAROCUR® 4265, LUCIRIN® TPO, and LUCIRIN® TPO-L by BASF.

Preferably, the photoinitiator is chosen from the group consisting of α -hydroxyketones, α -aminoketones, aromatic ketones preferably associated with a hydrogen donor compound, aromatic α -diketones and acylphosphine oxides, and mixtures thereof.

15 A mixture of photoinitiators absorbing light radiation at various wavelengths is preferably used in C1. The absorption spectrum of the photocrosslinkable composition can thus be adapted to the emission spectrum of the light sources used.

20 Preferably, the composition C1 comprises a mixture of two different photoinitiators, such as for example a mixture of an α -hydroxyketone and an acylphosphine oxide.

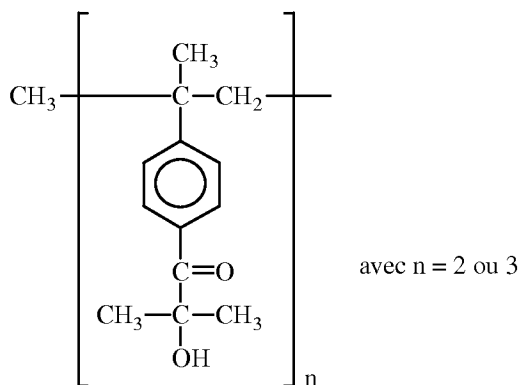
As a photoinitiator mixture, mention may be made of a mixture of IRGACURE® 184 (BASF) and LUCIRIN® TPO-L (BASF).

25 A particular group of photoinitiators suitable for use in the composition C1 according to the present invention is that of copolymerizable photoinitiators. It consists of molecules comprising both a photoinitiator group capable of photoinduced radical splitting and at least one double ethylene bond. The photoinitiators in this group offer the advantage, in relation to the conventional photoinitiators listed above, of being suitable for being incorporated, via the double bond, into the macromolecular system. This possibility reduces the content of free residual photoinitiators not having undergone photoinduced radical splitting and thus enhances the safety of the layer of varnish.

35 As examples of such copolymerizable photoinitiators, mention may be made of benzophenone acrylate derivatives marketed by CYTEC under the names EBECRYL® P36, EBECRYL® P37.

In one preferred embodiment of the invention, polymer photoinitiators or photoinitiators bound onto a high molar mass molecule are used. The choice of such a high mass photoinitiator offers the same advantage as selecting only polymeric copolymerizable compounds, i.e. enhanced safety of the photocrosslinkable cosmetic compositions due to the absence of very reactive molecules liable to diffuse to neighboring biological substrates. The mean molar mass by weight of the photoinitiator is preferably at least equal to 500 g/mol.

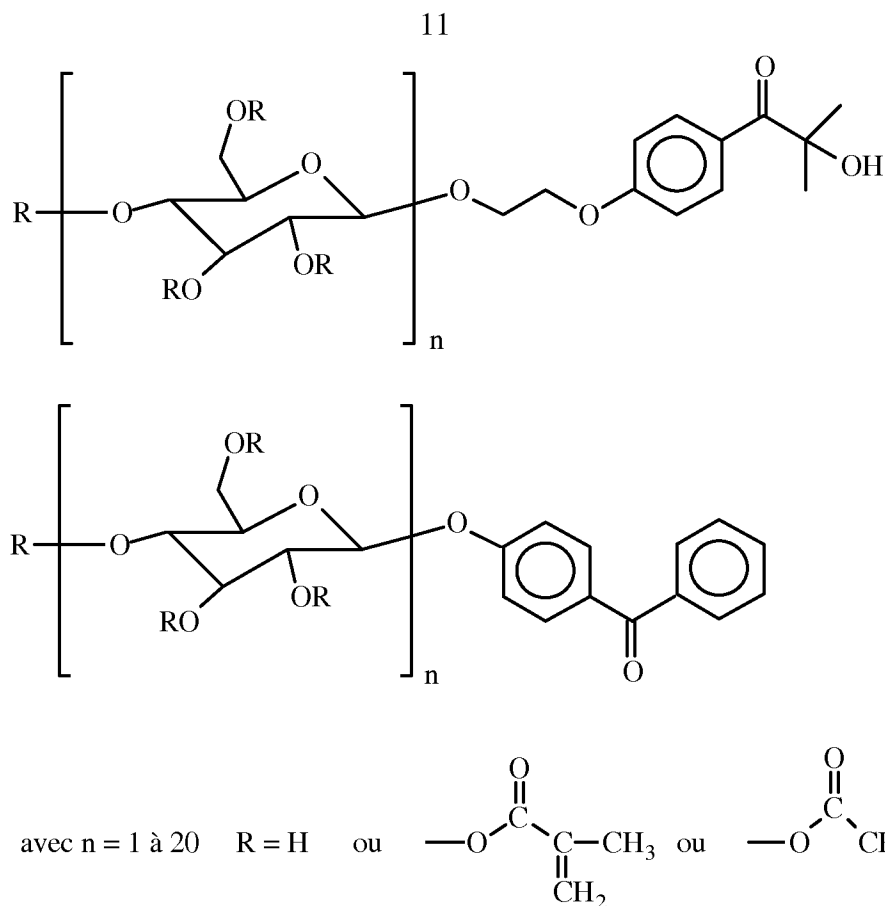
For example, mention may be made of an α -hydroxyketone oligomer corresponding to the following formula:



and which is marketed under the name ESACURE® KIP 150 by LAMBERTI.

