

MICROCAPSULES FROM POLYLACTONE BASED PREPOLYMER

5 Field of the Invention

The present invention relates to a process of preparing a core-shell microcapsule and a core-shell microcapsule slurry comprising a polylactone-based polyisocyanate prepolymer obtained by reacting a polylactone polyol and a polyisocyanate, the core-shell microcapsule and core-shell microcapsule slurry as well as perfuming compositions and consumer products comprising the same.

Background of the Invention

15 One of the problems faced by the perfumery industry lies in the relatively rapid loss of olfactive benefit provided by odoriferous compounds due to their volatility, particularly that of "top-notes". In order to tailor the release rates of volatiles, delivery systems such as microcapsules containing a perfume are needed to protect and later release the core payload when triggered. A key requirement from the industry regarding these systems is to survive
20 suspension in challenging bases without physically dissociating or degrading. This is referred to as storage *stability* for the delivery system. For instance, fragranced personal and household cleansers containing high levels of aggressive surfactant detergents are very challenging for the stability of microcapsules.

Polyurea and polyurethane-based microcapsule slurries are widely used for example
25 in perfumery industry as they provide a long lasting pleasant olfactory effect after their applications on different substrates. Those microcapsules have been widely disclosed in the prior art (see for example WO2007/004166 or EP 2300146 from the Applicant). The main disadvantage of polyurea and polyurethane-based microcapsule is their weak or non-existing biodegradability.

30 There is still a need to provide new microcapsules, while not compromising on their performance in particular in terms of stability in a challenging medium such as a consumer product base, as well as in delivering a good performance in terms of active ingredient delivery, e.g. olfactive performance in the case of perfuming ingredients and which provide satisfying or good biodegradability.

35 The present invention is proposing a solution to the above-mentioned problem by providing new microcapsules and a process for preparing said microcapsules.

Detailed Description of the Invention

Unless stated otherwise, percentages (%) are meant to designate percent by weight
5 of a composition.

By “**active ingredient**”, it is meant a single compound or a combination of ingredients.

By “**perfume or flavor oil**”, it is meant a single perfuming or flavoring compound or a mixture of several perfuming or flavoring compounds.

10 By “**consumer product**” or “**end-product**” it is meant a manufactured product ready to be distributed, sold and used by a consumer.

A “**microcapsule**”, or the similar, in the present invention has a morphology that can vary from a core-shell to a matrix type. According to one embodiment, it is of the core-shell type. In this case, the microcapsules comprise a core based on a hydrophobic material,
15 typically a perfume, and a shell surrounding the core.

Microcapsules have a particle size distribution in the micron range (e.g. a mean diameter) comprised between about 1 and 3000 microns, preferably comprised between 1 and 1000 microns, more preferably between 1 and 500 microns, and even more preferably between 5 and 50 microns. The polymeric shell of the microcapsule according to the present
20 invention is formed by interfacial polymerization and/or interfacial reaction.

By “**particle size**” it is meant an average diameter of particles based on size distribution measured by dynamic light scattering (DLS) using Zetasizer Nano ZS equipment from Malvern Instruments Ltd., UK when particles are dispersed into a water phase.

By “**microcapsules size**” it is meant the volume mean diameter ($D[4,3]$) of the
25 relevant capsules, capsules suspension as obtained by laser light scattering of a diluted sample in a Malvern Mastersizer 3000.

PROCESS FOR PREPARING A CORE-SHELL MICROCAPSULE

30 The present invention relates to a process for preparing a core-shell microcapsule or core-shell microcapsule slurry, wherein the process comprises the steps of:

- a. Admixing a hydrophobic material, preferably a perfume oil, and a polylactone-based polyisocyanate prepolymer, obtained by reacting a polylactone polyol and a polyisocyanate, to form an oil phase;
- 35 b. Dispersing the oil phase in a dispersing phase comprising an emulsifier or a stabilizer and, optionally, a cross-linker to form an emulsion;

- c. Optionally, adding into the emulsion a cross-linker;
- d. Applying conditions sufficient to induce cross-linking of the polylactone-based polyisocyanate prepolymer to form the core-shell microcapsule or core-shell microcapsule slurry.

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In a step of the process, a hydrophobic material and a polylactone-based polyisocyanate prepolymer, obtained by reacting a polylactone polyol and polyisocyanate, are admixed to form an oil phase.

10 In a step of the process, a polylactone-based polyisocyanate prepolymer is optionally dissolved in a solvent (e.g., ethyl acetate) before admixing with a hydrophobic material to form an oil phase. In a particular embodiment, the solvent may be chloroform, dichloromethane, carbon tetrachloride, benzene, toluene, xylene, cyclohexanone and 2-nitropropane, acetone, 2-butanone, ethyl acetate, butyl acetate, such as n-butyl acetate,
15 dimethylformamide and/or acetonitrile.

Hydrophobic material

The hydrophobic material is preferably an oil.

The hydrophobic material according to the invention can be "inert" material like solvents or
20 active ingredients.

By "hydrophobic material", it is meant any hydrophobic material which forms a two-phase dispersion when mixed with water. The hydrophobic material is typically liquid at about 20°C.

According to an embodiment, the hydrophobic material is a hydrophobic active ingredient.

25 When the hydrophobic materials is an active ingredient, it is preferably chosen from the group consisting of flavors, flavor ingredients, perfumes, perfume ingredients, nutraceuticals, cosmetics, pest control agents, biocide actives and mixtures thereof.

According to a particular embodiment, the hydrophobic material comprises a phase change material (PCM).

30 According to a particular embodiment, the hydrophobic material comprises a mixture of a perfume with another ingredient selected from the group consisting of nutraceuticals, cosmetics, pest control agents and biocide actives.

According to a particular embodiment, the hydrophobic material comprises a mixture of biocide actives with another ingredient selected from the group consisting of perfumes,
35 nutraceuticals, cosmetics, pest control agents.

According to a particular embodiment, the hydrophobic material comprises a mixture of pest control agents with another ingredient selected from the group consisting of perfumes, nutraceuticals, cosmetics, biocide actives.

According to a particular embodiment, the hydrophobic material comprises a perfume.

5 According to a particular embodiment, the hydrophobic material consists of a perfume.

According to a particular embodiment, the hydrophobic material consists of biocide actives.

10 According to a particular embodiment, the hydrophobic material consists of pest control agents.

By "perfume" (or also "perfume oil") what is meant here is an ingredient or a composition that is a liquid at about 20°C. According to any one of the above embodiments said perfume oil can be a perfuming ingredient alone or a mixture of ingredients in the form of a perfuming composition. As a "perfuming ingredient" it is meant here a compound, which
15 is used for the primary purpose of conferring or modulating an odor. In other words such an ingredient, to be considered as being a perfuming one, must be recognized by a person skilled in the art as being able to at least impart or modify in a positive or pleasant way the odor of a composition, and not just as having an odor. For the purpose of the present invention, perfume oil also includes a combination of perfuming ingredients with substances
20 which together improve, enhance or modify the delivery of the perfuming ingredients, such as perfume precursors, modulators, emulsions or dispersions, as well as combinations which impart an additional benefit beyond that of modifying or imparting an odor, such as long-lastingness, blooming, malodor counteraction, antimicrobial effect, microbial stability, pest control.

25 The nature and type of the perfuming ingredients present in the oil phase do not warrant a more detailed description here, which in any case would not be exhaustive, the skilled person being able to select them on the basis of its general knowledge and according to intended use or application and the desired organoleptic effect. In general terms, these perfuming ingredients belong to chemical classes as varied as alcohols, aldehydes, ketones,
30 esters, ethers, acetates, nitriles, terpenoids, nitrogenous or sulfurous heterocyclic compounds and essential oils (for example Thyme oil), and said perfuming co-ingredients can be of natural or synthetic origin. Many of these co-ingredients are in any case listed in reference texts such as the book by S. Arctander, Perfume and Flavor Chemicals, 1969, Montclair, New Jersey, USA, or its more recent versions, or in other works of a similar
35 nature, as well as in the abundant patent literature in the field of perfumery.

In particular one may cite perfuming ingredients which are commonly used in perfume formulations, such as:

- Aldehydic ingredients: decanal, dodecanal, 2-methyl-undecanal, 10-undecenal, octanal, nonanal and/or nonenal;
- 5 - Aromatic-herbal ingredients: eucalyptus oil, camphor, eucalyptol, 5-methyltricyclo[6.2.1.0^{2,7}]undecan-4-one, 1-methoxy-3-hexanethiol, 2-ethyl-4,4-dimethyl-1,3-oxathiane, 2,2,7/8,9/10-tetramethylspiro[5.5]undec-8-en-1-one, menthol and/or alpha-pinene;
- Balsamic ingredients: coumarin, ethylvanillin and/or vanillin;
- 10 - Citrus ingredients: dihydromyrcenol, citral, orange oil, linalyl acetate, citronellyl nitrile, orange terpenes, limonene, 1-p-menthen-8-yl acetate and/or 1,4(8)-p-menthadiene;
- Floral ingredients: methyl dihydrojasmonate, linalool, citronellol, phenylethanol, 3-(4-tert-butylphenyl)-2-methylpropanal, hexylcinnamic aldehyde, benzyl acetate, benzyl salicylate, tetrahydro-2-isobutyl-4-methyl-4(2H)-pyranol, beta ionone, methyl 2-
- 15 (methylamino)benzoate, (E)-3-methyl-4-(2,6,6-trimethyl-2-cyclohexen-1-yl)-3-buten-2-one, (1E)-1-(2,6,6-trimethyl-2-cyclohexen-1-yl)-1-penten-3-one, 1-(2,6,6-trimethyl-1,3-cyclohexadien-1-yl)-2-buten-1-one, (2E)-1-(2,6,6-trimethyl-2-cyclohexen-1-yl)-2-buten-1-one, (2E)-1-[2,6,6-trimethyl-3-cyclohexen-1-yl]-2-buten-1-one, (2E)-1-(2,6,6-trimethyl-1-cyclohexen-1-yl)-2-buten-1-one, 3-(3,3/1,1-dimethyl-5-indanyl)propanal,
- 20 2,5-dimethyl-2-indanmethanol, 2,6,6-trimethyl-3-cyclohexene-1-carboxylate, 3-(4,4-dimethyl-1-cyclohexen-1-yl)propanal, hexyl salicylate, 3,7-dimethyl-1,6-nonadien-3-ol, 3-(4-isopropylphenyl)-2-methylpropanal, verdyl acetate, geraniol, p-menth-1-en-8-ol, 4-(1,1-dimethylethyl)-1-cyclohexyle acetate, 1,1-dimethyl-2-phenylethyl acetate, 4-cyclohexyl-2-methyl-2-butanol, amyl salicylate, high cis methyl dihydrojasmonate, 3-
- 25 methyl-5-phenyl-1-pentanol, verdyl propionate, geranyl acetate, tetrahydro linalool, cis-7-p-menthanol, propyl (S)-2-(1,1-dimethylpropoxy)propanoate, 2-methoxynaphthalene, 2,2,2-trichloro-1-phenylethyl acetate, 4/3-(4-hydroxy-4-methylpentyl)-3-cyclohexene-1-carbaldehyde, amylcinnamic aldehyde, 8-decen-5-olide, 4-phenyl-2-butanone, isononyl acetate, 4-(1,1-dimethylethyl)-1-cyclohexyl
- 30 acetate, verdyl isobutyrate and/or mixture of methylionones isomers;
- Fruity ingredients: gamma-undecalactone, 2,2,5-trimethyl-5-pentylcyclopentanone, 2-methyl-4-propyl-1,3-oxathiane, 4-decanolide, ethyl 2-methyl-pentanoate, hexyl acetate, ethyl 2-methylbutanoate, gamma-nonolactone, allyl heptanoate, 2-phenoxyethyl isobutyrate, ethyl 2-methyl-1,3-dioxolane-2-acetate, diethyl 1,4-
- 35 cyclohexanedicarboxylate, 3-methyl-2-hexen-1-yl acetate, 1-[3,3-

dimethylcyclohexyl]ethyl [3-ethyl-2-oxiranyl]acetate and/or diethyl 1,4-cyclohexane dicarboxylate;

- Green ingredients: 2-methyl-3-hexanone (E)-oxime, 2,4-dimethyl-3-cyclohexene-1-carbaldehyde, 2-tert-butyl-1-cyclohexyl acetate, styrallyl acetate, allyl (2-methylbutoxy)acetate, 4-methyl-3-decen-5-ol, diphenyl ether, (Z)-3-hexen-1-ol and/or 1-(5,5-dimethyl-1-cyclohexen-1-yl)-4-penten-1-one;
- Musk ingredients: 1,4-dioxo-5,17-cycloheptadecanedione, (Z)-4-cyclopentadecen-1-one, 3-methylcyclopentadecanone, 1-oxa-12-cyclohexadecen-2-one, 1-oxa-13-cyclohexadecen-2-one, (9Z)-9-cycloheptadecen-1-one, 2-[(1S)-1-[(1R)-3,3-dimethylcyclohexyl]ethoxy]-2-oxoethyl propionate, 3-methyl-5-cyclopentadecen-1-one, 4,6,6,7,8,8-hexamethyl-1,3,4,6,7,8-hexahydrocyclopenta[g]isochromene, (1S,1'R)-2-[1-(3',3'-dimethyl-1'-cyclohexyl)ethoxy]-2-methylpropyl propanoate, oxacyclohexadecan-2-one and/or (1S,1'R)-[1-(3',3'-dimethyl-1'-cyclohexyl)ethoxycarbonyl]methyl propanoate;
- Woody ingredients: 1-[(1RS,6SR)-2,2,6-trimethylcyclohexyl]-3-hexanol, 3,3-dimethyl-5-[(1R)-2,2,3-trimethyl-3-cyclopenten-1-yl]-4-penten-2-ol, 3,4'-dimethylspiro[oxirane-2,9'-tricyclo[6.2.1.0^{2,7}]undec[4]ene, (1-ethoxyethoxy)cyclododecane, 2,2,9,11-tetramethylspiro[5.5]undec-8-en-1-yl acetate, 1-(octahydro-2,3,8,8-tetramethyl-2-naphthalenyl)-1-ethanone, patchouli oil, terpenes fractions of patchouli oil, Clearwood®, (1'R,E)-2-ethyl-4-(2',2',3'-trimethyl-3'-cyclopenten-1'-yl)-2-buten-1-ol, 2-ethyl-4-(2,2,3-trimethyl-3-cyclopenten-1-yl)-2-buten-1-ol, methyl cedryl ketone, 5-(2,2,3-trimethyl-3-cyclopentenyl)-3-methylpentan-2-ol, 1-(2,3,8,8-tetramethyl-1,2,3,4,6,7,8,8a-octahydronaphthalen-2-yl)ethan-1-one and/or isobornyl acetate;
- Other ingredients (e.g. amber, powdery spicy or watery): dodecahydro-3a,6,6,9a-tetramethyl-naphtho[2,1-b]furan and any of its stereoisomers, heliotropin, anisic aldehyde, eugenol, cinnamic aldehyde, clove oil, 3-(1,3-benzodioxol-5-yl)-2-methylpropanal, 7-methyl-2H-1,5-benzodioxepin-3(4H)-one, 2,5,5-trimethyl-1,2,3,4,4a,5,6,7-octahydro-2-naphthalenol, 1-phenylvinyl acetate, 6-methyl-7-oxa-1-thia-4-azaspiro[4.4]nonane and/or 3-(3-isopropyl-1-phenyl)butanal.

It is also understood that said ingredients may also be compounds known to release in a controlled manner various types of perfuming compounds also known as properfume or profragrance. Non-limiting examples of suitable properfumes may include 4-(dodecylthio)-4-(2,6,6-trimethyl-2-cyclohexen-1-yl)-2-butanone, 4-(dodecylthio)-4-(2,6,6-trimethyl-1-cyclohexen-1-yl)-2-butanone, 3-(dodecylthio)-1-(2,6,6-trimethyl-3-cyclohexen-1-yl)-1-butanone, 2-(dodecylthio)octan-4-one, 2-phenylethyl oxo(phenyl)acetate, 3,7-dimethylocta-2,6-dien-1-yl oxo(phenyl)acetate, (Z)-hex-3-en-1-yl oxo(phenyl)acetate, 3,7-dimethyl-2,6-

octadien-1-yl hexadecanoate, bis(3,7-dimethylocta-2,6-dien-1-yl) succinate, (2-((2-methylundec-1-en-1-yl)oxy)ethyl)benzene, 1-methoxy-4-(3-methyl-4-phenethoxybut-3-en-1-yl)benzene, (3-methyl-4-phenethoxybut-3-en-1-yl)benzene, 1-(((Z)-hex-3-en-1-yl)oxy)-2-methylundec-1-ene, (2-((2-methylundec-1-en-1-yl)oxy)ethoxy)benzene, 2-methyl-1-(octan-3-yloxy)undec-1-ene, 1-methoxy-4-(1-phenethoxyprop-1-en-2-yl)benzene, 1-methyl-4-(1-phenethoxyprop-1-en-2-yl)benzene, 2-(1-phenethoxyprop-1-en-2-yl)naphthalene, (2-phenethoxyvinyl)benzene, 2-(1-((3,7-dimethyloct-6-en-1-yl)oxy)prop-1-en-2-yl)naphthalene, (2-((2-pentylcyclopentylidene)methoxy)ethyl)benzene, 4-allyl-2-methoxy-1-((2-methoxy-2-phenylvinyl)oxy)benzene, (2-((2-heptylcyclopentylidene)methoxy)ethyl)benzene, 1-isopropyl-4-methyl-2-((2-pentylcyclopentylidene)methoxy)benzene, 2-methoxy-1-((2-pentylcyclopentylidene)methoxy)-4-propylbenzene, 3-methoxy-4-((2-methoxy-2-phenylvinyl)oxy)benzaldehyde, 4-((2-(hexyloxy)-2-phenylvinyl)oxy)-3-methoxybenzaldehyde or a mixture thereof.

The perfuming ingredients may be dissolved in a solvent of current use in the perfume industry. The solvent is preferably not an alcohol. Examples of such solvents are diethyl phthalate, isopropyl myristate, Abalyn® (rosin resins, available from Eastman), benzyl benzoate, ethyl citrate, triethyl citrate, limonene or other terpenes, or isoparaffins. Preferably, the solvent is very hydrophobic and highly sterically hindered, like for example Abalyn® or benzyl benzoate. Preferably the perfume comprises less than 30% of solvent. More preferably the perfume comprises less than 20% and even more preferably less than 10% of solvent, all these percentages being defined by weight relative to the total weight of the perfume. Most preferably, the perfume is essentially free of solvent.

Preferred perfuming ingredients are those having a high steric hindrance and in particular those from one of the following groups:

- Group 1: perfuming ingredients comprising a cyclohexane, cyclohexene, cyclohexanone or cyclohexenone ring substituted with at least one linear or branched C₁ to C₄ alkyl or alkenyl substituent;
- Group 2: perfuming ingredients comprising a cyclopentane, cyclopentene, cyclopentanone or cyclopentenone ring substituted with at least one linear or branched C₄ to C₈ alkyl or alkenyl substituent;
- Group 3: perfuming ingredients comprising a phenyl ring or perfuming ingredients comprising a cyclohexane, cyclohexene, cyclohexanone or cyclohexenone ring substituted with at least one linear or branched C₅ to C₈ alkyl or alkenyl substituent or with at least one phenyl substituent and optionally one or more linear or branched C₁ to C₃ alkyl or alkenyl substituents;

- Group 4: perfuming ingredients comprising at least two fused or linked C₅ and/or C₆ rings;
- Group 5: perfuming ingredients comprising a camphor-like ring structure;
- Group 6: perfuming ingredients comprising at least one C₇ to C₂₀ ring structure;
- 5 - Group 7: perfuming ingredients having a logP value above 3.5 and comprising at least one tert-butyl or at least one trichloromethyl substituent;

Examples of ingredients from each of these groups are:

- Group 1: 2,4-dimethyl-3-cyclohexene-1-carbaldehyde (origin: Firmenich SA, Geneva, Switzerland), isocyclocitral, menthone, isomenthone, methyl 2,2-dimethyl-6-methylene-1-cyclohexanecarboxylate (origin: Firmenich SA, Geneva, Switzerland), nerone, 10 terpeneol, dihydroterpineol, terpenyl acetate, dihydroterpenyl acetate, dipentene, eucalyptol, hexylate, rose oxide, (S)-1,8-p-menthadiene-7-ol (origin: Firmenich SA, Geneva, Switzerland), 1-p-menthene-4-ol, (1RS,3RS,4SR)-3-p-mentanyl acetate, (1R,2S,4R)-4,6,6-trimethyl-bicyclo[3,1,1]heptan-2-ol, tetrahydro-4-methyl-2-phenyl-2H-pyran (origin: Firmenich SA, Geneva, Switzerland), cyclohexyl acetate, cyclanol acetate, 15 1,4-cyclohexane diethyldicarboxylate (origin: Firmenich SA, Geneva, Switzerland), (3RS,3aRS,6SR,7ASR)-perhydro-3,6-dimethyl-benzo[B]furan-2-one (origin: Firmenich SA, Geneva, Switzerland), ((6R)-perhydro-3,6-dimethyl-benzo[B]furan-2-one (origin: Firmenich SA, Geneva, Switzerland), 2,4,6-trimethyl-4-phenyl-1,3-dioxane, 2,4,6-trimethyl-3-cyclohexene-1-carbaldehyde; 20
- Group 2: (E)-3-methyl-5-(2,2,3-trimethyl-3-cyclopenten-1-yl)-4-penten-2-ol (origin: Givaudan SA, Vernier, Switzerland), (1'R,E)-2-ethyl-4-(2',2',3'-trimethyl-3'-cyclopenten-1'-yl)-2-buten-1-ol (origin: Firmenich SA, Geneva, Switzerland), (1'R,E)-3,3-dimethyl-5-(2',2',3'-trimethyl-3'-cyclopenten-1'-yl)-4-penten-2-ol (origin: Firmenich SA, Geneva, Switzerland), 2-heptylcyclopentanone, methyl-cis-3-oxo-2-pentyl-1-cyclopentane acetate (origin: Firmenich SA, Geneva, Switzerland), 2,2,5-trimethyl-5-pentyl-1-cyclopentanone (origin: Firmenich SA, Geneva, Switzerland), 3,3-dimethyl-5-(2,2,3-trimethyl-3-cyclopenten-1-yl)-4-penten-2-ol (origin: Firmenich SA, Geneva, Switzerland), 3-methyl-5-(2,2,3-trimethyl-3-cyclopenten-1-yl)-2-pentanol (origin, Givaudan SA, Vernier, Switzerland); 30
- Group 3: damascones, 1-(5,5-dimethyl-1-cyclohexen-1-yl)-4-penten-1-one (origin: Firmenich SA, Geneva, Switzerland), (1'R)-2-[2-(4'-methyl-3'-cyclohexen-1'-yl)propyl]cyclopentanone, alpha-ionone, beta-ionone, damascenone, mixture of 1-(5,5-dimethyl-1-cyclohexen-1-yl)-4-penten-1-one and 1-(3,3-dimethyl-1-cyclohexen-1-yl)-4-penten-1-one (origin: Firmenich SA, Geneva, Switzerland), 1-(2,6,6-trimethyl-1-cyclohexen-1-yl)-2-buten-1-one (origin: Firmenich SA, Geneva, Switzerland), (1S,1'R)- 35

- [1-(3',3'-Dimethyl-1'-cyclohexyl)ethoxycarbonyl]methyl propanoate (origin: Firmenich SA, Geneva, Switzerland), 2-tert-butyl-1-cyclohexyl acetate (origin: International Flavors and Fragrances, USA), 1-(2,2,3,6-tetramethyl-cyclohexyl)-3-hexanol (origin: Firmenich SA, Geneva, Switzerland), trans-1-(2,2,6-trimethyl-1-cyclohexyl)-3-hexanol (origin: Firmenich SA, Geneva, Switzerland), (E)-3-methyl-4-(2,6,6-trimethyl-2-cyclohexen-1-yl)-3-buten-2-one, terpenyl isobutyrate, 4-(1,1-dimethylethyl)-1-cyclohexyl acetate (origin: Firmenich SA, Geneva, Switzerland), 8-methoxy-1-p-menthene, (1S,1'R)-2-[1-(3',3'-dimethyl-1'-cyclohexyl) ethoxy]-2-methylpropyl propanoate (origin: Firmenich SA, Geneva, Switzerland), para tert-butylcyclohexanone, menthenethiol, 1-methyl-4-(4-methyl-3-pentenyl)-3-cyclohexene-1-carbaldehyde, allyl cyclohexylpropionate, cyclohexyl salicylate, 2-methoxy-4-methylphenyl methyl carbonate, ethyl 2-methoxy-4-methylphenyl carbonate, 4-ethyl-2-methoxyphenyl methyl carbonate;
- Group 4: Methyl cedryl ketone (origin: International Flavors and Fragrances, USA), a mixture of (1RS,2SR,6RS,7RS,8SR)-tricyclo[5.2.1.0^{2,6}]dec-3-en-8-yl 2-methylpropanoate and (1RS,2SR,6RS,7RS,8SR)-tricyclo[5.2.1.0^{2,6}]dec-4-en-8-yl 2-methylpropanoate, vetyverol, vetyverone, 1-(octahydro-2,3,8,8-tetramethyl-2-naphtalenyl)-1-ethanone (origin: International Flavors and Fragrances, USA), (5RS,9RS,10SR)-2,6,9,10-tetramethyl-1-oxaspiro[4.5]deca-3,6-diene and the (5RS,9SR,10RS) isomer, 6-ethyl-2,10,10-trimethyl-1-oxaspiro[4.5]deca-3,6-diene, 1,2,3,5,6,7-hexahydro-1,1,2,3,3-pentamethyl-4-indenone (origin: International Flavors and Fragrances, USA), a mixture of 3-(3,3-dimethyl-5-indanyl)propanal and 3-(1,1-dimethyl-5-indanyl)propanal (origin: Firmenich SA, Geneva, Switzerland), 3',4-dimethyl-tricyclo[6.2.1.0(2,7)]undec-4-ene-9-spiro-2'-oxirane (origin: Firmenich SA, Geneva, Switzerland), 9/10-ethylidene-3-oxatricyclo[6.2.1.0(2,7)]undecane, (perhydro-5,5,8A-trimethyl-2-naphthalenyl acetate (origin: Firmenich SA, Geneva, Switzerland), octalynol, (dodecahydro-3a,6,6,9a-tetramethyl-naphtho[2,1-b]furan, origin: Firmenich SA, Geneva, Switzerland), tricyclo[5.2.1.0(2,6)]dec-3-en-8-yl acetate and tricyclo[5.2.1.0(2,6)]dec-4-en-8-yl acetate as well as tricyclo[5.2.1.0(2,6)]dec-3-en-8-yl propanoate and tricyclo[5.2.1.0(2,6)]dec-4-en-8-yl propanoate, (+)-(1S,2S,3S)-2,6,6-trimethyl-bicyclo[3.1.1]heptane-3-spiro-2'-cyclohexen-4'-one;
- Group 5: camphor, borneol, isobornyl acetate, 8-isopropyl-6-methyl-bicyclo[2.2.2]oct-5-ene-2-carbaldehyde, pinene, camphene, 8-methoxycedrane, (8-methoxy-2,6,6,8-tetramethyl-tricyclo[5.3.1.0(1,5)]undecane (origin: Firmenich SA, Geneva, Switzerland), cedrene, cedrenol, cedrol, mixture of 9-ethylidene-3-oxatricyclo[6.2.1.0(2,7)]undecan-4-one and 10-ethylidene-3-oxatricyclo[6.2.1.0^{2,7}]undecan-4-one (origin: Firmenich SA,

Geneva, Switzerland), 3-methoxy-7,7-dimethyl-10-methylene-bicyclo[4.3.1]decane (origin: Firmenich SA, Geneva, Switzerland);

- Group 6: (trimethyl-13-oxabicyclo-[10.1.0]-trideca-4,8-diene (origin: Firmenich SA, Geneva, Switzerland), 9-hexadecen-16-olide (origin: Firmenich SA, Geneva, Switzerland),
5 pentadecenolide (origin: Firmenich SA, Geneva, Switzerland), 3-methyl-(4/5)-cyclopentadecanone (origin: Firmenich SA, Geneva, Switzerland), 3-methylcyclopentadecanone (origin: Firmenich SA, Geneva, Switzerland), pentadecanolide (origin: Firmenich SA, Geneva, Switzerland), cyclopentadecanone (origin: Firmenich SA, Geneva, Switzerland), 1-ethoxyethoxycyclododecane (origin: Firmenich SA, Geneva,
10 Switzerland), 1,4-dioxacycloheptadecane-5,17-dione, 4,8-cyclododecadien-1-one;
- Group 7: (+)-2-methyl-3-[4-(2-methyl-2-propenyl)phenyl]propanal (origin: Givaudan SA, Vernier, Switzerland), 2,2,2-trichloro-1-phenylethyl acetate.

Preferably, the perfume comprises at least 30%, preferably at least 50%, more preferably at least 60% of ingredients selected from Groups 1 to 7, as defined above. More preferably said perfume comprises at least 30%, preferably at least 50% of ingredients from
15 Groups 3 to 7, as defined above. Most preferably said perfume comprises at least 30%, preferably at least 50% of ingredients from Groups 3, 4, 6 or 7, as defined above.

According to another preferred embodiment, the perfume comprises at least 30%, preferably at least 50%, more preferably at least 60% of ingredients having a logP above 3,
20 preferably above 3.5 and even more preferably above 3.75.

According to a particular embodiment, the perfume used in the invention contains less than 10% of its own weight of primary alcohols, less than 15% of its own weight of secondary alcohols and less than 20% of its own weight of tertiary alcohols. Advantageously, the perfume used in the invention does not contain any primary alcohols and contains less than
25 15% of secondary and tertiary alcohols.

According to an embodiment, the oil phase (or the oil-based core) comprises:

- 25-100wt% of a perfume oil comprising at least 15wt% of high impact perfume raw materials having a Log T<-4, and
- 0-75wt% of a density balancing material having a density greater than 1.07
30 g/cm³.

"High impact perfume raw materials" should be understood as perfume raw materials having a LogT<-4. The odor threshold concentration of a chemical compound is determined in part by its shape, polarity, partial charges and molecular mass. For convenience, the odor threshold concentration is presented as the common logarithm of the threshold
35 concentration, i.e., Log [Threshold] ("LogT").

A “density balancing material” should be understood as a material having a density greater than 1.07 g/cm³ and having preferably low or no odor.

The odor threshold concentration of a perfuming compound is determined by using a gas chromatograph (“GC”). Specifically, the gas chromatograph is calibrated to determine the exact volume of the perfume oil ingredient injected by the syringe, the precise split ratio, and the hydrocarbon response using a hydrocarbon standard of known concentration and chain-length distribution. The air flow rate is accurately measured and, assuming the duration of a human inhalation to last 12 seconds, the sampled volume is calculated. Since the precise concentration at the detector at any point in time is known, the mass per volume inhaled is known and hence the concentration of the perfuming compound. To determine the threshold concentration, solutions are delivered to the sniff port at the back-calculated concentration. A panelist sniffs the GC effluent and identifies the retention time when odor is noticed. The average across all panelists determines the odor threshold concentration of the perfuming compound. The determination of odor threshold is described in more detail in C. Vuilleumier et al., Multidimensional Visualization of Physical and Perceptual Data Leading to a Creative Approach in Fragrance Development, Perfume & Flavorist, Vol. 33, September,, 2008, pages 54-61.

The nature of high impact perfume raw materials having a Log T<-4 and density balancing material having a density greater than 1.07 g/cm³ are described in WO2018115250, the content of which are included by reference.

According to an embodiment, the high impact perfume raw materials having a Log T<-4 are selected from the group consisting of (+-)-1-methoxy-3-hexanethiol, 4-(4-hydroxy-1-phenyl)-2-butanone, 2-methoxy-4-(1-propenyl)-1-phenyl acetate, pyrazobutyle, 3-propylphenol, 1-(3-methyl-1-benzofuran-2-yl)ethanone, 2-(3-phenylpropyl)pyridine, 1-(3,3/5,5-dimethyl-1-cyclohexen-1-yl)-4-penten-1-one, 1-(5,5-dimethyl-1-cyclohexen-1-yl)-4-penten-1-one, a mixture comprising (3RS,3aRS,6SR,7ASR)-perhydro-3,6-dimethylbenzo[b]furan-2-one and (3SR,3aRS,6SR,7ASR)-perhydro-3,6-dimethylbenzo[b]furan-2-one, (+-)-1-(5-ethyl-5-methyl-1-cyclohexen-1-yl)-4-penten-1-one, (1'S,3'R)-1-methyl-2-[(1',2',2'-trimethylbicyclo[3.1.0]hex-3'-yl)methyl]cyclopropylmethanol, (+-)-3-mercaptohexyl acetate, (2E)-1-(2,6,6-trimethyl-1,3-cyclohexadien-1-yl)-2-buten-1-one, H-methyl-2h-1,5-benzodioxepin-3(4H)-one, (2E,6Z)-2,6-nonadien-1-ol, (4Z)-4-dodecenal, (+-)-4-hydroxy-2,5-dimethyl-3(2H)-furanone, methyl 2,4-dihydroxy-3,6-dimethylbenzoate, 3-methylindole, (+-)-perhydro-4alpha,8abeta-dimethyl-4a-naphthalenol, patchoulol, 2-methoxy-4-(1-propenyl)phenol, mixture comprising (+-)-5,6-dihydro-4-methyl-2-phenyl-2H-pyran and tetrahydro-4-methylene-2-phenyl-2H-pyran, mixture comprising 4-methylene-2-phenyltetrahydro-2H-pyran and (+-)-4-methyl-2-phenyl-3,6-dihydro-2H-pyran, 4-hydroxy-3-