The polymer on which the photoinitiator group is bound may optionally comprise one or a plurality of double ethylene bonds for optionally incorporating, into the macromolecular network, photoinitiator molecules not having undergone photoinduced splitting.

As examples of such high molar mass photoinitiators bearing double ethylene bonds, mention may be made of those corresponding to the following formulae:



These structures are described in the following articles: S. Knaus, *Pure Appl. Chem.*, A33(7), 869 (1996); S. Knaus, *J. Polym. Sci, Part A = Polym. Chem.*, 33, 929 (1995); and R. Liska, *Rad'Tech Europe 97*, Lyon, F, 1997, Conference Proceedings.

The photoinitiator content is dependent on a large number of factors such as the reactivity of the various constituents of the mixture, the presence of pigments or dyes, the crosslinking density sought, the intensity of the light source or the exposure time.

In order to obtain satisfactory mechanical properties, the photoinitiator(s) is (or are) preferably present in a total content greater than or equal to 0.1% by weight in relation to the total weight of the composition C1, preferably ranging from 1 to 5% by weight in relation to the total weight of the composition C1.

Photocrosslinkable urethane (meth)acrylate compound

The composition C2 comprises at least one photocrosslinkable urethane di(meth)acrylate compound. It may thus comprise a single photocrosslinkable urethane di(meth)acrylate compound or a mixture of photocrosslinkable urethane di(meth)acrylate compounds.

Preferably, the composition C2 comprises two photocrosslinkable urethane di(meth)acrylate compounds.

The term "urethane di(meth)acrylate compound" refers to any compound comprising at least one urethane function $-O-C(O)-NH-$, and at least two (meth)acrylate functions according to the formula $H_2C=C(R)-C(O)-O-$, where $R = H$ or CH_3 .

The "urethane" function is also referred to as a "carbamate" function.

Advantageously, the mean number of (meth)acrylate functions borne by the photocrosslinkable urethane di(meth)acrylate compound intended to form, after crosslinking, a crosslinked polymeric network, is greater than or equal to 2. Indeed, a polymerizable system consisting of molecules each bearing a single (meth)acrylate function forms, after reacting all of said functions, a linear or branched, and not crosslinked, chain macromolecular system. Only the presence of a certain fraction of molecules bearing at least two (meth)acrylate functions and thus acting as a crosslinking agent is suitable for obtaining a crosslinked polymeric system.

In the implementation of the present invention, the mean number of (meth)acrylate functions per molecule of urethane di(meth)acrylate compound is preferably greater than or equal to 2, advantageously ranging from 2 to 6, preferably from 2 to 4, and more preferentially equal to 2.

Preferentially, this urethane di(meth)acrylate compound is a urethane dimethacrylate compound. The term "urethane dimethacrylate compound" refers to any compound comprising at least one urethane function $-O-C(O)-NH-$, and two methacrylate functions according to the formula $H_2C=C(CH_3)-C(O)-O-$.

The composition C2 comprises at least 65% by weight of photocrosslinkable urethane di(meth)acrylate compounds in relation to the total dry extract weight of C2.

Preferably, the composition C2 comprises at least 70%, preferably at least 75%, and preferentially at least 80%, by weight of photocrosslinkable urethane di(meth)acrylate compounds in relation to the total dry extract weight of C2.

Volatile solvent S'

The composition C2 comprises at least one volatile solvent S'. It may thus comprise a single solvent or a mixture of a plurality of volatile solvents.

The mass solvent S' content is preferably between 10% and 30%, preferably between 15% and 25%.

Preferably, S' chosen from polar solvents.

Preferably, this polar volatile solvent is chosen from the group consisting of C3-C6 esters and ketones and mixtures thereof.

As a preferred solvent S', mention may be made of the solvents cited above for the solvent S.

According to one preferred embodiment, the solvent S' is butyl acetate.

Film-forming polymer

The composition C2 also comprises at least one film-forming polymer.

Preferably, the composition C2 comprises a single film-forming polymer.

The film-forming polymer content is preferably between 0.5% and 10%, preferably between 1% and 5%, by weight in relation to the total weight of C2 .

The term "film-forming polymer" refers to, according to the invention, a polymer suitable for forming alone (i.e. in the absence of an auxiliary film-forming agent or an external stimulus for example such as UV), a film suitable for being isolated, particularly a continuous adherent film, on a substrate, particularly on nails.

This film-forming polymer may be chosen from the group consisting of radical or polycondensate type synthetic polymers, polymers of natural origin, and mixtures thereof.

A film-forming polymer suitable for the invention may be chosen from polysaccharide derivatives, such as cellulose or guar gum derivatives. One preferential polysaccharide derivative suitable for the invention may be nitrocellulose or a polysaccharide ester or alkylether.

The term "polysaccharide ester or alkylether" refers to a polysaccharide consisting of repeat units comprising at least two identical or different rings and having a degree of substitution per saccharide unit between 1.9 and 3, preferably between 2.2 and 2.9, and more particularly between 2.4 and 2.8. The term substitution refers to the functionalization of hydroxyl groups into ester and/or alkylether functions, and/or the functionalization of carboxyl groups into ester functions.