methoxybenzaldehyde, nonylenic aldehyde, 2-methoxy-4-propylphenol, 3-methyl-5-phenyl-2-pentenitrile, 1-(spiro[4.5]dec-6/7-en-7-yl)-4-penten-1-one, 2-methoxynaphthalene, (-)-(3aR,5aS,9AS,9BR)-3a,6,6,9a-tetramethyldodecahydronaphtho[2,1-b]furan, 5-nonanolide, (3aR,5AS,9AS,9BR)-3a,6,6,9a-tetramethyldodecahydronaphtho[2,1-b]furan, 7-isopropyl-
5 2H,4H-1,5-benzodioxepin-3-one, coumarin, 4-methylphenyl isobutyrate, (2E)-1-(2,6,6-trimethyl-1,3-cyclohexadien-1-yl)-2-buten-1-one, beta,2,2,3-tetramethyl-delta-methylene-3-cyclopentene-1-butanol, delta damascone ((2E)-1-[(1R,2SR)-2,6,6-trimethyl-3-cyclohexen-1-yl]-2-buten-1-one), (+-)-3,6-dihydro-4,6-dimethyl-2-phenyl-2h-pyran, anisaldehyde, paracresol, 3-ethoxy-4-hydroxybenzaldehyde, methyl 2-aminobenzoate, ethyl
10 methylphenylglycidate, octalactone gamma, ethyl 3-phenyl-2-propenoate, (-)-(2E)-2-ethyl-4-[(1R)-2,2,3-trimethyl-3-cyclopenten-1-yl]-2-buten-1-ol, paracresyl acetate, dodecalactone, tricyclone, (+)-(3R,5Z)-3-methyl-5-cyclopentadecen-1-one, undecalactone, (1R,4R)-8-mercapto-3-p-menthanone, (3S,3AS,6R,7AR)-3,6-dimethylhexahydro-1-benzofuran-2(3H)-one, beta ionone, (+-)-6-pentyltetrahydro-2H-pyran-2-one, (3E,5Z)-1,3,5-undecatriene, 10-
15 undecenal, (9E)-9-undecenal (9Z)-9-undecenal, (Z)-4-decenal, (+-)-ethyl 2-methylpentanoate, 1,2-diallyldisulfane, 2-tridecenitrile, 3-tridecenitrile, (+-)-2-ethyl-4,4-dimethyl-1,3-oxathiane, (+)-(3R,5Z)-3-methyl-5-cyclopentadecen-1-one, 3-(4-tert-butylphenyl)propanal, allyl (cyclohexyloxy)acetate, methyl naphthylketone, (+-)-(4E)-3-methyl-4-cyclopentadecen-1-one, (+-)-5E3-methyl-5-cyclopentadecen-1-one, cyclopropylmethyl 3-
20 hexenoate, (4E)-4-methyl-5-(4-methylphenyl)-4-pentenal, (+-)-1-(5-propyl-1,3-benzodioxol-2-yl)ethanone, 4-methyl-2-pentylpyridine, (+-)-(E)-3-methyl-4-(2,6,6-trimethyl-2-cyclohexen-1-yl)-3-buten-2-one, (3aRS,5aSR,9aSR,9bRS)-3a,6,6,9a-tetramethyldodecahydronaphtho[2,1-b]furan, (2S,5R)-5-methyl-2-(2-propenyl)cyclohexanone oxime, 6-hexyltetrahydro-2H-pyran-2-one, (+-)-3-(3-isopropyl-1-phenyl)butanal, methyl 2-(3-oxo-2-pentylcyclopentyl)acetate, 1-
25 (2,6,6-trimethyl-1-cyclohex-2-enyl)pent-1-en-3-one, indol, 7-propyl-2H,4H-1,5-benzodioxepin-3-one, ethyl praline, (4-methylphenoxy)acetaldehyde, ethyl tricyclo[5.2.1.0.^{2,6}]decane-2-carboxylate, (+)-(1'S,2S,E)-3,3-dimethyl-5-(2',2',3'-trimethyl-3'-cyclopenten-1'-yl)-4-penten-2-ol, (4E)-3,3-dimethyl-5-[(1R)-2,2,3-trimethyl-3-cyclopenten-1-yl]-4-penten-2-ol, 8-isopropyl-6-methyl-bicyclo[2.2.2]oct-5-ene-2-carbaldehyde, methyl nonylacetaldehyde, 4-formyl-2-
30 methoxyphenyl 2-methylpropanoate, (E)-4-decenal, (+-)-2-ethyl-4-(2,2,3-trimethyl-3-cyclopenten-1-yl)-2-buten-1-ol, (1R,5R)-4,7,7-trimethyl-6-thiabicyclo[3.2.1]oct-3-ene, (1R,4R,5R)-4,7,7-trimethyl-6-thiabicyclo[3.2.1]octane, (-)-(3R)-3,7-dimethyl-1,6-octadien-3-ol, (E)-3-phenyl-2-propenenitrile, 4-methoxybenzyl acetate, (E)-3-methyl-5-(2,2,3-trimethyl-3-cyclopenten-1-yl)-4-penten-2-ol, allyl (2/3-methylbutoxy)acetate, (+-)-(2E)-1-(2,6,6-trimethyl-
35 2-cyclohexen-1-yl)-2-buten-1-one, (1E)-1-(2,6,6-trimethyl-1-cyclohexen-1-yl)-1-penten-3-one, and mixtures thereof.

According to an embodiment, perfume raw materials having a Log T<-4 are chosen in the group consisting of aldehydes, ketones, alcohols, phenols, esters lactones, ethers, epoxydes, nitriles and mixtures thereof.

According to an embodiment, perfume raw materials having a Log T<-4 comprise at least one compound chosen in the group consisting of alcohols, phenols, esters lactones, ethers, epoxydes, nitriles and mixtures thereof, preferably in amount comprised between 20 and 70% by weight based on the total weight of the perfume raw materials having a Log T<-4.

According to an embodiment, perfume raw materials having a Log T<-4 comprise between 20 and 70% by weight of aldehydes, ketones, and mixtures thereof based on the total weight of the perfume raw materials having a Log T<-4.

The remaining perfume raw materials contained in the oil-based core may have therefore a Log T>-4.

According to an embodiment, the perfume raw materials having a Log T>-4 are chosen in the group consisting of ethyl 2-methylbutyrate, (E)-3-phenyl-2-propenyl acetate, (+)-6/8-sec-butylquinoline, (+)-3-(1,3-benzodioxol-5-yl)-2-methylpropanal, verdyl propionate, 1-(octahydro-2,3,8,8-tetramethyl-2-naphtalenyl)-1-ethanone, methyl 2-((1R,2R)-3-oxo-2-pentylcyclopentyl)acetate, (+)-(E)-4-methyl-3-decen-5-ol, 2,4-dimethyl-3-cyclohexene-1-carbaldehyde, 1,3,3-trimethyl-2-oxabicyclo[2.2.2]octane, tetrahydro-4-methyl-2-(2-methyl-1-propenyl)-2H-pyran, dodecanal, 1-oxa-12/13-cyclohexadecen-2-one, (+)-3-(4-isopropylphenyl)-2-methylpropanal, aldehyde C11, (+)-2,6-dimethyl-7-octen-2-ol, allyl 3-cyclohexylpropanoate, (Z)-3-hexenyl acetate, 5-methyl-2-(2-propenyl)cyclohexanone, allyl heptanoate, 2-(2-methyl-2-propenyl)cyclohexyl acetate, 1,1-dimethyl-2-phenylethyl butyrate, geranyl acetate, neryl acetate, (+)-1-phenylethyl acetate, 1,1-dimethyl-2-phenylethyl acetate, 3-methyl-2-butenyl acetate, ethyl 3-oxobutanoate, (2Z)-ethyl 3-hydroxy-2-butenate, 8-p-menthanol, 8-p-menthanyl acetate, 1-p-menthanyl acetate, (+)-2-(4-methyl-3-cyclohexen-1-yl)-2-propenyl acetate, (+)-2-methylbutyl butanoate, 2-((1S)-1-((1R)-3,3-dimethylcyclohexyl)ethoxy)-2-oxoethyl propionate, 3,5,6-trimethyl-3-cyclohexene-1-carbaldehyde, 2,4,6-trimethyl-3-cyclohexene-1-carbaldehyde, 2-cyclohexylethyl acetate, octanal, ethyl butanoate, (+)-(3E)-4-(2,6,6-trimethyl-1/2-cyclohexen-1-yl)-3-buten-2-one, 1-[(1R,6SR)-2,2,6-trimethylcyclohexyl]-3-hexanol, 1,3,3-trimethyl-2-oxabicyclo[2.2.2]octane, 1,3,3-trimethyl-2-oxabicyclo[2.2.2]octane, ethyl hexanoate, undecanal, decanal, 2-phenylethyl acetate, (1S,2S,4S)-1,7,7-trimethylbicyclo[2.2.1]heptan-2-ol, (1S,2R,4S)-1,7,7-trimethylbicyclo[2.2.1]heptan-2-ol, (+)-3,7-dimethyl-3-octanol, 1-methyl-4-(2-propenylidene)cyclohexene, (+)-(R)-4-(2-methoxypropan-2-yl)-1-methylcyclohex-1-ene, verdyl acetate, (3R)-1-[(1R,6S)-2,2,6-trimethylcyclohexyl]-3-hexanol, (3S)-1-[(1R,6S)-2,2,6-

trimethylcyclohexyl]-3-hexanol, (3R)-1-[(1S,6S)-2,2,6-trimethylcyclohexyl]-3-hexanol, (+)-(1S,1'R)-2-[1-(3',3'-dimethyl-1'-cyclohexyl)ethoxy]-2-methylpropyl propanoate, and mixtures thereof.

According to an embodiment, the core comprises a perfume formulation comprising:

- 5 - 0 to 60 wt.% of a hydrophobic solvent (based on the total weight of the perfume formulation),
- 40 to 100 wt.% of a perfume oil (based on the total weight of the perfume formulation), wherein the perfume oil has at least two, preferably all of the following characteristics:
- 10 ○ at least 35%, preferably at least 40%, preferably at least 50%, more preferably at least 60% of perfuming ingredients having a log P above 3, preferably above 3.5,
- at least 20%, preferably at least 25%, preferably at least 30%, more preferably at least 40% of Bulky materials of groups 1 to 6, preferably 3 to
- 15 6 as herein defined and
- at least 15%, preferably at least 20%, more preferably at least 25%, even more preferably at least 30% of high impact perfume materials having a Log T < -4,

optionally, further hydrophobic active ingredients.

- 20 According to a particular embodiment, the perfume comprises 0 to 60 wt.% of a hydrophobic solvent.

According to a particular embodiment, the hydrophobic solvent is a density balancing material preferably chosen in the group consisting of benzyl salicylate, benzyl benzoate, cyclohexyl salicylate, benzyl phenylacetate, phenylethyl phenylacetate, triacetin, ethyl citrate,

25 methyl and ethyl salicylate, benzyl cinnamate, and mixtures thereof.

In a particular embodiment, the hydrophobic solvent has Hansen Solubility Parameters compatible with entrapped perfume oil.

The term "Hansen solubility parameter" is understood refers to a solubility parameter approach proposed by Charles Hansen used to predict polymer solubility and was developed

30 around the basis that the total energy of vaporization of a liquid consists of several individual parts. To calculate the "weighted Hansen solubility parameter" one must combine the effects of (atomic) dispersion forces, (molecular) permanent dipole-permanent dipole forces, and (molecular) hydrogen bonding (electron exchange). The weighted Hansen solubility parameter" is calculated as $(\delta D^2 + \delta P^2 + \delta H^2)^{0.5}$, wherein δD is the Hansen dispersion value

35 (also referred to in the following as the atomic dispersion fore), δP is the Hansen polarizability value (also referred to in the following as the dipole moment), and δH is the

Hansen Hydrogen-bonding ("h-bonding") value (also referred to in the following as hydrogen bonding). For a more detailed description of the parameters and values, see Charles Hansen, The Three Dimensional Solubility Parameter and Solvent Diffusion Coefficient, Danish Technical Press (Copenhagen, 1967).

- 5 Euclidean difference in solubility parameter between a fragrance and a solvent is calculated as $(4 \cdot (\delta D_{\text{solvent}} - \delta D_{\text{fragrance}})^2 + (\delta P_{\text{solvent}} - \delta P_{\text{fragrance}})^2 + (\delta H_{\text{solvent}} - \delta H_{\text{fragrance}})^2)^{0.5}$, in which $\delta D_{\text{solvent}}$, $\delta P_{\text{solvent}}$, and $\delta H_{\text{solvent}}$, are the Hansen dispersion value, Hansen polarizability value, and Hansen h-bonding values of the solvent, respectively; and $\delta D_{\text{fragrance}}$, $\delta P_{\text{fragrance}}$, and $\delta H_{\text{fragrance}}$ are the Hansen dispersion value, Hansen polarizability value, and Hansen h-bonding values of the fragrance, respectively.

In a particular embodiment, the perfume oil and the hydrophobic solvent have at least two Hansen solubility parameters selected from a first group consisting of: an atomic dispersion force (δD) from 12 to 20, a dipole moment (δP) from 1 to 8, and a hydrogen bonding (δH) from 2.5 to 11.

- 15 In a particular embodiment, the perfume oil and the hydrophobic solvent have at least two Hansen solubility parameters selected from a second group consisting of: an atomic dispersion force (δD) from 12 to 20, preferably from 14 to 20, a dipole moment (δP) from 1 to 8, preferably from 1 to 7, and a hydrogen bonding (δH) from 2.5 to 11, preferably from 4 to 11.

- 20 In a particular embodiment, at least 90% of the perfume oil, preferably at least 95% of the perfume oil, most preferably at least of 98% of the perfume oil has at least two Hansen solubility parameters selected from a first group consisting of: an atomic dispersion force (δD) from 12 to 20, a dipole moment (δP) from 1 to 8, and a hydrogen bonding (δH) from 2.5 to 11.

- 25 In a particular embodiment, the perfume oil and the hydrophobic solvent have at least two Hansen solubility parameters selected from a second group consisting of: an atomic dispersion force (δD) from 12 to 20, preferably from 14 to 20, a dipole moment (δP) from 1 to 8, preferably from 1 to 7, and a hydrogen bonding (δH) from 2.5 to 11, preferably from 4 to 11.

- 30 According to an embodiment, the perfuming formulation comprises a fragrance modulator (that can be used in addition to the hydrophobic solvent when present or as substitution of the hydrophobic solvent when there is no hydrophobic solvent).

Preferably, the fragrance modulator is defined as a fragrance material with

- 35 i. a vapor pressure of less than 0.0008 Torr at 22°C;
ii. a clogP of 3.5 and higher, preferable 4.0 and higher and more preferable 4.5

- iii. at least two Hansen solubility parameters selected from a first group consisting of: an atomic dispersion force from 12 to 20, a dipole moment from 1 to 7, and a hydrogen bonding from 2.5 to 11,
- iv. at least two Hansen solubility parameters selected from a second group consisting of: an atomic dispersion force from 14 to 20, a dipole moment from 1 to 8, and a hydrogen bonding from 4 to 11, when in solution with a compound having a vapor pressure range of 0.0008 to 0.08 Torr at 22°C.

Preferably, as examples the following ingredients can be listed as modulators but the list is not limited to the following materials: alcohol C12, oxacyclohexadec-12/13-en-2-one, 3-[(2',2',3'-trimethyl-3'-cyclopenten-1'-yl)methoxy]-2-butanol, cyclohexadecanone, (Z)-4-cyclopentadecen-1-one, cyclopentadecanone, (8Z)-oxacycloheptadec-8-en-2-one, 2-[5-(tetrahydro-5-methyl-5-vinyl-2-furyl)-tetrahydro-5-methyl-2-furyl]-2-propanol, muguet aldehyde, 1,5,8-trimethyl-13-oxabicyclo[10.1.0]trideca-4,8-diene, (+)-4,6,6,7,8-hexamethyl-1,3,4,6,7,8-hexahydrocyclopenta[g]isochromene, (+)-(1S,2S,3S,5R)-2,6,6-trimethylspiro[bicyclo[3.1.1]heptane-3,1'-cyclohexane]-2'-en-4'-one, oxacyclohexadecan-2-one, 2-[(1S)-1-[(1R)-3,3-dimethylcyclohexyl]ethoxy]-2-oxoethyl propionate, (+)-(4R,4aS,6R)-4,4a-dimethyl-6-(1-propen-2-yl)-4,4a,5,6,7,8-hexahydro-2(3H)-naphthalenone, amylcinnamic aldehyde, hexylcinnamic aldehyde, hexyl salicylate, (1E)-1-(2,6,6-trimethyl-1-cyclohexen-1-yl)-1,6-heptadien-3-one, (9Z)-9-cycloheptadecen-1-one.

According to a particular embodiment, the hydrophobic material is free of any active ingredient (such as perfume). According to this particular embodiment, it comprises, preferably consists of hydrophobic solvents, preferably chosen in the group consisting of isopropyl myristate, tryglycerides (e.g. Neobee® MCT oil, vegetable oils), D-limonene, silicone oil, mineral oil, and mixtures thereof with optionally hydrophilic solvents preferably chosen in the group consisting of 1,4-butanediol, benzyl alcohol, triethyl citrate, triacetin, benzyl acetate, ethyl acetate, propylene glycol (1,2-propanediol), 1,3-propanediol, dipropylene glycol, glycerol, glycol ethers and mixtures thereof.

The term "biocide" refers to a chemical substance capable of killing living organisms (e.g. microorganisms) or reducing or preventing their growth and/or accumulation. Biocides are commonly used in medicine, agriculture, forestry, and in industry where they prevent the fouling of, for example, water, agricultural products including seed, and oil pipelines. A biocide can be a pesticide, including a fungicide, herbicide, insecticide, algicide, molluscicide, miticide and rodenticide; and/or an antimicrobial such as a germicide, antibiotic, antibacterial, antiviral, antifungal, antiprotozoal and/or antiparasite.

As used herein, a "pest control agent" indicates a substance that serves to repel or attract pests, to decrease, inhibit or promote their growth, development or their activity. Pests

refer to any living organism, whether animal, plant or fungus, which is invasive or troublesome to plants or animals, pests include insects notably arthropods, mites, spiders, fungi, weeds, bacteria and other microorganisms.

By "flavor oil", it is meant here a flavoring ingredient or a mixture of flavoring ingredients, solvents or adjuvants of current use for the preparation of a flavoring formulation, i.e. a particular mixture of ingredients which is intended to be added to an edible composition or chewable product to impart, improve or modify its organoleptic properties, in particular its flavor and/or taste. Flavoring ingredients are well known to a person skilled in the art and their nature does not warrant a detailed description here, which in any case would not be exhaustive, the skilled flavorist being able to select them on the basis of his general knowledge and according to the intended use or application and the organoleptic effect it is desired to achieve. Many of these flavoring ingredients are listed in reference texts such as in the book by S. Arctander, Perfume and Flavor Chemicals, 1969, Montclair, N.J., USA, or its more recent versions, or in other works of similar nature such as Fenaroli's Handbook of Flavor Ingredients, 1975, CRC Press or Synthetic Food Adjuncts, 1947, by M. B. Jacobs, van Nostrand Co., Inc. Solvents and adjuvants of current use for the preparation of a flavoring formulation are also well known in the art.

In a particular embodiment, the flavor is a mint flavor. In a more particular embodiment, the mint is selected from the group consisting of peppermint and spearmint.

In a further embodiment, the flavor is a cooling agent or mixtures thereof.

In another embodiment, the flavor is a menthol flavor.

Flavors that are derived from or based on fruits where citric acid is the predominant, naturally-occurring acid include but are not limited to, for example, citrus fruits (e.g. lemon, lime), limonene, strawberry, orange, and pineapple. In one embodiment, the flavors food is lemon, lime or orange juice extracted directly from the fruit. Further embodiments of the flavor comprise the juice or liquid extracted from oranges, lemons, grapefruits, key limes, citrons, clementines, mandarins, tangerines, and any other citrus fruit, or variation or hybrid thereof. In a particular embodiment, the flavor comprises a liquid extracted or distilled from oranges, lemons, grapefruits, key limes, citrons, clementines, mandarins, tangerines, any other citrus fruit or variation or hybrid thereof, pomegranates, kiwifruits, watermelons, apples, bananas, blueberries, melons, ginger, bell peppers, cucumbers, passion fruits, mangos, pears, tomatoes, and strawberries.

In a particular embodiment, the flavor comprises a composition that comprises limonene, in a particular embodiment, the composition is a citrus that further comprises limonene.

In another particular embodiment, the flavor comprises a flavor selected from the group comprising strawberry, orange, lime, tropical, berry mix, and pineapple.

The phrase flavor includes not only flavors that impart or modify the smell of foods but include taste imparting or modifying ingredients. The latter do not necessarily have a taste or smell themselves but are capable of modifying the taste that other ingredients provides, for instance, salt enhancing ingredients, sweetness enhancing ingredients, umami enhancing ingredients, bitterness blocking ingredients and so on.

In a further embodiment, suitable sweetening components may be included in the particles described herein. In a particular embodiment, a sweetening component is selected from the group consisting of sugar (e.g., but not limited to sucrose), a stevia component (such as but not limited to stevioside or rebaudioside A), sodium cyclamate, aspartame, sucralose, sodium saccharine, and Acesulfam K or mixtures thereof.

According to any one of the invention's embodiments, the hydrophobic material represents between about 10% and 60% w/w, or even between 15% and 45% w/w, by weight, relative to the total weight of the oil phase.

Polylactone-based polyisocyanate prepolymer

A polylactone-based polyisocyanate prepolymer according to the present invention is obtained by reacting a polylactone polyol and a polyisocyanate. Thereby it is understood that the polylactone-based polyisocyanate prepolymer is obtained in a separate process to the process according to the present invention and then introduced in a separate step to the process according to the present invention.

The polylactone-based polyisocyanate prepolymer according to the present invention is not understood as a polymeric structure in the sense that it does not comprise multiple repetitions (i.e. not more than 3, preferably not more than 2, more preferably not more than 1) of monomeric units such as the polylactone polyol or the polyisocyanate.

The polylactone-based polyisocyanate prepolymer is capable of entering, through reactive groups, such as terminal reactive isocyanate functional groups, into further polymerization, thereby contributing more than one monomeric unit to at least one chain of the polymeric shell.

In a particular embodiment, the polylactone-based polyisocyanate is obtained by reacting only a polylactone polyol and a polyisocyanate. In a particular embodiment, the polylactone-based polyisocyanate is obtained by only one or more (i.e. 2 or 3), preferably one, polylactone polyol(s) and only one or more (i.e. 2 or 3), preferably one polyisocyanate.

In a particular embodiment, the polylactone-based polyisocyanate prepolymer is obtained in a separate process to the process according to the present invention and in the presence of excess isocyanate groups to obtain a prepolymer with terminated isocyanate groups.

5 In a particular embodiment, the polylactone-based polyisocyanate prepolymer is obtained by reacting a polylactone polyol and a polyisocyanate in a manner that the polylactone-based polyisocyanate prepolymer comprises at least 2 terminal isocyanate groups.

10 In a particular embodiment, the polylactone-based polyisocyanate prepolymer is obtained by reacting a polylactone polyol and a polyisocyanate in a manner that the polylactone-based polyisocyanate prepolymer comprises at least 3 terminal isocyanate groups.

15 In a particular embodiment, the polylactone-based polyisocyanate prepolymer is obtained by reacting a polylactone polyol and a polyisocyanate in a manner that the polylactone-based polyisocyanate prepolymer comprises not more than 4 terminal isocyanate groups.

20 In a particular embodiment, the polylactone-based polyisocyanate prepolymer is obtained by reacting a polylactone polyol and a polyisocyanate in a manner that the polylactone-based polyisocyanate prepolymer comprises not more than 3 terminal isocyanate groups.

In a particular embodiment, the polylactone-based polyisocyanate prepolymer is obtained by a process comprising the following steps:

- i. Providing a polylactone polyol and optionally a solvent;
- 25 ii. Adding a polyisocyanate to the mixture of step i. with an excess of isocyanate (NCO) functional groups over hydroxy (OH) groups;
- iii. Applying conditions to form a reaction between the OH functional groups of the polylactone polyol and the NCO functional groups of the polyisocyanate to form the polylactone-based polyisocyanate prepolymer.

30 In case a solvent is used, any suitable solvent may be used in which the polylactone polyol can be dissolved at room temperature. In a particular embodiment, the solvent may be chloroform, dichloromethane, carbon tetrachloride, benzene, toluene, xylene, cyclohexanone and 2-nitropropane, acetone, 2-butanone, ethyl acetate, butyl acetate, such as n-butyl acetate, dimethylformamide and/or acetonitrile. In a particular embodiment, the solvent is xylene or n-butyl acetate.

35

By excess of isocyanate (NCO) functional groups over hydroxy (OH) functional groups, it is understood that the number of reactable isocyanate (NCO) groups of the polyisocyanate has to be at least equal and preferably higher than the number of reactable hydroxy (OH) groups of the polylactone polyol.

In a particular embodiment, the molar ratio NCO/OH is ≥ 2 , preferably the molar ratio of NCO/OH > 2 .

In a particular embodiment, the molar ratio NCO/OH is ≥ 3 , preferably the molar ratio of NCO/OH > 3 .

In a particular embodiment, the molar ratio NCO/OH is ≥ 4 , preferably the molar ratio NCO/OH is > 4 .

In a particular embodiment, the molar ratio NCO/OH is ≥ 5 , preferably the molar ratio NCO/OH is > 5 .

In a particular embodiment, the molar ratio NCO/OH is ≥ 6.5 , preferably the molar ratio NCO/OH is > 6.5 .

Any conditions can be applied which are known from a reaction between the OH functional groups of the polylactone polyol and the NCO functional groups of the polyisocyanate.

In a particular embodiment, any conditions can be applied which are known to form an addition reaction between the OH functional groups of the polylactone polyol and the NCO functional groups of the polyisocyanate.

In a particular embodiment, the reaction temperature can be above 40°C, preferably above 60°C, more preferably above 80°C, more preferably above 100°C and most preferably at 120°C.

In a particular embodiment, the reaction time can be more than 1 h, preferably more than 1h 30 min, more preferably equal to or more than 2 h.

In a particular embodiment, the reaction can be applied in the presence of catalyst, such as bases, preferably amine bases (e.g., tertiary amines) and organometals (e.g., alkyltin carboxylates or organobismuth).

Poly lactone polyol

A polylactone polyol is herein understood as a polyol from a polylactone. A polylactone in turn is herein understood as a (cyclic) polyester polymer whose monomers are aliphatic hydroxy acids. Polylactone polyol can be the reaction product of dicarboxylic acid, preferably azelic acid, and polyol, preferably ethylene glycol.

In a particular embodiment, the polylactone polyol is a biodegradable polylactone polyol.

5 In a particular embodiment, the polylactone polyol is polylactide (PLA), polyglycolide (PGA), polycaprolactone (PCL), copolylactones such as poly(lactide-co-glycolide) (PLGA), poly (glycolide-co-lactide-co-caprolactone), tri-component copolymer (PGLC), tri- and multi-
10 block polylactide/poly(ethylene oxide) copolymer (TPLE and BPLE), as well as polycaprolactone/polylactide/poly(ethylene oxide) copolymer (PCEL), or ethylene glycol azelate (being the reaction product of azelic acid and ethylene glycol).

In a particular preferred embodiment, the polylactone polyol is a polycaprolactone polyol.

In a particular preferred embodiment, the polylactone polyol is a polycaprolactone diol or triol.

15 In a particular embodiment, the polylactone polyol has a molecular weight at the range from 200 g/mol to 10000 g/mol, preferably from 220 g/mol to 2000 g/mol, and more preferably from 240 g/mol to 550 g/mol.

The polylactone polyol used in the process for preparing the polylactone-based polyisocyanate prepolymer may be present in amounts of more than 60 wt.%, preferably
20 more than 40 wt.%, more preferably more than 20 wt.%, more preferably more than 10 wt.% of the preparing the polylactone-based polyisocyanate prepolymer reaction mixture.

The polylactone polyol moiety of the polylactone-based polyisocyanate prepolymer may be present in the process according to the present invention amounts representing from 0.1 to 10%, preferably from 0.5 to 7% and more preferably from 1 to 5% by weight of the
25 microcapsule slurry.

Polyisocyanate

The polyisocyanate may comprise at least 2 or even at least 3 isocyanate functional groups.

30 The polyisocyanate may comprise up to 6, or even up to 4 isocyanate functional groups.

Low volatility polyisocyanates are preferred because of their low toxicity.

The at least one polyisocyanate may be aliphatic, aromatic or a mixture of both aromatic and aliphatic polyisocyanates. In the case of mixtures of polyisocyanates, each
35 member of the mixture has at least two isocyanate functional groups.

According to one embodiment, the at least one polyisocyanate is an aromatic polyisocyanate.

The term "aromatic polyisocyanate" is meant here as encompassing any polyisocyanate comprising an aromatic moiety. Preferably, it comprises a phenyl, a toluyl, a xylyl, a naphthyl or a diphenyl moiety, more preferably a toluyl or a xylyl moiety. Preferred aromatic polyisocyanates are biurets and polyisocyanurates, more preferably comprising one of the above-cited specific aromatic moieties. More preferably, the aromatic polyisocyanate is a polyisocyanurate of toluene diisocyanate (commercially available from Bayer under the tradename Desmodur® RC), a trimethylol propane (TMP)-adduct of toluene diisocyanate (commercially available from Bayer under the tradename Desmodur® L75), a trimethylol propane (TMP)-adduct of xylylene diisocyanate (commercially available from Mitsui Chemicals under the tradename Takenate® D-110N). In a most preferred embodiment, the aromatic polyisocyanate is a trimethylol propane (TMP)-adduct of xylylene diisocyanate.

According to another embodiment, said polyisocyanate is an aliphatic polyisocyanate.

The term "aliphatic polyisocyanate" is defined as a polyisocyanate which does not comprise any aromatic moiety. Preferred aliphatic polyisocyanates are a trimer of hexamethylene diisocyanate, a trimer of isophorone diisocyanate, a trimethylol propane (TMP)-adduct of hexamethylene diisocyanate (available from Mitsui Chemicals) or a biuret of hexamethylene diisocyanate (commercially available from Bayer under the tradename Desmodur® N 100), among which a biuret of hexamethylene diisocyanate is even more preferred.

In a particular embodiment, the polyisocyanate comprises an aliphatic polyisocyanate, an aromatic polyisocyanate or a mixture of an aliphatic and aromatic polyisocyanates, preferably comprising an aromatic polyisocyanate.

According to another embodiment, said at least one polyisocyanate is in the form of a mixture of at least one aliphatic polyisocyanate and of at least one aromatic polyisocyanate, both comprising at least two or three isocyanate functional groups, such as a mixture of a biuret of hexamethylene diisocyanate with a trimethylol propane (TMP)-adduct of xylylene diisocyanate, a mixture of a biuret of hexamethylene diisocyanate with a polyisocyanurate of toluene diisocyanate and a mixture of a biuret of hexamethylene diisocyanate with a trimethylol propane (TMP)-adduct of toluene diisocyanate. Most preferably, it is a mixture of a biuret of hexamethylene diisocyanate with a trimethylol propane (TMP)-adduct of xylylene diisocyanate.

In a particular embodiment, the polyisocyanate is xylylene diisocyanate, toluene diisocyanate, 1,5-pentamethylene diisocyanate, 1,6-hexamethylene diisocyanate, L-Lysine diisocyanate, isophorone diisocyanate, methylene diphenyl diisocyanate, L-Lysine

diisocyanate ethyl ester, lysine triisocyanate, aliphatic isocyanate biuret, aliphatic or aromatic isocyanate trimethylol propane (TMP) adduct, aromatic isocyanate trimethylol propane (TMP) adduct, preferably xylylene diisocyanate, toluene diisocyanate, methylene diphenyl diisocyanate and aromatic isocyanate trimethylol propane (TMP) adduct, more preferably xylylene diisocyanate, toluene diisocyanate and aromatic isocyanate trimethylol (TMP) adduct.

In a preferred embodiment, the at least one aliphatic polyisocyanate and the at least one aromatic polyisocyanate are used in a respective molar ratio comprised between 80:20 and 10:90, preferably between 75:25 and 20:80, more preferably between 60:40 and 20:80, even more preferably between 60:40 and 30:70, most preferably between 45:55 and 30:70.

The polyisocyanate used in the process for preparing the polylactone-based polyisocyanate prepolymer may be present in amounts of more than 40wt.%, preferably more than 60%, more preferably more than 80 wt.%, more preferably more than 90 wt.% of the preparing the polylactone-based polyisocyanate prepolymer reaction mixture.

The polyisocyanate moiety of the polylactone-based polyisocyanate prepolymer may present in the process according to the present invention in amounts representing from 0.1 to 15%, preferably from 0.5 to 8% and more preferably from 1 to 6% by weight of the microcapsule slurry.

In another step of the process, the oil phase is dispersed in a dispersing phase comprising an emulsifier or colloidal stabilizer and, optionally, a cross-linker to form an emulsion.

Dispersing phase

There is no restriction regarding the nature of the solvent that can be used for dispersing phase as long as it can dissolve or disperse the emulsifier or colloidal stabilizer.

According to a particular embodiment, the dispersing phase comprises, preferably consists of water, i.e. the dispersing phase is an aqueous phase.

According to another particular embodiment, the content of water is below or equal to 10%, preferably below or equal to 5%, more preferably below or equal to 3% by weight based on the total weight of the aqueous phase.

According to a particular embodiment, the dispersing phase is free of water.

According to an embodiment, the dispersing phase comprises a solvent chosen in the group consisting of glycerol, 1,4-butanediol, ethylene glycol and mixtures thereof.

Emulsifier / stabilizer

According to the invention, the emulsifier or stabilizer can be ionic or non-ionic.

According to an embodiment, the stabilizer is a colloidal stabilizer.

According to an embodiment, the stabilizer is solid particles (Pickering emulsion).

According to the invention, the ionic emulsifier or stabilizer is chosen in the group
5 consisting of gum Arabic, carboxymethyl cellulose, soy protein, sodium caseinate, gelatin,
bovine serum albumin, sugar beet pectin, hydrolyzed soy protein, hydrolyzed sericin,
Pseudocollagen, Biopolymer SA-N (INCI name : Hyaluronic Acid (and) Serum Albumen (and)
Dextran Sulfate), Pentacare-NA PF (Hydrolyzed Wheat Gluten (and) Ceratonia Siliqua
(Carob) Gum (and) Aqua (and) Sodium Dextran Sulfate (and) Bis-Hydroxyethyl
10 Tromethamine (and) Phenoxyethanol (and) Ethylhexylglycerin), and mixtures thereof.

According to a preferred embodiment, the ionic emulsifier or stabilizer is chosen in the
group consisting of gum Arabic, carboxymethyl cellulose, sodium caseinate, sugar beet
pectin and mixtures thereof.

According to the invention, the non-ionic emulsifier or stabilizer is chosen in the group
15 consisting of polyvinyl alcohol, modified polyvinyl alcohol, modified starch, modified cellulose,
polysaccharides, and mixtures thereof.

According to a particular embodiment, the non-ionic emulsifier or stabilizer is chosen
in the group consisting of polyvinyl alcohol, modified starch and mixtures thereof.

According to a particular embodiment, the emulsifier or stabilizer is polymeric
20 stabilizer such as polyvinyl alcohol, a cellulose derivative, polyethylene oxide, a copolymer of
polyethylene oxide and polyethylene or polypropylene oxide, a copolymer of acrylamide and
acrylic acid, a copolymer of vinylpyrrolidone and of a quaternized vinylimidazol and sodium
dodecyl sulfate; inorganic colloidal stabilizer such as hydroxyapatite, calcium carbonate,
kaolin, laponite, silica, amine functionalized silica, clays, sericite mica, tri-calcium phosphate;
25 polysaccharides such as Gum Arabic, starch, modified starch, chitosan, sodium alginate,
alginic acid, cellulose, chitin, pectin, sugar beet pectin or colloidal stabilizers comprising
these polysaccharides; proteins such as silk fibroin, sericin, gelatin, sodium caseinate,
casein, bovine serum albumin, whey protein isolate, potato protein, soy protein isolate and
mixtures thereof or colloidal stabilizers comprising these proteins.

30 For the sake of clarity the term "derivative" is herein understood generally as a
modification of the compound it is referring to by chemical and/or biotechnological
modification.

For the sake of clarity, the term "cellulose derivative" is herein understood as
cellulose which is modified by chemical and/or biotechnological modification, particularly
35 chemical modification. In a particular embodiment, the "cellulose derivative" is characterized
by modifications such as esterification, etherification, or other chemical reactions that impart

specific changes to the original cellulose molecule. Particular cellulose derivatives include substances like cellulose acetate, cellulose ethers (e.g. methyl cellulose, ethyl cellulose, propyl cellulose, hydroxyethyl cellulose, hydroxypropyl cellulose and/or hydroxypropyl methyl cellulose), and carboxymethyl cellulose.