In other words, it may consist of a polysaccharide, partially or totally substituted with ester and/or alkylether groups. Preferably, the hydroxyl groups may be substituted with C₂-C₄ ester and/or alkylether functions.

Particular mention may be made of cellulose esters (such as cellulose acetobutyrate or cellulose acetopropionate), cellulose alkylethers (such as ethylcelluloses), and ethylguars.

A film-forming polymer suitable for the invention may be chosen from synthetic polymers such as polyurethanes, acrylic polymers, vinyl polymers, polyvinylbutyrals, alkyd resins and ketone/aldehyde resins, resins from aldehyde condensation products, such as aryl sulfonamide formaldehyde resins such as toluene sulfonamide formaldehyde resin, aryl-sulfonamide epoxy resins or ethyl tosylamide resins.

In particular, it may consist of(meth)acrylate homopolymers and copolymers.

A film-forming polymer suitable for the invention may also be chosen from polymers of natural origin, such as plant resins such as dammars, elemi, copals, benzoin; gums such as shellac, sandarac and mastic.

As a film-forming polymer, the toluene sulfonamide formaldehyde resins "Ketjentflex MS80" from AKZO or "Santolite MHP", "Santolite MS 80" from FACONNIER or "RESIMPOL 80" from PAN AMERICANA, the alkyd resin "BECKOSOL ODE 230-70-E" from DAINIPPON, the acrylic resin "ACRYLOID B66" from ROHM & HAAS, the polyurethane resin "TRIXENE PR 4127" from BAXENDEN, the acetophenone/formaldehyde resin marketed under the reference Synthetic Resin SK by Degussa may notably be used.

According to one preferred particular embodiment, the film-forming polymer is chosen from the group consisting of polysaccharides and polysaccharide derivatives, preferably from nitrocellulose and polysaccharide ethers and esters, particularly C₂-C₄, and more preferentially from cellulose acetobutyrate, cellulose acetopropionate, ethylcelluloses, ethylguars, and mixtures thereof.

According to one advantageous embodiment, the film-forming polymer is chosen from the group consisting of nitrocellulose, cellulose acetopropionate, cellulose acetobutyrate, and (meth)acrylate homopolymers and copolymers, and mixtures thereof.

Preferentially, in the compositions according to the invention, the film-forming polymer of C2 is a (meth)acrylate copolymer.

Adjuvants

The compositions C1 and C2 may further contain adjuvants, or additives, particularly chosen from pigments and dyes, plasticizers, coalescing agents, preservatives, waxes, thickeners, perfumes, UV filters, cosmetic active substances for nail care, spreading agents, anti-foaming agents and dispersing agents.

Obviously, those skilled in the art will take care to choose these optional adjuvants or additives such that the advantageous properties of the composition

according to the invention are not, or are practically not, altered by the envisaged addition.

If the composition comprises pigments and/or dyes, it is particularly advisable to adapt the absorption spectrum of the pigments and/or dyes used to that of the photoinitiators, or conversely the absorption spectrum of the photoinitiators to that of the pigments and/or dyes used, so as to prevent both types of compounds from absorbing light at the same wavelengths. Indeed, the absorption of light by the pigments and/or dyes would render the photoinitiators present beyond a specific depth of the coat almost completely ineffective.

The compositions C1 and C2 according to the invention may further comprise one or a plurality of plasticizers.

According to one embodiment, these compositions comprise less than 15% by weight of plasticizer in relation to the total weight of said composition.

Preferably, the mass plasticizer content ranges from 0% to 15%, preferentially from 1% to 10%, and more preferentially from 5% to 10%.

As examples of plasticizers, mention may particularly be made of standard plasticizers such as glycols and derivatives thereof, such as diethylene glycol ethylether, diethylene glycol methylether, diethylene glycol butylether or diethylene glycol hexylether, ethylene glycol ethylether, ethylene glycol methylether, ethylene glycol butylether, ethylene glycol hexylether, glycol esters, propylene glycol derivatives and particularly propylene glycol phenylether, propylene glycol diacetate, dipropylene glycol butylether, tripropylene glycol butylether, propylene glycol methylether, dipropylene glycol ethylether, tripropylene glycol methylether and diethylene glycol methylether, propylene glycol butylether, acid esters particularly carboxylic acid esters, such as citrates, particularly triethyl citrate, tributyl citrate, triethyl acetylcitrate, tributyl acetylcitrate, triethyl-2 hexyl acetylcitrate; phthalates, particularly dimethoxyethyl phthalate; phosphates, particularly tricresyl phosphate, tributyl phosphate, triphenyl phosphate, tributoxyethyl phosphate; tartrates, particularly dibutyl tartrate; adipates; carbonates; sebacates; benzyl benzoate, butyl acetyl ricinoleate, glyceryl acetyl ricinoleate, butyl glycolate, camphor, glycerol triacetate, N-ethyl-o,p-toluenesulfonamide, oxyethylenated derivatives such as oxyethylenated oils, particularly plant oils, such as castor oil, silicone oils, hydrocarbon oils, and mixtures thereof.

Preferably, the composition C1 is transparent.

As used herein, the term transparent refers to that the composition has a HAZEYK index of less than 5 as measured with a KYKHAZEGLOSS type gloss meter.

According to one advantageous embodiment, the composition C2 comprises at least one coloring agent. Preferably, the composition C2 is a colored composition.

According to one embodiment, the composition C2 further comprises a coloring agent chosen from the group consisting of soluble dyes, pigments, nacs and glitter.

The coloring agent(s) may be present in a total content greater than or equal to 0.1% by weight in relation to the total weight of the layer, ranging preferably from 0.1 to 5%, advantageously from 0.2 to 1% by weight in relation to the total weight of C2.

The term "soluble dyes" should be understood to refer to organic, inorganic or organometallic compounds, soluble in the composition according to the invention and intended to color said composition.

The dyes are, for example, Sudan Red, DC Red 17, DC Green 6, β -carotene, soybean oil, Sudan brown, DC Yellow 11, DC Violet 2, DC Orange 5 and Quinoline Yellow.

The term "pigments" should be understood to refer to inorganic or organic, white or colored particles of any shape, insoluble in the composition according to the invention and intended to color said composition.

The term "nacs" should be understood to refer to iridescent particles of any shape, particularly produced by some mollusks in their shell or by synthetic means.

The pigments may be white or colored, inorganic and/or organic. Of the inorganic pigments, mention may be made of titanium dioxide, optionally surface-treated, zirconium or cerium oxides, along with zinc, iron (black, yellow or red) or chromium oxides, manganese violet, ultramarine blue, chromium hydrate and iron blue, metallic powders such as aluminum powder, copper powder.

Of the organic pigments, mention may be made of carbon black, D & C type pigments, and lacquers based on cochineal carmine, barium, strontium, calcium, aluminum.

Mention may also be made of effect pigments such as particles comprising a natural or synthetic organic or inorganic substrate, for example glass, acrylic resins, polyester, polyurethane, polyethylene terephthalate, ceramics, aluminas and optionally coated with metallic substances such as aluminum, gold, copper, bronze,

or with metal oxides such as titanium dioxide, iron oxide, chromium oxide, inorganic or organic pigments and mixtures thereof.

The pearlescent pigments may be chosen from white pearlescent pigments such as mica coated with titanium, or bismuth oxychloride, colored pearlescent pigments such as titanium mica coated with iron oxides, titanium mica coated with iron blue and chromium oxide in particular, titanium mica coated with an organic pigments of the aforementioned type and pearlescent pigments based on bismuth oxychloride.

Pigments with goniochromatic properties may be used, particularly liquid crystal or multilayer pigments.

Optical brighteners or fibers optionally coated with optical brighteners may also be used.

The compositions C1 and C2 may further comprise one or a plurality of fillers, particularly at a content ranging from 0.01% to 50% by weight, in relation to the total weight of the composition, preferably ranging from 0.01% to 30% by weight.

The term "fillers" should be understood to refer to inorganic or synthetic colorless or white particles of any shape, insoluble in the medium of the composition regardless of the temperature at which the composition is manufactured. These fillers may particularly be used to modify the rheology or texture of the composition.

The fillers may be mineral or organic particles of any shape, in sheet, spherical or oblong form, regardless of the crystallographic shape (for example sheet, cubic, hexagonal, orthorhombic, etc). Mention may be made of talc, mica, silica, kaolin, polyamide (Nylon®) (Orgasol® from Atochem), poly- β -alanine and polyethylene powders, tetrafluoroethylene polymer powders (Teflon®), lauroyl-lysine, starch, boron nitride, polymeric hollow microspheres such as those of polyvinylidene chloride/acrylonitrile like Expancel® (Nobel Industrie), acrylic acid copolymers (Polytrap® from Dow Corning) and silicone resin microbeads (Tospearls® from Toshiba, for example), elastomer polyorganosiloxane particles, precipitated calcium carbonate, magnesium carbonate and hydro-carbonate, hydroxyapatite, hollow silica microspheres (Silica Beads® from Maprecos), glass or ceramic microcapsules, metallic soaps derived from carboxylic organic acids having 8 to 22 carbon atoms, preferably from 12 to 18 carbon atoms, for example zinc, magnesium or lithium stearate, zinc laurate, magnesium myristate.

As specified above, the compositions C1 and C2 are intended to be applied onto nails and/or false nails.

In particularly, they are intended to be used as photocrosslinkable nail varnish.

Preferably, the composition C1 is intended to be applied onto nails as a base coat and the composition C2 is preferably intended to be applied onto nails coated with the base coat, as a colored layer.

The radiation suitable for the crosslinking of the compositions C1 and C2 (steps b) and d) of the method according to the invention) have a wavelength between 210 nm and 600 nm, preferably between 250 nm and 420 nm, preferably between 350 nm and 410 nm. The use of lasers may also be envisaged.

In one preferred embodiment of the invention, a LED lamp or an UV lamp and particularly a mercury vapor lamp, optionally doped with further elements, such as gallium, suitable for modifying the emission spectrum of the light source, is used.

The exposure time of the deposited coat to radiation is dependent on various factors such as the chemical nature and content of the reactive compounds or the crosslinking density sought.

For nail varnishes, it would generally be sought to obtain satisfactory results for an exposure time between 10 seconds and 10 minutes, preferably between 30 seconds and 5 minutes.

Such a method may use a UV lamp having a power of approximately 36 W.

Preferably, the thickness after drying the coat of photocrosslinkable composition deposited in step a) is less than or equal to 100 μm , preferably less than or equal to 50 μm .