- 5 According to any one of the above embodiments of the present invention, the emulsion comprises between about 0.1% and 5% w/w of at least an emulsifier or stabilizer, percentage being expressed on a w/w basis relative to the total weight of the dispersion as obtained after step b). In still another aspect of the invention, the emulsion comprises between about 0.1% and 2% w/w of at least an emulsifier or stabilizer. In still another aspect
- 10 of the invention, the emulsion comprises between about 0.1% and 1% w/w of at least an emulsifier or stabilizer.

In a particular embodiment, a cross-linker may be added to the dispersing phase.

- 15 Any compound can be used as a cross-linker which is able to react with the isocyanate functional groups of the polylactone-based polyisocyanate prepolymer to further cross-link the polylactone-based polyisocyanate prepolymer.

In a particular embodiment, the cross-linker may be multifunctionalized amines, multifunctionalized alcohols and/or multifunctionalized thiols.

- 20 In a particular embodiment, the cross-linker is multi-functionalized amines such as ethylenediamine, diethylenetriamine, triethylenetetramine, guanidine, 1,5-pentanediamine, 1,8-diaminooctane, 1,12-diaminododecane, 3,5-Diamino-1,2,4-triazole, urea; amino acids such as L-lysine, L-tryptophan, L-cystine, cystamine, and their hydrochloric acid salts, multi-functionalized polyols such as 1,5-pentanediol, 1,6-hexanediol, and polylactone-based polyols
- 25 or multi-functionalized thiols.

In a particular embodiment, the cross-linker may be an amino acid, such as L-lysine, L-tryptophan, L-cystine, cystamine, and their hydrochloric acid salts, more preferably L-lysine.

- In a particular embodiment, the cross-linker may be present in an amount of more than 0.5 wt.%, preferably more than 1.0 wt.%, even more preferably equal or more than 1.2
- 30 wt.% based on the weight of the emulsion.

In another step of the process, a cross-linker may be optionally added into the emulsion.

In another step of the process, conditions are applied sufficient to induce cross-linking of the polylactone-based polyisocyanate prepolymer to form the core-shell microcapsule or core-shell microcapsule slurry.

5 Thereby, it is understood that any conditions can be applied which induces cross-linking of the polylactone-based polyisocyanate prepolymer to form the core-shell microcapsule.

 In a particular embodiment, the condition sufficient to induce the cross-linking include heating the oil in water emulsion at elevated temperature, preferably at a temperature of at
10 least 30°C, preferably more than 45°C, more preferably more than 60°C, even more preferably more than 70°C, such as for example 80°C.

 In a particular embodiment, the condition sufficient to induce the cross-linking include heating the oil in water emulsion at elevated temperature for at least 30 minutes, preferably at least 1 hours, even more preferably at least 2 hours, such as for example 3 hours.

15 In a particular embodiment, the condition sufficient to induce the cross-linking include heating the oil in water emulsion at elevated temperature and at a pH of 4 to 10.

Optional outer coating

 According to a particular embodiment of the invention, at the end of step d) or during step d),
20 one may also add to the microcapsule slurry a polymer selected from the group consisting of a non-ionic polysaccharide, a cationic polymer, a polysuccinimide derivative (as described for instance in WO2021185724), and mixtures thereof to form an outer coating to the microcapsule.

 Non-ionic polysaccharide polymers are well known to a person skilled in the art and
25 are described for instance in WO2012/007438 page 29, lines 1 to 25 and in WO2013/026657 page 2, lines 12 to 19 and page 4, lines 3 to 12. Preferred non-ionic polysaccharides are selected from the group consisting of locust bean gum, xyloglucan, guar gum, hydroxypropyl guar, hydroxypropyl cellulose and hydroxypropyl methyl cellulose.

 Cationic polymers are well known to a person skilled in the art. Preferred cationic
30 polymers have cationic charge densities of at least 0.5 meq/g, more preferably at least about 1.5 meq/g, but also preferably less than about 7 meq/g, more preferably less than about 6.2 meq/g. The cationic charge density of the cationic polymers may be determined by the Kjeldahl method as described in the US Pharmacopoeia under chemical tests for Nitrogen determination. The preferred cationic polymers are chosen from those that contain units
35 comprising primary, secondary, tertiary and/or quaternary amine groups that can either form part of the main polymer chain or can be borne by a side substituent directly connected

thereto. The weight average (Mw) molecular weight of the cationic polymer is preferably between 10,000 and 3.5M Dalton, more preferably between 50,000 and 1.5M Dalton. According to a particular embodiment, one will use cationic polymers based on acrylamide, methacrylamide, N-vinylpyrrolidone, quaternized N,N-dimethylaminomethacrylate, diallyldimethylammonium chloride, quaternized vinylimidazole (3-methyl-1-vinyl-1H-imidazol-3-ium chloride), vinylpyrrolidone, acrylamidopropyltrimonium chloride, cassia hydroxypropyltrimonium chloride, guar hydroxypropyltrimonium chloride or polygalactomannan 2-hydroxypropyltrimethylammonium chloride ether, starch hydroxypropyltrimonium chloride and cellulose hydroxypropyltrimonium chloride. Preferably copolymers shall be selected from the group consisting of polyquaternium-5, polyquaternium-6, polyquaternium-7, polyquaternium10, polyquaternium-11, polyquaternium-16, polyquaternium-22, polyquaternium-28, polyquaternium-43, polyquaternium-44, polyquaternium-46, cassia hydroxypropyltrimonium chloride, guar hydroxypropyltrimonium chloride or polygalactomannan 2-hydroxypropyltrimethylammonium chloride ether, starch hydroxypropyltrimonium chloride and cellulose hydroxypropyltrimonium chloride. As specific examples of commercially available products, one may cite Salcare® SC60 (cationic copolymer of acrylamidopropyltrimonium chloride and acrylamide, origin: BASF) or Luviquat®, such as the PQ 11N, FC 550 or Style (polyquaternium-11 to 68 or quaternized copolymers of vinylpyrrolidone origin: BASF), or also the Jaguar® (C13S or C17, origin Rhodia).

According to any one of the above embodiments of the invention, there is added an amount of polymer described above comprised between about 0% and 5% w/w, or even between about 0.1% and 2% w/w, percentage being expressed on a w/w basis relative to the total weight of the slurry as obtained after step d). It is clearly understood by a person skilled in the art that only part of said added polymers will be incorporated into/deposited on the microcapsule shell.

PROCESS FOR PREPARING MICROCAPSULE POWDER

Another object of the invention is a process for preparing a microcapsule powder comprising the steps as defined above and an additional step consisting of submitting the microcapsule slurry to a drying process, like spray-drying, to provide the microcapsules as such, i.e. in a powdery form.

It is understood that any standard method known by a person skilled in the art to perform such drying is also applicable. In particular the slurry may be spray-dried preferably in the presence of a polymeric carrier material such as polyvinyl acetate, polyvinyl alcohol,

dextrins, natural or modified starch, vegetable gums, pectins, xanthans, alginates, carragenans or cellulose derivatives to provide microcapsules in a powder form.

However, one may cite also other drying method such as the extrusion, plating, spray granulation, the fluidized bed, or even a drying at room temperature using materials (carrier, desiccant) that meet specific criteria as disclosed in WO2017/134179.

According to a particular embodiment, the carrier material contains free perfume oil which can be the same or different from the perfume from the core of the microcapsules.

CORE-SHELL MICROCAPSULE

10

The present invention also relates to a core-shell microcapsule or core-shell microcapsule slurry obtainable by the process according to the present invention.

The present invention also relates to the core-shell microcapsule or core-shell microcapsule, wherein the core-shell microcapsule comprises

- a core, preferably oil core, comprising a hydrophobic material, preferably a perfume oil,
- a cross-linked polymeric shell surrounding the oil core and wherein the cross-linked polymeric shell is obtained by reacting a polylactone-based polyisocyanate prepolymer obtained by reacting polylactone polyol and a polyisocyanate and, optionally, a cross-linker.

The polylactone-based polyisocyanate prepolymer is capable of entering, through its reactive groups, such as terminal reactive isocyanate functional groups, into further polymerization, thereby contributing more than one monomeric unit to at least one chain of the polymeric shell.

The definitions and embodiments for the hydrophobic material, polylactone-based polyisocyanate prepolymer, polylactone polyol, polyisocyanate and cross-linker are the same as described herein-above.

In a particular embodiment, the shell material is a biodegradable material.

In a particular embodiment, the shell has a biodegradability of at least 40%, preferably at least 45%, 50%, 60%, 65%, 70%, 75%, 80%, 85%, 90%, 95% or 98%, within 60 days according to OECD301F.

In a particular embodiment, the core-shell microcapsule has a biodegradability of at least 40 %, preferably at least 60 %, preferably at least 65%, 70%, 75%, 80%, 85%, 90%, 95% or 98% within 60 days according to OECD301F.

5 Thereby it is understood that the core-shell microcapsule including all components, such as the core, shell and optionally coating may have a biodegradability of at least 40 %, preferably at least 60 %, preferably at least 65%, 70%, 75%, 80%, 85%, 90%, 95% or 98% within 60 days according to OECD301F.

10 In a particular embodiment, the oil core, preferably perfume oil, has a biodegradability of at least 40 %, preferably at least 60 %, preferably at least 65%, 70%, 75%, 80%, 85%, 90%, 95% or 98% within 60 days according to OECD301F.

OECD301F is a standard test method on the biodegradability from the Organization of Economic Co-operation and Development.

A typical method for extracting the shell for measuring the biodegradability is disclosed in *Gasparini and all in Molecules 2020, 25,718*.

15

PERFUMING COMPOSITION AND CONSUMER PRODUCTS

20 The present invention also relates to a perfuming composition comprising

- a core-shell microcapsule or core-shell microcapsule slurry obtained by the process according to the present invention or as described herein-above,
- at least one ingredient selected from the group consisting of a perfumery carrier and a perfumery base, and
- optionally, at least one perfumery adjuvant.

25

In a particular embodiment, the composition comprises:

30 (i) a core-shell microcapsule or core-shell microcapsule slurry obtained by the process according to the present invention or as described herein-above;

(ii) an active ingredient, preferably chosen in the group consisting of a cosmetic ingredient, skin caring ingredient, perfume ingredient, flavor ingredient, malodour counteracting ingredient, bactericide ingredient, fungicide ingredient, pharmaceutical or agrochemical ingredient, a sanitizing ingredient, an insect repellent or attractant, and mixtures thereof.

In a particular embodiment, a core-shell microcapsule or core-shell microcapsule slurry obtained by the process according to the present invention or as described herein-above can also be added in different perfumed consumer products

5 In a particular embodiment, present invention relates to a perfuming composition comprising

- a core-shell microcapsule or core-shell microcapsule slurry obtained by the process according to the present invention or as described herein-above and
- optionally, a free perfume oil.

10

Preferably, the perfuming composition according to the invention comprises between 0.1 and 30 % by weight of a core-shell microcapsule or core-shell microcapsule slurry obtained by the process according to the present invention or as described herein-above.

15 By "free perfume" it is herein understood a perfume or perfume oil which is comprised in the perfuming composition and not entrapped in the core-shell microcapsule or core-shell microcapsule slurry obtained by the process according to the present invention or as described herein-above.

In a particular embodiment, the total amount of the core-shell microcapsule or core-shell microcapsule slurry obtained by the process according to the present invention or as described herein-above is 0.05 to 5 wt.% (based on the total weight of the perfuming composition) and the total amount of the free perfume oil is 0.05 to 5 wt.% (based on the total weight of the perfuming composition).

20 In a particular embodiment, the total perfume oil of the perfume formulation entrapped in the core-shell microcapsule or core-shell microcapsule slurry obtained by the process according to the present invention or as described herein-above and total free perfume oil are present in the perfuming composition in a weight ratio of 1:20 to 20:1, preferably 10:1 to 1:10.

30 The perfuming composition can further comprise at least one perfuming co-ingredient and, optionally a perfumery adjuvant,

By "perfuming co-ingredient" it is herein understood a compound, which is used in a perfuming preparation or a composition to impart a hedonic effect and which is not a microcapsule as 20 defined above. In other words such a co-ingredient, to be considered as being a perfuming one, must be recognized by a person skilled in the art as being able to

impart or modify in a positive or pleasant way the odor of a composition, and not just as having an odor. The nature and type of the perfuming co-ingredients present in the perfuming composition do not warrant a more detailed description here, which in any case would not be exhaustive, the skilled person being able to select them on the basis of his
5 general knowledge and according to the intended use or application and the desired organoleptic effect. In general terms, these perfuming co-ingredients belong to chemical classes as varied as alcohols, lactones, aldehydes, ketones, esters, ethers, acetates, nitriles, terpenoids, nitrogenous or sulfur heterocyclic compounds and essential oils, and said
10 perfuming co-ingredients can be of natural or synthetic origin. Many of these co-30 ingredients are in any case listed in reference texts such as the book by S. Arctander, Perfume and Flavor Chemicals, 1969, Montclair, New Jersey, USA, or its more recent versions, or in other works of a similar nature, as well as in the abundant patent literature in the field of perfumery. It is also understood that said co-ingredients may also be compounds known to release in a controlled manner various types of perfuming compounds.

15

By "perfumery adjuvant" it is herein understood an ingredient capable of imparting additional 5 added benefit such as a color, a particular light resistance, chemical stability, etc. A detailed description of the nature and type of adjuvant commonly used in perfuming bases cannot be exhaustive, but it has to be mentioned that said ingredients are well known to a
20 person skilled in the art.

According to an embodiment, the core-shell microcapsules or core-shell microcapsules slurries obtained by the process according to the present invention or as described herein-above (first type of delivery system) can be used in combination with a
25 second type of delivery system.

Thus, according to a particular embodiment, the perfuming composition comprises:

- the core-shell microcapsule or core-shell microcapsule slurry obtained by the process according to the present invention or as described herein-above as a first type of delivery system, and
30
- a second type of delivery system, wherein the first type of delivery system and the second type of delivery system differ in their perfuming formulations and/or carrier material (shell or matrix) and/or outer coating.

The core-shell microcapsule or core-shell microcapsule slurry obtained by the
35 process according to the present invention or as described herein-above can advantageously be used in many application fields and used in consumer products.

The present invention also relates to a perfumed consumer product comprising

- a core-shell microcapsule or core-shell microcapsule slurry obtained by the process according to the present invention or as described herein-above, and
- 5 - a personal care, home care, or fabric care active base.

The consumer products of the invention, can in particular be of used in perfumed consumer products such as product belonging to fine fragrance or "functional" perfumery. Functional perfumery includes in particular personal-care products including hair-care, body cleansing, 10 skin care, hygiene-care as well as home-care products including laundry care and air care.

In particular a liquid consumer product comprising:

- from 2 to 65% by weight, relative to the total weight of the consumer product, of at least one surfactant;
- 15 - water or a water-miscible hydrophilic organic solvent; and
- a perfuming composition or the core-shell microcapsule or core-shell microcapsule slurry obtained by the process according to the present invention or as described herein-above.

Also a powder consumer product comprising

- 20 - from 2 to 65% by weight, relative to the total weight of the consumer product, of at least one surfactant; and
- a perfuming composition or the core-shell microcapsule or core-shell microcapsule slurry obtained by the process according to the present invention or as described herein-above.

25 For the sake of clarity, it has to be mentioned that, by "perfumed consumer product" it is meant a consumer product which is expected to deliver among different benefits a perfuming effect to the surface to which it is applied (e.g. skin, hair, textile, paper, or home surface) or in the air (air-freshener, deodorizer etc). In other words, a perfumed consumer product according to the invention is a manufactured product which comprises a functional 30 formulation also referred to as "base", together with benefit agents, among which an effective amount of microcapsules according to the invention.

The nature and type of the other constituents of the perfumed consumer product do not warrant a more detailed description here, which in any case would not be exhaustive, the 35 skilled person being able to select them on the basis of his general knowledge and according to the nature and the desired effect of said product. Base formulations of consumer products

in which the microcapsules of the invention can be incorporated can be found in the abundant literature relative to such products. These formulations do not warrant a detailed description here which would in any case not be exhaustive. The person skilled in the art of formulating such consumer products is perfectly able to select the suitable components on the basis of his general knowledge and of the available literature.

Non-limiting examples of suitable perfumed consumer products can be a fine perfume, a splash or eau de perfume, a cologne, a shave or after-shave lotion, a liquid or solid detergent, a mono or multi chamber unidose detergent, a fabric softener, a fabric refresher, liquid or solid scent-boosters (PEG / urea or salts), a dryer sheet, an ironing water, a paper, a bleach, a carpet cleaners, curtain-care products, a shampoo, a coloring preparation, a color care product, a hair shaping product, a dental care product, a disinfectant, an intimate care product, a hair spray, a hair conditioning product, a vanishing cream, a deodorant or antiperspirant, hair remover, tanning or sun product, nail products, skin cleansing, a makeup, a perfumed soap, shower or bath mousse, oil or gel, or a foot/hand care products, a hygiene product, an air freshener, a "ready to use" powdered air freshener, a mold remover, furnisher care, wipe, a dish detergent or hard-surface detergent, a leather care product, a car care product.

In a particular embodiment, the perfumed consumer product is preferably selected from the group consisting of personal care composition, home care composition or fabric care composition, most preferably in form of antiperspirants, hair care products, such as shampoo or hair-conditioner, body care products such as a shower gel, oral care products, laundry care products, preferably a detergent or a fabric softener.

25

Another object of the invention is a consumer product comprising:

- a personal care active base, and
 - the core-shell microcapsule or core-shell microcapsule slurry obtained by the process according to the present invention or as described herein-above or the perfuming composition as defined above,
- wherein the consumer product is in the form of a personal care composition.

Personal care active base in which the delivery system of the invention can be incorporated can be found in the abundant literature relative to such products. These formulations do not warrant a detailed description here which would in any case not be exhaustive. The person skilled in the art of formulating such consumer products is perfectly

able to select the suitable components on the basis of his general knowledge and of the available literature.

The personal care composition is preferably chosen in the group consisting of a hair-care product (e.g. a shampoo, hair conditioner, a coloring preparation or a hair spray), a
5 cosmetic preparation (e.g. a vanishing cream, body lotion or a deodorant or antiperspirant), a skin-care product (e.g. a perfumed soap, shower or bath mousse, body wash, oil or gel, bath salts, or a hygiene product), oral care product (toothpaste or mouthwash composition) or a fine fragrance product (e.g. Eau de Toilette - EdT).

10 Another object of the invention is a consumer product comprising:

- a home care or a fabric care active base, and
- a core-shell microcapsule or core-shell microcapsule slurry obtained by the process according to the present invention or as described herein-above or the perfuming composition as defined above,

15 wherein the consumer product is in the form of a home care or a fabric care composition.

Home care or fabric care bases in which the delivery system of the invention can be incorporated can be found in the abundant literature relative to such products. These formulations do not warrant a detailed description here which would in any case not be
20 exhaustive. The person skilled in the art of formulating such consumer products is perfectly able to select the suitable components on the basis of his general knowledge and of the available literature.

The home or fabric care composition is preferably chosen in the group consisting
25 fabric softener, liquid detergent, powder detergent, liquid scent booster and solid scent booster.

Fabric softener

An object of the invention is a consumer product in the form of a fabric softener
30 composition comprising:

- a fabric softener active base; preferably chosen in the group consisting of dialkyl quaternary ammonium salts, dialkyl ester quaternary ammonium salts (esterquats), Hamburg esterquat (HEQ), TEAQ (triethanolamine quat), silicones, cationic guar and mixtures thereof, preferably in an amount comprised between 85 and 99.95% by
35 weight (excluding water) based on the total weight of the composition,

- the core-shell microcapsule or core-shell microcapsule slurry obtained by the process according to the present invention or as described herein-above, preferably in an amount comprised between 0.05 to 15 wt%, more preferably between 0.1 and 5 wt% by weight based on the total weight of the composition.

5

Liquid detergent

An object of the invention is a consumer product in the form of a liquid detergent composition comprising:

- a liquid detergent active base; preferably chosen in the group consisting of anionic surfactant such as alkylbenzenesulfonate (ABS), secondary alkyl sulfonate (SAS), primary alcohol sulfate (PAS), lauryl ether sulfate (LES), methyl ester sulfonate (MES) and nonionic surfactant such as alkyl amines, alkanolamide, fatty alcohol poly(ethylene glycol) ether, fatty alcohol ethoxylate (FAE), ethylene oxide (EO) and propylene oxide (PO) copolymers, amine oxydes, alkyl polyglucosides, alkyl polyglucosamides, preferably in an amount comprised between 85 and 99.95% by weight (excluding water) based on the total weight of the composition,
- the core-shell microcapsule or core-shell microcapsule slurry obtained by the process according to the present invention or as described herein-above, preferably in an amount comprised between 0.05 to 15 wt%, more preferably between 0.1 and 5 wt% by weight based on the total weight of the composition.

Solid detergent

An object of the invention is a consumer product in the form of a solid detergent composition comprising:

- a solid detergent active base; preferably chosen in the group consisting of anionic surfactant such as alkylbenzenesulfonate (ABS), secondary alkyl sulfonate (SAS), primary alcohol sulfate (PAS), lauryl ether sulfate (LES), methyl ester sulfonate (MES) and nonionic surfactant such as alkyl amines, alkanolamide, fatty alcohol poly(ethylene glycol) ether, fatty alcohol ethoxylate (FAE), ethylene oxide (EO) and propylene oxide (PO) copolymers, amine oxydes, alkyl polyglucosides, alkyl polyglucosamides, preferably in an amount comprised between 85 and 99.95% by weight based on the total weight of the composition,
- the core-shell microcapsule or core-shell microcapsule slurry obtained by the process according to the present invention or as described herein-above, preferably in an amount comprised between 0.05 to 15 wt%, more preferably between 0.1 and 5 wt% by weight based on the total weight of the composition.

Solid scent booster

An object of the invention is a consumer product in the form of a solid scent booster comprising:

- 5 - a solid carrier, preferably chosen in the group consisting of urea, sodium chloride, sodium sulphate, sodium acetate, zeolite, sodium carbonate, sodium bicarbonate, clay, talc, calcium carbonate, magnesium sulfate, gypsum, calcium sulfate, magnesium oxide, zinc oxide, titanium dioxide, calcium chloride, potassium chloride, magnesium chloride, zinc chloride, saccharides such as sucrose, mono-, di-, and
10 polysaccharides and derivatives such as starch, cellulose, methyl cellulose, ethyl cellulose, propyl cellulose, polyols/sugar alcohols such as sorbitol, maltitol, xylitol, erythritol, and isomalt, PEG, PVP, citric acid or any water soluble solid acid, fatty alcohols or fatty acids and mixtures thereof.
- 15 - the core-shell microcapsule or core-shell microcapsule slurry obtained by the process according to the present invention or as described herein-above, in a powdered form, preferably in an amount comprised between 0.05 to 15 wt%, more preferably between 0.1 and 5 wt% by weight based on the total weight of the composition.

Liquid scent booster

20 An object of the invention is a consumer product in the form of a liquid scent booster comprising:

- 25 - an aqueous phase,
- a surfactant system essentially consisting of one or more than one non-ionic surfactant, wherein the surfactant system has a mean HLB between 10 and
30 14, preferably chosen in the group consisting of ethoxylated aliphatic alcohols, POE/PPG (polyoxyethylene and polyoxypropylene) ethers, mono and polyglyceryl esters, sucrose ester compounds, polyoxyethylene hydroxylesters, alkyl polyglucosides, amine oxides and combinations thereof;
- a linker chosen in the group consisting of alcohols, salts and esters of
35 carboxylic acids, salts and esters of hydroxyl carboxylic acids, fatty acids, fatty acid salts, glycerol fatty acids, surfactant having an HLB less than 10 and mixtures thereof, and
- the core-shell microcapsule or core-shell microcapsule slurry obtained by the process according to the present invention or as described herein-above, in the form of a
 slurry, preferably in an amount comprised between 0.05 to 15 wt%, more preferably
 between 0.1 and 5 wt% by weight based on the total weight of the composition.

Shampoo/shower gel

An object of the invention is a consumer product in the form of a shampoo or a shower gel composition comprising:

- 5 - a shampoo or a shower gel active base; preferably chosen in the group consisting of sodium alkylether sulfate, ammonium alkylether sulfates, alkylamphoacetate, cocamidopropyl betaine, cocamide MEA, alkylglucosides and aminoacid based surfactants and mixtures thereof, preferably in an amount comprised between 85 and 99.95% (excluding water) by weight based on the total weight of the composition,
- 10 - the core-shell microcapsule or core-shell microcapsule slurry obtained by the process according to the present invention or as described herein-above, preferably in an amount comprised between 0.05 to 15 wt%, more preferably between 0.1 and 5 wt% by weight based on the total weight of the composition.

15 Rinse-Off Conditioner

An object of the invention is a consumer product in the form of a rinse-off conditioner composition comprising:

- 20 - a rinse-off conditioner active base; preferably chosen in the group consisting of cetyltrimonium chloride, stearyl trimonium chloride, benzalkonium chloride, behentrimonium chloride and mixture thereof, preferably in an amount comprised between 85 and 99.95% by weight (excluding water) based on the total weight of the composition,
- 25 - the core-shell microcapsule or core-shell microcapsule slurry obtained by the process according to the present invention or as described herein-above, preferably in an amount comprised between 0.05 to 15 wt%, more preferably between 0.1 and 5 wt% by weight based on the total weight of the composition.

Perfuming composition

30 According to a particular embodiment, the consumer product is in the form of a perfuming composition comprising:

- 35 - 0.1 to 30%, preferably 0.1 to 20% of the core-shell microcapsule or core-shell microcapsule slurry obtained by the process according to the present invention or as described herein-above,
- 0 to 40%, preferably 3-40% of perfume, and
- 20-90, preferably 40-90% of ethanol, by weight based on the total weight of the perfuming composition.

The invention will now be further described by way of examples. It will be appreciated that the invention as claimed is not intended to be limited in any way by these examples.

Examples

Example 1

Preparation of microcapsules from polycaprolactone (PCL) polyol

5

i) Preparation of PCL-based polyisocyanate prepolymers (catalyst-free):

PCL-diol or PCL-triol was dissolved in butyl acetate (5 mL) to obtain solutions, which was then added into the flask of excess m-xylene diisocyanate with molar ratio of -NCO/-OH>4 dissolved in butyl acetate (10 mL) by a syringe pump dropwise in 1 h with stirring at 120°C. It was then heated for another 1 h to obtain a PCL-based multi-functionalized isocyanate prepolymer solution. The butyl acetate was removed by vacuum first, and the excess m-xylene diisocyanate was removed by liquid-liquid extraction using hexane. After washing and extraction with hexane, it was removed by vacuum to obtain a transparent viscous product.

Table 1: Composition of PCL-tri-isocyanate prepolymer synthesis

Ingredient	Effective Amount (% wt) ^{a)}
PCL-triol ¹⁾	11.5
m-xylene diisocyanate	88.5
n-butyl acetate	15 mL

¹⁾PCL-triol, average Mn~300 from Sigma-Aldrich

20 Table 2: Composition of PCL-di-isocyanate prepolymer synthesis

Ingredient	Effective Amount (% wt) ^{a)}
PCL-diol ¹⁾	38.7
m-xylene diisocyanate	61.3
n-butyl acetate	15 mL

¹⁾PCL-diol, average Mn~530 from Sigma-Aldrich

ii) Preparation of microcapsules

25 PCL-based polyisocyanate prepolymers were dissolved in ethyl acetate and mixed with perfume oil, with which colloidal stabilizers suspensions were mixed by an overhead disperser to make emulsion.

The emulsion was transferred into a reactor and the interfacial reaction was carried out at 45°C for 15 min, 60°C for 15 min, and 80°C for 2 h.

Microcapsules with PCL incorporated in the shell were obtained.

5

Table 3: Composition of microcapsules slurry synthesized with PCL-di-isocyanate prepolymer

Ingredient	Effective Amount (% wt) ^{a)}
Hydroxyapatite particle	1.0
pH 4 buffer solution	67.9
PCL-di-isocyanate prepolymer	2.0
Ethyl acetate	2.0
Perfume oil A ¹⁾	27.1

1) See table 3a

10 Table 3a: Perfume oil A formulation

Ingredient	% in oil
Ethyl 2-methyl-pentanoate	3.20%
Eucalyptol	7.80%
2,4-Dimethyl-3-cyclohexene-1-carbaldehyde	0.75%
Aldehyde C ₁₀	0.75%
Citronellyl Nitrile	4.30%
Isobornyl acetate	3.00%
2-tert-butyl-1-cyclohexyl acetate	9.80%
Citronellyl Acetate	1.30%
2-Methylundecanal	3.00%
Diphenyloxide	0.80%
Aldehyde C ₁₂	1.30%
Dicyclopentadiene acetate	9.85%
Ionone beta	3.30%
Undecalactone gamma	18.75%
Hexyl Salicylate	15.9%
Benzyl Salicylate	16.2%

Table 4: Composition of microcapsules synthesized with PCL-tri-isocyanate prepolymer with additional L-lysine

Ingredient	Effective Amount (% wt) ^{a)}
Superfine silk particle	2.6
pH 5 buffer solution	63.4
L-Lysine	1.1
DI water	4.5
PCL-tri-isocyanate prepolymer	2.0
Ethyl acetate	2.0
Perfume oil A ¹⁾	24.4

1) See table 3a

5 Table 5: Composition of microcapsules synthesized with PCL-tri-isocyanate prepolymer

Ingredient	Effective Amount (% wt) ^{a)}
Superfine silk particle	2.8
pH 5 buffer solution	67.2
PCL-tri-isocyanate prepolymer	2.0
Ethyl acetate	2.0
Perfume oil A ¹⁾	26.0

1) See table 3a

iii) Results on stability

10 The microcapsules according to Table 4 hereinabove were used for the stability.

Storage stability test: The microcapsules were added in a Fabric Softener base (see Table 6) and stored for 3 days at 37°C with a perfume oil dosage in the base is 0.2%. The microcapsules showed an oil leakage of 18.5%.

15

Example 2

Preparation of microcapsules from PCL-triol

i) Preparation of PCL-based polyisocyanate prepolymer in the presence of a catalyst

20

1,3-Bis(isocyanatomethyl)benzene (1.80 mL, 11.50 mmol) and Tin(II) 2-ethylhexanoate in ethyl acetate (0.1 mL, 0.34 mmol) were added in a 25 mL round bottomed three necked flask to give a colorless solution.

- 5 CAPA3050 (a 540 MW polycaprolactone triol initiated with trimethylol propane (TMP); 2.01 g, 3.64 mmol) was added in ethyl acetate (4.60 mL, 3.64 mmol) in a second 25 mL round-bottomed flask to give a colorless solution. The latter was added dropwise over the period of 5 min to the diisocyanate solution. The reaction mixture was stirred at 50°C for 3 h and then slowly cooled down to room temperature under stirring. Product was recovered by solvent
10 evaporation to afford a white pasty solid.

δ ¹H-NMR (CDCl₃, 400 MHz): 0.88 (3H), 1.37 (6H), 1.46 (2H), 1.63 (12H), 2.31 (6H), 4.04 (12H), 4.33 (6H), 4.48 (3H), 5.19 (3H), 7.03-7.37 (8H) ppm.

- δ ¹³C-NMR (CDCl₃, 100 MHz): 7.3, 22.9, 24.6, 25.5, 28.3, 28.7, 33.5, 34.13, 44.9, 46.3, 63.7,
15 64.1, 64.4, 64.9, 123.3, 125.8, 126.5, 127.1, 129.2, 137.5, 139.2, 139.6, 156.3, 156.9, 173.2, 173.6 ppm.

ii) Preparation of microcapsules

- 20 PCL-based polyisocyanate prepolymer (4.96 g, 2.22 mmol NCO) was dissolved in perfume oil B (see Table A, 20 g) in a 150 mL beaker to give a yellow solution. This solution was stirred for 5 min. A solution of PVOH at 1% in water (46.30 g) was added in the beaker and an emulsion was prepared with an ultra Turrax (S25N 10G) at 20,000 rpm for 2 min. The droplet size was controlled by light microscopy and pH was measured at 5.01. The reaction
25 mixture was transferred in a 250 mL reactor and stirred at 350 r.p.m. at room temperature for 1 h. The temperature was increased to 70°C over the period of 1 h and the reaction mixture was stirred at 70°C for 2h. At the end of process, the dispersion was cooled down to room temperature and pH was measured at 5.71.

- 30 Table A: Perfume oil B composition

Ingredient	% in oil
Cyclosal ¹⁾	25%
Tert-butyl-1-cyclohexyl acetate ²⁾	25%
Romascone ³⁾	25%
Salicynile ⁴⁾	25%
Dorisyl ⁵⁾	25%

- 1) 3-(4-Isopropylphenyl)-2-methylpropanal
- 2) Tert-butyl-1-cyclohexyl acetate
- 3) Methyl 2,2-dimethyl-6-methylene-1-cyclohexanecarboxylate
- 4) (2Z)-2-Phenyl-2-hexenenitrile
- 5) 4-(Tert-Butyl) cyclohexyl acetate

The microcapsule slurry was dried and the shell was recovered by solvent extraction of the perfume by ethyl acetate (5 times), filtration, water washing at 0.5% for 24h, filtration, and a second extraction by ethyl acetate (5 times). A white solid was recovered by filtration and dried.

Example 3

Preparation of microcapsules from polylactone polyol based polyisocyanate prepolymer

15 i) Preparation of polylactone polyol based polyisocyanate prepolymer

Emerox 14555 (linear diol polyol based on ethylene glycol (EG) azelate; 5.03 g, 2.31 mmol, diol from azelic acid and ethylene glycol) and titanium IV isopropoxyde in ethyl acetate (0.1 mL, 0.04 mmol) were dissolved in anhydrous ethyl acetate (6.5 mL) in a 25 mL round-bottomed flask to give a colorless solution. This solution was added into a 50 mL round-bottomed three necked flask in the presence of 1,3-bis(isocyanatomethyl)benzene (0.76 mL, 4.85 mmol) to give a colorless solution. The reaction mixture was stirred at 50°C for 3 h and then slowly cooled down to room temperature under stirring to afford a yellow viscous oil.

25 ii) Preparation of microcapsules

Poly(lactone polyol based polyisocyanate prepolymer (4.81 g) was dissolved in perfume oil B (Table A, 20 g) in a 150 mL beaker to give a yellow solution. This solution was stirred for 3 min. A solution of PVOH at 1% in water (46.10 g) was added in the beaker and an emulsion was prepared with an ultra Turrax (S25N 10G) at 21,500 rpm for 2 min. The droplet size was controlled by light microscopy and pH was measured at 4.89. The reaction mixture was transferred in a 250 mL reactor and stirred at 350 r.p.m. at room temperature for 1 h. The temperature was increased to 70°C over the period of 1 h and the reaction mixture was stirred at 70°C for 2 h. At the end of process, the dispersion was cooled down to room temperature and pH was measured at 5.68.

The microcapsule slurry was dried and the shell was recovered by solvent extraction of the perfume by ethyl acetate (5 times), filtration, water washing at 0.5% for 24h, filtration, and a second extraction by ethyl acetate (5 times). A white solid was recovered by filtration and dried.

5

Example 4

Fabric softener composition

A sufficient amount of microcapsules of the present invention according to Examples 1 and 3 is dispersed in liquid detergent base described in Table 6 to obtain a concentration of encapsulated perfume oil at 0.22%.