Preferably, the thickness of the coat of photocrosslinkable composition deposited in step c) ranges from 50 μm to 500 μm .

Following the final crosslinking step, the coat deposited on the nail or false nail may have a tacky layer on the surface thereof requiring cleaning of the crosslinked coat using for example a solvent such as isopropanol.

According to one embodiment, the method according to the invention further comprises, before steps b) and d), a period for drying the coat deposited following the respective steps a) and c), the duration whereof may vary from 10 seconds to 10 minutes, typically from 30 seconds to 5 minutes. Said drying is generally performed in air and at ambient temperature.

A particular method according to the invention solely consists of steps a), b), c) and d) as defined above, optionally at an interval of a drying period as defined above.

The crosslinked coats obtained from the crosslinking in steps b) and d) exhibit a significant stability over time, in terms of chipping resistance and gloss, particularly

over the course of at least one week. They thus prove to be resistant to water, friction and shocks, and do not exhibit significant wear or chipping in this interval.

These coats are also capable of being solubilized or increasing in volume and thus weight when placed in contact with a standard makeup removal solvent. This ability to be solubilized or swell, displayed by the crosslinked coat, is specifically advantageous for the removal thereof when applied onto the surface of a nail or false nail. Indeed, the coat may be removed readily merely by means of makeup removal using a conventional solvent.

In this way, the compositions C1 and C2 are advantageously suitable for being removed using standard solvents used in the field of nail varnish, and particularly using acetone and ethyl acetate, and mixtures thereof.

According to one embodiment, the method according to the invention may comprise intermediate steps between step b) and c). Step b) may be followed by a step for applying an optionally photocrosslinkable varnish composition, particularly a colored composition, onto the coated nail obtained following step b), followed if applicable by a step for exposing the nail obtained to UV or visible light radiation.

Similarly, according to one embodiment, after the crosslinking step d), the coat deposited on the nail is coated with at least one colored composition and/or a finishing composition, also known as a "*top-coat*", these compositions being optionally photocrosslinkable.

In this way, step d) of the method according to the invention may be followed by application and UV or visible light radiation exposure steps. According to this embodiment, step d) may be followed by a step (or a plurality of steps) for applying an optionally photocrosslinkable composition, particularly a colored composition and/or a finishing composition, onto the coated nail obtained following step d), followed if applicable by a step for exposing the nail obtained to UV or visible light radiation.

Step d) may thus be followed by application / exposure cycles.

Similarly, such cycles may take place between steps b) and c).

The present invention also relates to a kit comprising:

- a photocrosslinkable cosmetic composition C1 according to the invention,
- a photocrosslinkable cosmetic composition C2 according to the invention,
- an abrasive material having a granulometry greater than or equal to 200 μm , preferably less than 300 μm , advantageously comprised from 220 μm to 280 μm , and

- a LED lamp or an UV lamp.

The present invention also relates to a makeup and/or care method of a nail and/or false nail, comprising the following steps:

- 5 i) rubbing the surface of a nail or false nail with an abrasive material having a granulometry greater than or equal to 200 μm , preferably less than 300 μm , advantageously comprised from 220 μm to 280 μm ,
- 10 ii) applying a photocrosslinkable composition C1 according to the invention onto the surface of the nail or false nail which has been rubbed following step i), whereby a coat consisting of at least one layer of said photocrosslinkable composition C1 is deposited,
- 15 iii) exposing the coated nail or false nail obtained following step ii) to a LED lamp or an UV lamp, whereby photocrosslinking is carried out to obtain a crosslinked layer C'1,
- 20 iv) applying onto the nail or false nail coated with the crosslinked layer C'1, obtained following step iii), a photocrosslinkable composition C2 according to the invention, whereby a coat consisting of at least one layer of said photocrosslinkable composition C2 is deposited, and
- v) exposing the coated nail or false nail obtained following step iv) to a LED lamp or an UV lamp, whereby photocrosslinking is carried out to obtain a crosslinked layer C'2.

Usually, the rubbing step is performed for less than 10 seconds, preferably less than 5 seconds, for example for approximately 3 seconds.

Throughout the application, the term "comprising a" or "including a" means "comprising at least one" or "including at least one", unless otherwise specified.

The weight percentages given in this application can be considered equivalent to the dry weight percentage of the compounds used.

The invention will be understood more clearly on reading the following description, given merely as an example.

EXAMPLES**Example 1**

5

A layer of the base coat composition described below was applied onto nails.

After applying this layer, the film was crosslinked for 30 seconds under an "OPI GelColor" LED lamp from OPI.

10

Base coat composition

Pyromellitic dianhydride glycerol dimethacrylate (PMGDM) (X-830-0100 – ESSTECH, Inc.)	5%
Urethane dimethacrylate (EXOTHANE 32 – ESSTECH, Inc.)	5%
Nitrocellulose with 30% isopropyl alcohol (viscosity: E22 – 1/2s)	12.244%
50% acrylic copolymer in butyl acetate (PECOREZ AC 50 – PHOENIX CHEMICAL)	22.86%
Acetone	10%
Ethyl acetate	26.526%
Butyl acetate	15.3696%
Hydroxy Cyclohexylphenyl ketone photoinitiator (Irgacure 184 – BASF)	2%
Ethyl-2,4,6-trimethylbenzoylphenylphosphinate photoinitiator (Lucirin TPO-L – BASF)	1%
Alizuroil purple SS (CI: 60725) (D&C VIOLET 2 – SENSIENT)	0.0004%

A layer of the colored composition as described hereinafter was then applied.