10

Table 6: Fabric Softener composition

Product	Wt %
Stepantex VL 90A	8.88
Calcium Chloride Sol. 10%	0.36
Proxel GXL	0.04
Perfume	1.00
Water	89.72
TOTAL	100.00

15

Example 5

Liquid detergent composition

A sufficient amount of microcapsule of the present invention according to Examples 1 to 3 is dispersed in liquid detergent base described in Table 7 to obtain a concentration of encapsulated perfume oil at 0.22%.

20

Table 7: Composition of the liquid detergent formulation

Ingredient	Concentration [wt%]
Sodium C14-17 Alkyl Sec Sulfonate ¹⁾	7.0
Fatty acids, C12-18 and C18-unsaturated ²⁾	7.5
C12/14 fatty alcohol polyglycol ether with 7 mol EO ³⁾	17.0

Triethanolamine	7.5
Propylene Glycol	11.0
Citric acid	6.5
Potassium Hydroxyde	9.5
Protease	0.2
Amylase	0.2
Mannanase	0.2
Acrylates/Steareth-20 Methacrylate structuring Crosspolymer ⁴⁾	6.0
Deionized Water	27.4

- 1) Hostapur SAS 60; Origin: Clariant
- 2) Edenor K 12-18; Origin: Cognis
- 3) Genapol LA 070; Origin: Clariant
- 4) Aculyn 88; Origin: Dow Chemical

5

Example 6

Rinse-off hair conditioner composition

10 A sufficient amount of microcapsules of the present invention according to Examples 1 and 3 is incorporated at the required dosage (corresponding to an encapsulated perfume oil at 0.5%) in the rinse-off base (see Table 8).

Table 8: rinse-off conditioner composition

	Ingredient	Concentration [wt%]
A	Water deionized	81.8
	Behentrimonium Chloride ¹⁾	2.5
	Hydroxyethylcellulose ²⁾	1.5
B	Cetearyl Alcohol ³⁾	4.0
	Glyceryl Stearate (and) PEG-100 Stearate ⁴⁾	2.0
	Behentrimonium Methosulfate (and) Cetyl alcohol (and) Butylene Glycol ⁵⁾	4.0
	Ethoxy (20) Stearyl Alcohol ⁶⁾	1.0

C	Amodimethicone (and) Trideceth-12 (and) Cetrimonium Chloride ⁷⁾	3.0
	Chlorhexidine Digluconate ⁸⁾ 20% aqueous solution	0.2
D	Citric acid 10% aqueous sol. till pH 3.5-4	q.s.
	T O T A L:	100.0

- 1) Genamin KDM P, Clariant
 - 2) Tylose H10 Y G4, Shin Etsu
 - 3) Lanette O, BASF
 - 4) Arlacel 165-FP-MBAL-PA-(RB), Croda
 - 5) Incroquat Behenyl TMS-50-MBAL-PA-(MH) HA4112, Croda
 - 6) SP Brij S20 MBAL-PA(RB), Croda
 - 7) Xiameter DC MEM-0949 Emulsion, Dow Corning
 - 8) Alfa Aesar
- 10 Ingredients of Phase A are mixed until a uniform mixture was obtained. Tylose is allowed to completely dissolve. Then the mixture is heated up to 70-75°C. Ingredients of Phase B are combined and melted at 70-75°C. Then ingredients of Phase B are added to Phase A with good agitation and the mixing is continued until cooled down to 60°C. Then, ingredients of Phase C are added while agitating and keeping mixing until the mixture cooled down to
- 15 40°C. The pH is adjusted with citric acid solution till pH: 3.5 – 4.0.

Example 7

Spray-dried microcapsules preparation

- 20 Emulsions 1-5 having the following ingredients are prepared.

Table 9: Composition of Emulsions 1-5 and composition of granulated powder 1-5 after spray-drying

Ingredient	Emulsion 1	Emulsion 2	Emulsion 3	Emulsion 4	Emulsion 5
Modified starch ¹⁾	2.6%	2.6%	2.6%	12.5%	2%
Maltodextrin ²⁾	26.8%	22.8%	19.3%	0%	19.1%
Maltose ³⁾	0%	0%	0%	7.9%	0%
Citric Acid	0%	0%	0%	1%	0%
Tripotassium Citrate	0%	0%	0%	1.9%	0%

Microcapsules according to Examples 1 to 3	12.0%	24%	37.0%	8.9%	56.2%
Silica ⁴⁾	1.1%	1.1%	1.1%	0%	0%
Free Perfume	0%	0%	0%	11%	0%
Water	57.6%	49.6%	40.1%	56.9	22.7%
	Granule 1	Granule 2	Granule 3	Granule 4	Granule 5
Modified starch ¹⁾	7.5%	7.4%	7.2%	31.6%	4.9%
Maltodextrin ²⁾	77.4%	65.5%	53.8%	0%	44.7%
Maltose	0%	0%	0%	20.9%	
Citric Acid	0%	0%	0%	2.6%	0%
Tripotassium citrate	0%	0%	0%	4.9%	0%
Encapsulated perfume	0%	0%	0%	28.1%	0%
Microcapsules according to Examples 1 to 3	12. %	24.1%	36.1%	9.8%	48.4%
Silica	3.0	3.0%	2.9%	2.0%	2%
Fragrance loading in powder after spray-drying	10.1%	20.1%	30%	35.8%	40.2%

1) Capsul™, Ingredion

2) Maltodextrin 10DE origin: Roquette

3) Maltose, Lehmann & Voss

4) Silica, Evonik

5

Components for the polymeric matrix (Maltodextrin and capsul™, or capsul™, citric acid and tripotassium citrate) are added in water at 45-50°C until complete dissolution.

For emulsion 4, free perfume C is added to the aqueous phase.

10

Microcapsules according to Examples 1 to 3 are added to the obtained mixture. Then, the resulting mixture is then mixed gently at 25°C (room temperature).

Granulated powder 1-5 are prepared by spray-drying Emulsion A-E using a Sodeva Spray Dryer (Origin France), with an air inlet temperature set to 215°C and a throughput set to 500 ml per hour. The air outlet temperature is of 105°C. The emulsion before atomization is at ambient temperature.

5

Example 8

Liquid scent booster composition

A sufficient amount of microcapsules of the present invention according to Examples 1 and 3 is weighed and mixed in a liquid scent booster to add the equivalent of 0.2% perfume.

10

Table 10: Liquid scent booster composition

Ingredient	Amount (% wt)					
	1	2	3	4	5	6
Water	71.20%	89.5%	78.8%	79.4%	70%	70%
Propylene glycol	20.30%	-	-	-	20%	20%
Polyethylene glycol ethers of decyl alcohol ¹⁾	4.00%	6%				
Polyethylene glycol ether of Lauryl Alcohol ²⁾					4.00%	4.00%
alkyl polyglucoside C8-C10 ³⁾			8.30%	7.7%		
Deceth-3 ¹⁾	1.50%					
Lauryl lactate				1%		
Lauric acid		1.5%	1.60%			
Glyceryl Caprylate					3.00%	3.00%
Fragrance	3.00%	3.0%	3.00%	3.00%	3.00%	0%

1) Deceth-8; trademark and origin : KLK Oleo

2) Laureth-9; ; trademark and origin

15 3) Plantacare 2000UP; trademark and origin : BASF

Different ringing gel compositions are prepared (compositions 1-6) according to the following protocol.

In a first step, the aqueous phase (water), the solvent (propylene glycol) if present and surfactants are mixed together at room temperature under agitation with magnetic stirrer at 300 rpm for 5 min.

- 5 In a second step, the linker is dissolved in the hydrophobic active ingredient (fragrance) at room temperature under agitation with magnetic stirrer at 300 rpm. The resulting mixture is mixed for 5 min.

- 10 Then, the aqueous phase and the oil phase are mixed together at room temperature for 5 min leading to the formation of a transparent or opalescent ringed gel.

Example 9

Powder detergent composition

- 15 A sufficient amount of granules 1-5 according to Example 7 is weighed and mixed in a powder detergent composition to add the equivalent of 0.2% perfume.

Table 11: Powder detergent composition

Ingredient	Part
Anionic (Linear Alkyl Benzene Sulphonates)	20.0%
Nonionics (Alcohol Ethoxylates (5-9 ethylene oxide)	6.0%
Builders (zeolites, sodium carbonate)	25%
Silicates	6.0%
Sodium Sulphate	35.0%
Others (Enzymes, Polymers, Bleach)	7.5%
Spray-dried granule powder 1-5	0.5%

20

Example 10

Concentrated All Purpose Cleaner composition

- A sufficient amount of microcapsules of the present invention according to Examples 1 and 3 is weighed and mixed in a concentrated all-purpose cleaner composition to add the
25 equivalent of 0.2% perfume.

Table 12: concentrated all-purpose cleaner composition

Ingredient	Amount (% wt)
Ethoxylated Alcohol (C9-C11, 8EO) ⁽¹⁾	20.0
Sodium Dodecyl Benzene Sulfonate ⁽²⁾	16.0
Sodium Cumene Sulfonate ⁽³⁾	8.0
Methyl chloro isothiazolinone Methyl isothiazolinone 3.3:1 ⁽⁴⁾	0.8%
Water	55.9

- 1) Neodol 91-8 ®; trademark and origin : Shell Chemical
- 2) Biosoft D-40®; trademark and origin : Stepan Company
- 5 3) Stepanate SCS®; trademark and origin : Stepan Company
- 4) Kathon CG®; trademark and origin : Dow Chemical Company

All ingredients are mixed together and then the mixture was diluted with water to 100%.

10

Example 11

Solid scent booster composition

A sufficient amount of microcapsules in dried form according to Example 7 is weighed and mixed with a solid scent booster composition to add the equivalent of 0.2% perfume.

15

Table 13: Salt-based solid scent booster compositions

Ingredient	Part
Sodium chloride	95
Spray-dried granule powder 1-5	5

Table 14: Urea-based solid scent booster compositions

Ingredient	Part
Urea (beads)	86
Spray-dried granule powder 1-5	8

Bentonite	3
Perfume	3

Example 12Shampoo composition

- 5 A sufficient amount of microcapsules of the present invention according to Examples 1 and 3 is weighed and mixed in a shampoo composition to add the equivalent of 0.2% perfume.

Table 15: Shampoo composition

	Ingredients	Concentration [wt%]
A	Water deionized	44.4
	Polyquaternium-10 ¹⁾	0.3
	Glycerin 85% ²⁾	1
	DMDM Hydantoin ³⁾	0.2
B	Sodium Laureth Sulfate ⁴⁾	28
	Cocamidopropyl Betaine ⁵⁾	3.2
	Disodium Cocoamphodiacetate ⁶⁾	4
	Ethoxy (20) Stearyl Alcohol ⁶⁾	1
C	Sodium Laureth Sulfate ⁴⁾	3
	Glyceryl Laureate ⁷⁾	0.2
D	Water deionized	1
	Sodium Methylparaben ⁸⁾	0.1
E	Sodium Chloride 10% aqueous sol.	15
	Citric acid 10% aqueous sol. till pH 5.5-6	q.s.
	Perfume	0.5
	T O T A L:	100

1) Ucare Polymer JR-400, Noveon

2) Schweizerhall

3) Glydant, Lonza

- 4) Texapon NSO IS, Cognis
- 5) Tego Betain F 50, Evonik
- 6) Amphotensid GB 2009, Zschimmer & Schwarz
- 7) Monomuls 90 L-12, Gruenau
- 8) Nipagin Monosodium, NIPA

Polyquaternium-10 is dispersed in water. The remaining ingredients of phase A are mixed separately by addition of one after the other while mixing well after each adjunction. Then this pre-mix is added to the Polyquaternium-10 dispersion and was mixed for 5 min. Then Phase B and the premixed Phase C (heat to melt Monomuls 90L-12 in Texapon NSO IS) are added. The mixture is mixed well. Then, Phase D and Phase E are added while agitating. The pH was adjusted with citric acid solution till pH: 5.5 – 6.0.

10

Example 13
Shampoo composition

A sufficient amount of microcapsules of the present invention according to Examples 1 and 3 is weighed and mixed in a shampoo composition to add the equivalent of 0.2% perfume.

15 Table 16: Shampoo composition

	Ingredients	Concentration [wt%]
A	Water deionized	45.97
	Tetrasodium EDTA ¹⁾	0.05
	Guar Hydroxypropyltrimonium Chloride ²⁾	0.05
	Polyquaternium-10 ³⁾	0.075
B	NaOH 10% aqueous sol.	0.3
C	Ammonium Lauryl Sulfate ⁴⁾	34
	Ammonium Laureth Sulfate ⁵⁾	9.25
	Cocamidopropyl Betaine ⁶⁾	2
	Dimethicone (&) C12-13 Pareth-4 (&) C12-13 Pareth-23 (&) Salicylic Acid ⁷⁾	2.5

D	Cetyl Alcohol ⁸⁾	1.2
	Cocamide MEA ⁹⁾	1.5
	Glycol Distearate ¹⁰⁾	2
E	Methylchlorisothiazolinone & Methylisothiazolinone ¹¹⁾	0.1
	D-Panthenol 75% ¹²⁾	0.1
	Water deionized	0.3
F	Sodium Chloride 25% aqueous sol.	0.6
	T O T A L:	100

- 1) EDETA B Powder, BASF
- 2) Jaguar C14 S, Rhodia
- 3) Ucare Polymer JR-400, Noveon
- 4) Sulfetal LA B-E, Zschimmer & Schwarz
- 5) Zetesol LA, Zschimmer & Schwarz
- 6) Tego Betain F 50, Evonik
- 7) Xiameter MEM-1691, Dow Corning
- 8) Lanette 16, BASF
- 9) Comperlan 100, Cognis
- 10) Cutina AGS, Cognis
- 11) Kathon CG, Rohm & Haas
- 12) D-Panthenol, Roche

A premix comprising Guar Hydroxypropyltrimonium Chloride and Polyquaternium-10 are added to water and Tetrasodium EDTA while mixing. When the mixture is homogeneous, NaOH is added. Then, Phase C ingredients are added and the mixture was heat to 75 °C.

- 5 Phase D ingredients are added and mixed till homogeneous. The heating is stopped and temperature of the mixture is decreased to RT. At 45 °C, ingredients of Phase E while mixing final viscosity is adjusted with 25% NaCl solution and pH of 5.5-6 is adjusted with 10% NaOH solution.

A sufficient amount of microcapsules of the present invention according to Examples 1 and 3 is weighed and mixed in an antiperspirant spray anhydrous composition to add the equivalent of 0.2% perfume.

5 Table 17: antiperspirant spray anhydrous composition

Ingredient	Amount (wt %)
Cyclomethicone ¹⁾	53.51
Isopropyl miristate	9.04
Silica ²⁾	1.03
Quaternium-18-Hectorite ³⁾	3.36
Aluminium Chlorohydrate ⁴⁾	33.06

- 1) Dow Corning® 345 Fluid; trademark and origin: Dow Corning
- 2) Aerosil® 200 ; trademark and origin : Evonik
- 3) Bentone® 38; trademark and origin : Elementis Specialities
- 4) Micro Dry Ultrafine; origin : Reheis

10

Using a high speed stirrer, Silica and Quaternium-18-Hectorite are added to the Isopropyl miristate and Cyclomethicone mixture. Once completely swollen, Aluminium Chlorohydrate is added portion wise under stirring until the mixture was homogeneous and without lumps. The aerosol cans are filled with 25 % Suspension of the suspension and 75 % of Propane/Butane (2,5 bar).

15

Example 15

Antiperspirant spray emulsion composition

20 A sufficient amount of microcapsules of the present invention according to Examples 1 and 3 is weighed and mixed in antiperspirant spray emulsion composition to add the equivalent of 0.2% perfume.

Table 18: antiperspirant spray emulsion composition

Ingredient	Amount (wt %)
Polysorbate 65 ¹⁾ (Part A)	0.95
Polyglyceryl-2 dipolyhydroxystearate ²⁾ (Part A)	1.05
Cetyl PEG/PPG-10/1 Dimethicone ³⁾ (Part A)	2.75

Cyclomethicone ⁴⁾ (Part A)	16.4
Isopropylisostearate ⁵⁾ (Part A)	4.5
Phenoxyethanol ⁶⁾ (Part A)	0.5
Ethylhexylglycerin ⁷⁾ (Part A)	0.2
C12-15 Alkyl Benzoate ⁸⁾ (Part A)	5.65
Silica Silylate ⁹⁾ (Part A)	0.1
Sodium Methylparaben ¹⁰⁾ (Part B)	0.1
Aluminium Chlorohydrate ¹¹⁾ (Part B)	20
Water (Part B)	44.47
Fragrance (Part C)	3.33

- 1) Tween 65; trademark and origin : CRODA
- 2) Dehymuls PGPH; trademark and origin : BASF
- 3) Abil EM-90; trademark and origin : BASF
- 4) Dow Corning 345 fluid; trademark and origin : Dow Corning
- 5 5) Crodamol ipis; trademark and origin : CRODA
- 6) Phenoxyethanol; trademark and origin : LANXESS
- 7) Sensiva sc 50; trademark and origin : KRAFT
- 8) Tegosoft TN; trademark and origin : Evonik
- 9) Aerosil R 812; trademark and origin : Evonik
- 10 10) Nipagin mna; trademark and origin : CLARIANT
- 11) Locron L; trademark and origin : CLARIANT

The ingredients of Part A and Part B are weighted separately. Ingredients of Part A are heated up to 60°C and ingredients of Part B are heated to 55 °C. Ingredients of Part B are poured small parts while continuous stirring into A. Mixture were stirred well until the room temperature was reached. Then, ingredients of part C are added. The emulsion is mixed and is introduced into the aerosol cans. The propellant is crimped and added.

Aerosol filling: 30% Emulsion: 70% Propane / Butane 2,5 bar

Example 16
Deodorant spray composition

A sufficient amount of microcapsules of the present invention according to Examples 1 and 3 is weighed and mixed in antiperspirant deodorant spray composition to add the equivalent of 0.2% perfume.