After applying this layer, the film was crosslinked for 30 seconds under an "OPI GelColor" LED lamp from OPI.

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Colored composition

Urethane dimethacrylate (EXOTHANE 10 - ESSTECH, Inc.)	58.79%
Urethane dimethacrylate (EXOTHANE 32 - ESSTECH, Inc.)	14.69%
50% acrylic copolymer in butyl acetate (PECOREZ AC 50 - PHOENIX CHEMICAL)	2%
Butyl acetate	20%
Titanium oxide (PI-TAO-77891 - MIYOSHI KASEI)	0,24%
Red 7 lacquer (Sunchroma D&C red 7 - Sun)	0.7%
Red 6 lacquer (Sunchroma D&C red 6 - Sun)	0.58%
Hydroxy Cyclohexylphenyl ketone photoinitiator (Irgacure 184 - BASF)	2%
Ethyl-2,4,6-trimethylbenzoylphenylphosphinate photoinitiator (Lucirin TPO-L - BASF)	1%

5 After crosslinking the final layer, the surface is cleaned with cotton wool soaked in isopropanol.

A varnish exhibiting satisfactory stability on the nail was thus obtained.

10 The varnish can be removed after placing in contact with acetone for 10 minutes.

Example 2

15 After applying the intermediate layer according to example 1 and crosslinking same, a second layer of the colored composition according to example 1 was applied. The film was then crosslinked for 30 seconds under a "OPI GelColor" LED lamp from OPI.

20 One layer of the finishing composition as described hereinafter was then applied, and the film was crosslinked for 30 seconds under an "OPI GelColor" LED lamp from OPI.

After crosslinking the final layer, the surface is cleaned with cotton wool soaked in isopropanol.

Finishing composition

5

Urethane dimethacrylate (EXOTHANE 10 – ESSTECH, Inc.)	58.4%
Urethane dimethacrylate (EXOTHANE 32 – ESSTECH, Inc.)	14.6%
50% acrylic copolymer in butyl acetate (PECOREZ AC 50 – PHOENIX CHEMICAL)	2%
Butyl acetate	19.9996%
Hydroxy Cyclohexylphenyl ketone photoinitiator (Irgacure 184 - BASF)	2%
Ethyl-2,4,6-trimethylbenzoylphenylphosphinate photoinitiator (Lucirin TPO-L – BASF)	3%
AlizuroI purple SS (CI: 60725) (D&C VIOLET 2 - SENSIENT)	0.0004%

A varnish exhibiting satisfactory stability on the nail was thus obtained.

The varnish can be removed after placing in contact with acetone for 10 minutes.

10

Example 3

Study of the stability and gloss of the compositions according to example 2 compared to "CND Shellac" brand reference formulae

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1. Application protocol:

Nail preparation

10

Before applying the compositions according to the invention or the reference compositions, the cuticles were pushed back using a boxwood stick or a metal cuticle pusher.

The nail was then shaped by filing and trimming, and buffed slightly (to remove any gloss) with a 180 or 220 file / buffer.

Finally, the nail was degreased with a Nail Prep solution (solvent mixture).

15

Formula application

The compositions according to the invention or reference compositions were applied to the nails according to the following protocol:

20

- applying a thin base coat, carefully keeping to the edge of the nail and then exposing to a UV/LED lamp;

- applying a first colored layer, carefully keeping to the edge of the nail and then exposing to a UV/LED lamp;

- applying a second colored layer, carefully keeping to the edge of the nail and then exposing to a UV/LED lamp;

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- applying a finishing layer, carefully keeping to the edge of the nail and then exposing to a UV/LED lamp; and

- applying the Nail Cleanser product (from CND) or isopropanol to remove the tacky layer.

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The LED lamp exposure for the compositions according to example 2 is carried out under an LED lamp: 30 seconds per layer exposed to the UV/LED layer, all 5 fingers at the same time.

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The UV lamp exposure for the "CND Shellac" brand compositions is carried out under a UV lamp: 10 seconds for the base coat composition, all 5 fingers at the same time and 2 minutes for the layer of colored composition and the finishing composition, all 5 fingers at the same time.

Product removal

5 The removal protocol consists of removing the gloss from the finishing composition with a 180 file, soaking pieces of cotton wool in acetone and applying them to the nail coated with aluminum foil and leaving in place for ten minutes. The aluminum wrappers are then removed with a rotating movement while applying pressure on the nail.

2. Conclusion:

10 The film according to example 2 has a satisfactory stability after 7 days similar to the CND Shellac reference film. The added bonus thereof in terms of stability is the quality and gloss of the film; indeed, the film is smoother and exhibits less rough and matt areas and/or scratching.

15 The removal procedure in example 2 is simple and effective, merely leaving acetone compresses around each nail for ten minutes. Practically no color remains on the nail when the compress is removed, without having to scrape using a tool.

20 In comparison, in order to remove the CND Shellac product, it is necessary to apply acetone compresses for 10 minutes and scrape off the material. It is a markedly longer process than that in example 2. Indeed, after soaking in acetone, the nails are coated with dissolved varnish particles which need to be scraped off.

CLAIMS

1. Makeup and/or care method of a nail and/or false nail, comprising the following steps:

a) applying, onto a nail or false nail, a photocrosslinkable cosmetic composition C1, whereby a coat consisting of at least one layer of said composition C1 is deposited;

the composition C1 comprising in a physiologically acceptable medium:

- at least one photocrosslinkable compound comprising at least two (meth)acrylate functions and at least one carboxylic acid function,
- at least one volatile solvent S in a proportion greater than or equal to 30% in relation to the total weight of the composition C1, and
- at least one photoinitiator,

b) exposing the coated nail or false nail obtained following step a) to UV or visible light radiation, whereby photocrosslinking is carried out to obtain a crosslinked layer C'1;

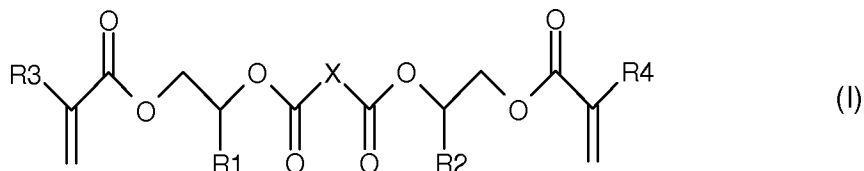
c) applying, onto the nail or false nail coated with the crosslinked layer C'1, obtained following step b), a photocrosslinkable cosmetic composition C2, whereby a coat consisting of at least one layer of said composition C2 is deposited;

the composition C2 comprising in a physiologically acceptable medium:

- at least one photocrosslinkable urethane di(meth)acrylate compound at a content by weight greater than or equal to 65% in relation to the total dry extract weight of C2, and
- at least one volatile solvent S';

d) exposing the coated nail or false nail obtained following step c) to UV or visible light radiation, whereby photocrosslinking is carried out to obtain a crosslinked layer C'2.

2. Method according to claim 1, wherein the photocrosslinkable compound of C1 is of formula (I):



wherein:

- R1 and R2, identical or different, represent a hydrogen atom, or a methyl group, or a group of formula (II):

5

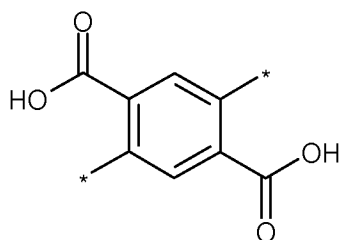


where R5 represents a hydrogen atom or a methyl group;

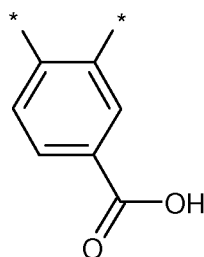
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- R3 and R4, identical or different, represent a hydrogen atom or a methyl group;
- X represents a radical of any of the following formulae (III), (IV), (V), (VI), (VII), (VIII), (IX), or (X):

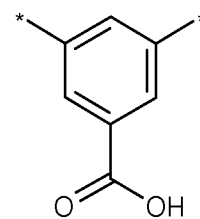
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(III)

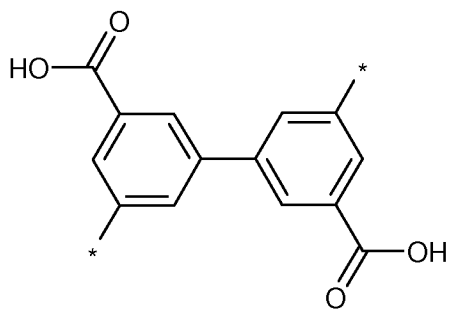


(IV)

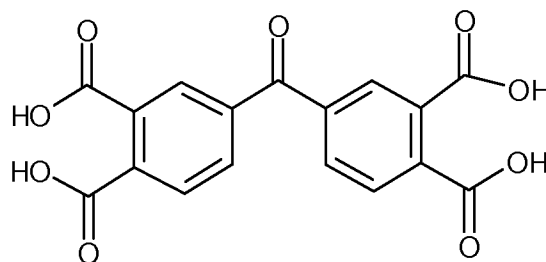


(V)

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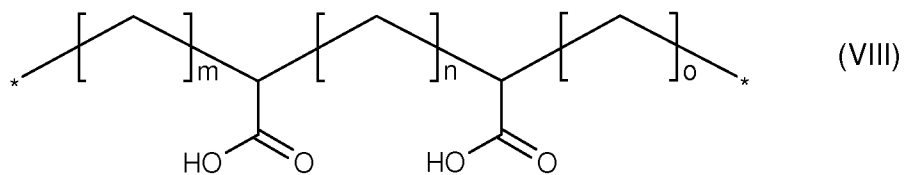


(VI)



(VII)

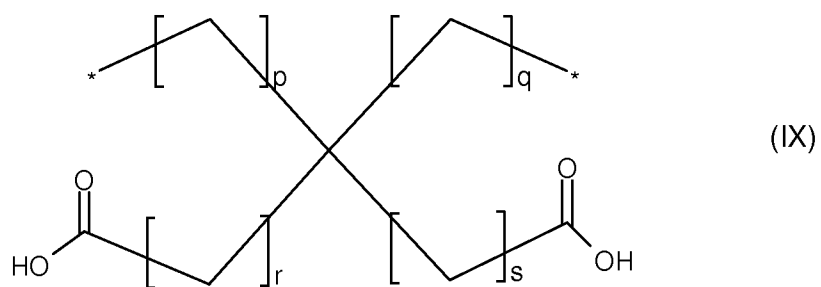
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where m, n, and o, identical or different, represent an integer between 0 and 10;

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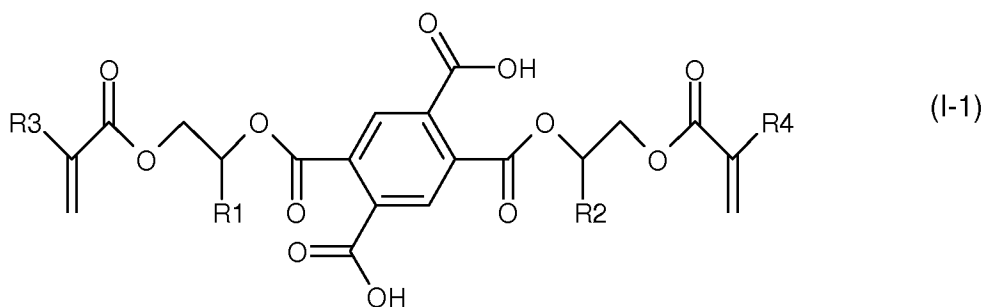


where p, q, r and s, identical or different, represent an integer between 0 and 10;



where R6, R7 and R8, identical or different, represent a hydrogen atom or a hydroxyl group.

3. Method according to claim 1 or 2, wherein the photocrosslinkable compound of C1 is of formula (I-1):



where R1, R2, R3 and R4 are as defined in claim 2;

4. Method according to claim 3, wherein R3 and R4 are methyl groups.

5. Method according to claim 3 or 4, wherein R1 and R2, identical or different, represent a group of formula (II-1):



6. Method according to any of claims 1 to 5, wherein the solvent S is a polar volatile solvent chosen from the group consisting of C3-C6 esters and ketones and mixtures thereof.

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7. Method according to any of claims 1 to 6, wherein the solvent S is present in a content by weight ranging from 40% to 80% in relation to the total weight of the composition C1.

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8. Method according to any of claims 1 to 7, wherein the photoinitiator is chosen from the group consisting of α -hydroxyketones, α -aminoketones, aromatic ketones preferably associated with a hydrogen donor compound, aromatic α -diketones, and acylphosphine oxides, and mixtures thereof.

15

9. Method according to any of claims 1 to 8, wherein the composition C2 comprises two photocrosslinkable urethane di(meth)acrylate compounds.

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10. Method according to any of claims 1 to 9, wherein the composition C2 comprises at least 70%, preferably at least 75%, and preferentially at least 80%, by weight of photocrosslinkable urethane di(meth)acrylate compounds in relation to the total dry extract weight of C2.

25

11. Method according to any of claims 1 to 10, wherein the composition C2 further comprises at least one film-forming polymer.

12. Method according to claim 11, wherein the film-forming polymer is chosen from the group consisting of nitrocellulose, cellulose acetopropionate, cellulose acetobutyrate, and (meth)acrylate homopolymers and copolymers, and mixtures thereof.

30

13. Method according to any of claims 1 to 12, wherein the solvent S' is a polar volatile solvent chosen from the group consisting of C3-C6 esters and ketones and mixtures thereof.

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14. Method according to any of claims 1 to 13, wherein the composition C2 further comprises at least one coloring agent.

15. Method according to any of claims 1 to 14, wherein the compositions C1 and C2 comprise less than 10% by weight of (meth)acrylate monomer.

5 16. Method according to any of claims 1 to 15, wherein the compositions C1 and C2 comprise less than 5% by weight of (meth)acrylate monomer.

17. Kit comprising:

- 10 - a photocrosslinkable cosmetic composition C1 as defined in any one of claims 1 to 16,
- a photocrosslinkable cosmetic composition C2 as defined in any one of claims 1 to 16,
- an abrasive material having a granulometry greater than or equal to 200 μm , preferably less than 300 μm , advantageously comprised from 220 μm to 280 μm , and
- 15 - a LED lamp or an UV lamp.

18. Makeup and/or care method of a nail and/or false nail, comprising the following steps:

- 20 i) rubbing the surface of a nail or false nail with an abrasive material having a granulometry greater than or equal to 200 μm , preferably less than 300 μm , advantageously comprised from 220 μm to 280 μm ,
- ii) applying a photocrosslinkable composition C1 as defined in any one of claims 1 to 16 onto the surface of the nail or false nail which has been rubbed following step i),
- 25 whereby a coat consisting of at least one layer of said photocrosslinkable composition C1 is deposited,
- iii) exposing the coated nail or false nail obtained following step ii) to a LED lamp or an UV lamp, whereby photocrosslinking is carried out to obtain a crosslinked layer C'1,
- 30 iv) applying onto the nail or false nail coated with the crosslinked layer C'1, obtained following step iii), a photocrosslinkable composition C2 as defined in any one of claims 1 to 16, whereby a coat consisting of at least one layer of said photocrosslinkable composition C2 is deposited, and
- v) exposing the coated nail or false nail obtained following step iv) to a LED lamp or
- 35 an UV lamp, whereby photocrosslinking is carried out to obtain a crosslinked layer C'2.