Table 19: deodorant spray composition

Ingredient	Amount (wt %)
Ethanol 95 %	90.65
Triclosan ¹⁾	0.26
Isopropyl miristate	9.09

1) Irgasan® DP 300; trademark and origin : BASF

5 All the ingredients according to the sequence of the Table above are mixed and dissolved. Then the aerosol cans are filled, crimp and the propellant is added (Aerosol filling: 40% active solution 60% Propane / Butane 2.5 bar).

Example 17

10 Antiperspirant roll-on emulsion composition

A sufficient amount of microcapsules of the present invention according to Examples 1 and 3 is weighed and mixed in antiperspirant roll-on emulsion composition to add the equivalent of 0.2% perfume.

15 Table 20: antiperspirant roll-on emulsion composition

Ingredient	Amount (wt %)
Steareth-2 ¹⁾ (Part A)	3.25
Steareth-21 ²⁾ (Part A)	0.75
PPG-15 Stearyl Ether ³⁾ (Part A)	4
WATER deionised (Part B)	51
Aluminum Chlorohydrate 50% aqueous solution ⁴⁾ (Part C)	40
Fragrance (Part D)	1

- 1) BRIJ 72; origin : ICI
2) BRIJ 721; origin : ICI
20 3) ARLAMOL E; origin : UNIQEMA-CRODA
4) LOCRON L; origin : CLARIAN

Part A and B are heated separately to 75°C; Part A is added to part B under stirring and the mixture is homogenized for 10 minutes. Then, the mixture is cooled down under stirring; and

part C is slowly added when the mixture reached 45°C and part D when the mixture reached at 35 °C while stirring. Then the mixture is cooled down to RT.

Example 18

Antiperspirant roll-on composition

A sufficient amount of microcapsules of the present invention according to Examples 1 and 3 is weighed and mixed in antiperspirant roll-on composition to add the equivalent of 0.2% perfume.

Table 21: antiperspirant roll-on composition

Ingredient	QUANTITY
Water (Part A)	45
Aluminum Chlorohydrate 50% aqueous solution ¹⁾ (Part B)	20
Alcohol Denat. (Ethanol 96%) (Part B)	30
Ceteareth-12 ²⁾ (Part C)	2
Ceteareth-30 ³⁾ (Part C)	2
Fragrance (Part D)	1

- 1) LOCRON L; origin: CLARIANT
- 2) EUMULGIN B-1; origin : BASF
- 3) EUMULGIN B-3; origin : BASF

The ingredients of part B are mixed in the vessel then ingredient of part A is added. Then dissolved part C in part A and B. With perfume, 1 part of Cremophor RH40 for 1 part of perfume is added while mixing well

Example 19

Antiperspirant roll-on composition

A sufficient amount of microcapsules of the present invention according to Examples 1 and 3 is weighed and mixed in antiperspirant roll-on emulsion composition to add the equivalent of 0.2% perfume.

Table 22: antiperspirant roll-on emulsion composition

Ingredient	Amount (wt %)
------------	---------------

Water (Part A)	50.51
Hydroxyethylcellulose ¹⁾ (Part A)	0.71
Ethanol 95 % (Part B)	40.40
1,2-Propylene Glycol (Part B)	5.05
Triclosan ²⁾ (Part B)	0.30
PEG-40 Hydrogenated castor oil ³⁾ (Part C)	3.03

1) Natrosol® 250 H; trademark and origin: Ashland

2) Irgasan® DP 300; trademark and origin : BASF

3) Cremophor® RH 40; trademark and origin : BASF

5 Part A is prepared by sprinkling little by little the Hydroxyethylcellulose in the water whilst rapidly stirring with the turbine. Stirring is continued until the Hydroxyethylcellulose is entirely swollen and giving a limpid gel. Then, Part B is poured little by little in Part A whilst continuing stirring until the whole is homogeneous. Part C is added.

10

Example 20

Deodorant pump without alcohol formulation

A sufficient amount of microcapsules of the present invention according to Examples 1 and 3 is weighed and mixed in the following composition to add the equivalent of 0.2% perfume.

15

Table 23: deodorant composition

Ingredients	Amount (wt %)
C12-15 Alkyl Lactate ¹⁾	5
Dimethicone ²⁾	91.6
Cetyl Lactate ³⁾	1
Octyldodecanol ⁴⁾	0.8
Triclosan ⁵⁾	0.1
PERFUME	1.5

1) Ceraphyl 41; trademark and origin ASHLAND

2) DOW CORNING 200 FLUID 0.65cs; trademark and origin DOW CORNING CORPORATION

3) Ceraphyl 28; trademark and origin ASHLAND

4) Eutanol G; trademark and origin BASF

5) Irgasan® DP 300; trademark and origin : BASF

20

All the ingredients are mixed according to the sequence of the table and the mixture is heated slightly to dissolve the Cetyl Lactate.

5

Example 21

Deodorant pump with alcohol formulation

A sufficient amount of microcapsules of the present invention according to Examples 1 and 3 is weighed and mixed in the following composition to add the equivalent of 0.2% perfume.

10

Table 24: deodorant composition

Ingredients	Amount (wt %)
Ethyl Alcohol (Part A)	60
PEG-6 Caprylic/Capric Glycerides ¹⁾ (Part A)	2
Water (Part A)	35.6
PEG-40 Hydrogenated Castor Oil ²⁾ (Part B)	0.4
PERFUME (Part B)	2

- 1) Softigen 767; trademark and origin CRODA
2) Cremophor® RH 40; trademark and origin : BASF

15 Ingredients from Part B are mixed together. Ingredients of Part A are dissolved according to the sequence of the Table and are poured into part B.

Example 22

Deodorant stick without alcohol formulation

20

A sufficient amount of microcapsules of the present invention according to Examples 1 and 3 is weighed and mixed in the following composition to add the equivalent of 0.2% perfume.

Table 25: deodorant composition

Ingredient	Amount (wt %)
Stearic acid (Part A)	5.05
1,2-propylene glycol (Part A)	41.87
Sodium hydroxide 20% aqueous solution (Part A)	4.24

Water (Part A)	30.30
Tetrasodium EDTA ¹⁾ (Part A)	0.10
Cetareth-25 ²⁾ (Part A)	1.52
PPG-3 Myristyl ether ³⁾ (Part A)	1.52
1,2-propylene glycol (Part B)	15.14
Triclosan ⁴⁾ (Part B)	0.25

- 1) Edeta® B Power; trademark and origin : BASF
- 2) Cremophor® A25; trademark and origin: BASF
- 3) Tegosoft® APM; trademark and origin: Evonik
- 4) Irgasan® DP 300; trademark and origin : BASF

5

All the components of Part A are weighted and heated up to 70-75°C. Cetareth-25 is added once the other Part A ingredients are mixed and heated. Once the Cetareth-25 is dissolved, the Stearic Acid is added. Part B is prepared by dissolving the Triclosan in 1,2 Propylene Glycol. Water which has evaporated is added. Slowly under mixing, Part B is poured into part A. To stock, a plastic bag into the bucket is put in to be sealed after cooling. Moulds was filled at about 70°C.

10

Example 23

Anti-perspirant stick

15

A sufficient amount of microcapsules of the present invention according to Examples 1 and 3 is weighed and mixed in the following composition to add the equivalent of 0.2% perfume.

Table 26: deodorant composition

Ingredient	Amount (wt %)
Cyclomethicone ¹⁾ (Part A)	55.56
Stearyl Alcohol ²⁾ (Part A)	21.21
PPG-14 Butyl ether ³⁾ (Part A)	2.02
Hydrogenated Castor Oil ⁴⁾ (Part A)	1.01
Aluminium Zirconium tetrachlorohydrate-Gly ⁵⁾ (Part B)	20.20

20

- 1) Dow Corning® 345 Fluid; trademark and origin: Dow Corning
- 2) Lanette® 18; trademark and origin: BASF
- 3) Tegosoft® PBE; trademark and origin: Evonik
- 4) Cutina® HR; trademark and origin: BASF

5) Summit AZP-908; trademark and origin: Reheis

All the components of Part A are weighted, heated up to 70-75°C and mixed well. Ingredient of Part B is dispersed in Part A. The mixture is mixed and putted into a tick at 65 °C.

5

Example 24
Day cream

10 A sufficient amount of microcapsules of the present invention according to Examples 1 and 3 is weighed and mixed in the following composition to add the equivalent of 0.2% perfume.

Table 27: day cream

Ingredients	%
ARLATONE 985 Ethoxylated Fatty Alcohol Ester	5.000
CETYL ALCOHOL	0.500
TEFOSE 2561 Ceteth-20 (and) Glyceryl Stearate (and) PEG-6 Stearate (and) Steareth-20	4.000
COSBIOL Squalan	1.000
MINERAL OIL 30-40 cp Paraffin Oil	2.000
PETROLEUM JELLY Petrolatum	6.000
WATER deionized	75.850
PROPYLENE GLYCOL	5.000
GLYDANT PLUS DMDM Hydantoin (and) Iodopropynyl Butylcarbamate	0.150
PNC 400 Sodium Carbomer	0.200
PERFUME	0.300
Total	100.00

Example 25

Talc formulation

- 5 A sufficient amount of granules 1-5 according to Example 7 is weighed and mixed in introduced in a standard talc base: 100% talc, very slight characteristic odor, white powder, origin: LUZENAC to add the equivalent of 0.2% perfume.

Example 26

10

Shower-gel composition

A sufficient amount of microcapsules of the present invention according to Examples 1 and 3 is weighed and mixed in the following composition to add the equivalent of 0.2% perfume.

- 15 Table 28: shower gel composition

Ingredients	Amount (% wt)	Function
WATER deionised	49.350	Solvent
Tetrasodium EDTA ¹⁾	0.050	Chelating agent
Acrylates Copolymer ²⁾	6.000	Thickener
Sodium C12-C15 Pareth Sulfate ³⁾	35.000	Surfactant
Sodium Hydroxide 20% aqueous solution	1.000	pH adjuster
Cocamidopropyl Betaine ⁴⁾	8.000	Surfactant
Methylchloroisothiazolinone and Methylisothiazolinone ⁵⁾	0.100	Preservative
Citric Acid (40%)	0.500	pH adjuster

- 1) EDETA B POWDER; trademark and origin: BASF
2) CARBOPOL AQUA SF-1 POLYMER; trademark and origin: NOVEON
3) ZETESOL AO 328 U; trademark and origin: ZSCHIMMER & SCHWARZ
4) TEGO-BETAIN F 50; trademark and origin: GOLDSCHMIDT
20 5) KATHON CG; trademark and origin: ROHM & HASS

Ingredients are mixed, pH is adjusted to 6-6.3 (Viscosity: 4500cPo +/-1500cPo (Brookfield RV / Spindle#4 / 20RPM)).

25

Example 27

Shower-gel composition

A sufficient amount of microcapsules of the present invention according to Examples 1 and 3 is weighed and mixed in the following composition to add the equivalent of 0.2% perfume.

Table 29: shower gel composition

Ingredients	Amount (% wt)	Function
WATER deionized	52.40	Solvent
Tetrasodium EDTA ¹⁾	0.10	Chelating agent
Sodium Benzoate	0.50	Preservative
Propylene Glycol	2.00	Solvent
Sodium C12-C15 Pareth Sulfate ²⁾	35.00	Surfactant
Cocamidopropyl Betaine ³⁾	8.00	Surfactant
Polyquaternium-7 ⁴⁾	0.20	Conditioning agent
Citric Acid (40%)	1.00	pH adjuster
Sodium Chloride	0.80	Viscosity adjuster

5 1) EDETA B POWDER; trademark and origin: BASF

2) ZETESOL AO 328 U; trademark and origin: ZSCHIMMER & SCHWARZ

3) TEGO-BETAIN F 50; trademark and origin: GOLDSCHMIDT

4) MERQUAT 550; trademark and origin: LUBRIZOL

10 Ingredients are mixed, pH is adjusted to 4.5 (Viscosity: 3000cPo +/-1500cPo (Brookfield RV / Spindle#4 / 20RPM)).

Example 28

Shower-gel composition

15

A sufficient amount of microcapsules of the present invention according to Examples 1 and 3 is weighed and mixed in the following composition to add the equivalent of 0.2% perfume.

Table 30: shower gel composition

Ingredients	Amount (% wt)	Function
WATER deionized	50.950	Solvent
Tetrasodium EDTA ¹⁾	0.050	Chelating agent
Sodium Benzoate	0.50	Preservative
Glycerin 86%	3.50	Solvent
Sodium Laureth Sulfate ²⁾	27.0	Surfactant

Polyquaternium-7 ³⁾	1.0	Conditioning Agent
Coco-Betaine ⁴⁾	6.0	Surfactant
PEG-120 Methyl Glucose trioleate ⁵⁾	1.0	Thickener
Citric Acid (40%)	1.0	pH adjuster
Glycol Distearate & Laureth-4 & Cocamidopropyl Betaine ⁶⁾	3.0	Pearlizing agent
Sodium Chloride 20%	5.0	Viscosity adjuster
PEG-40 Hydrogenated Castor Oil ⁷⁾	1.0	Viscosity adjuster

1) EDETA B POWDER; trademark and origin: BASF

2) Texapon NSO IS; trademark and origin: COGNIS

3) MERQUAT 550; trademark and origin: LUBRIZOL

4) DEHYTON AB-30; trademark and origin: COGNIS

5) GLUCAMATE LT; trademark and origin: LUBRIZOL

6) EUPERLAN PK 3000 AM; trademark and origin: COGNIS

7) CREMOPHOR RH 40; trademark and origin: BASF

Ingredients are mixed, pH is adjusted to 4.5 (Viscosity: 4000cPo +/-1500cPo (Brookfield RV /
10 Spindle#4 / 20RPM))

Example 29

Hair coloration composition

15 A sufficient amount of microcapsules of the present invention according to Examples 1 and 3 is weighed and mixed with alkaline base A to add the equivalent of 0.2% perfume.

2g of alkaline base A is then mixed with 2g of the oxidative base B

20 Table 31: Composition of the alkaline base A

Ingredients	%
Phase A	
Water	39.13
Carbomer ¹⁾	0.9
p-phenylenediamine ²⁾	1
m-aminophenol ³⁾	1
m-phenylenediamine sulfate ⁴⁾	0.07
resorcinol ⁵⁾	0.5

Phase B	
Propylene glycol	6
Laureth-2 ⁶⁾	6
Laureth-12 ⁷⁾	6
Dimethicone ⁸⁾	0.7
Phase C	
Cetearyl alcohol ⁹⁾	18
Oleth-30 ¹⁰⁾	3
Lauric acid	3
Glycol distearate ¹¹⁾	3
Phase D	
Sodium metabisulfite ¹²⁾	0.4
Silica dimethyl silylate	0.3
Pentasodium pentetate ¹³⁾	0.2
Polyquaternium-22 ¹⁴⁾	1
Ammonium Hydroxide ¹⁵⁾	9.3
Perfume	0.5

- 1) Carbopol Ultrez 10 Polymer
- 2) Covastyle PAP
- 3) Covastyle MAP
- 4) Covastyle MPDS
- 5) 5) Resorcine
- 6) Lipocol L 12
- 7) Arlypon F
- 8) Dow Corning 200 Fluid 350
- 9) Lanette O
- 10) 10) Eumulgin O 30
- 11) Cutina AGS
- 12) Covastyle MBS
- 13) Dissolvine D-40
- 14) Merquat 280
- 15) 15) Ammonium hydroxide 30% aqueous solution

Procedure:

All ingredients of Phase A were mixed and heated until 75°C.

All ingredients of Phase B were combined and melt at 70-75°C.

Phase B was added to Phase A (both at 70-75°C) with good agitation.

Phase C was added while mixing continued until cooled down to room temperature

- 5 At room temperature Phase D ingredients were added while mixing
Remaining ingredients of Phase C were added under stirring.

Table 32: Composition of the oxidative base B

Ingredients	%
Phase A	
Water	75
Phase B	
Cetearyl alcohol and dicethyl phosphahate and Cteteth-20 phosphate ¹⁾	3.5
Mineral oil ²⁾	3.5
Cetyl acetate and acetylated lanolin alcohol ³⁾	0.35
Steareth-20 ⁴⁾	0.35
Phase C	
Hydrogen peroxide ⁵⁾	17
Perfume	0.3

1) Crodafos CS 20 Acid

- 10 2) Paraffin Oil 30-40 cPs

3) Acetulan

4) Brij 78P

5) Hydrogen Peroxide 35% aqueous solution

Procedure:

- 15 All ingredients of Phase A were mixed and heated until 75°C.

All ingredients of Phase B were combined and melt at 70-75°C.

Phase B was added to Phase A (both at 70-75°C) with good agitation and mixing continued until cooled down to room temperature

At room temperature Phase C ingredients were added while mixing

20

Example 30
Hand Dishwash

A sufficient amount of microcapsules of the present invention according to Examples 1 and 3
5 is weighed and mixed in the following composition to add the equivalent of 0.2% perfume.

Table 33: Hand dishwash composition

Ingredients	Amount (% wt)	Function
Linear alkylbenzene sulfonic acid ⁽¹⁾	20	Anionic surfactant
Diethanolamide ⁽²⁾	3.5	Foam booster
Sodium Hydroxide (50%) ⁽³⁾	3.4	pH Adjuster/neutralizer
Secondary alcohol ethoxolate ⁽⁴⁾	2.5	Non-ionic surfactant
Sodium xylene sulfonate	6.3	Hydrotrope
Water	64.3	Solvent

- 1) Biosoft S-118®; trademark and origin : Stepan Company
2) Ninol 40-CO®; trademark and origin : Stepan Company
10 3) Stepanate SXS®; trademark and origin : Stepan Company
4) Tergitol 15-S-9®; trademark and origin : Dow Chemical Company

Water with sodium hydroxide and diethanolamide are mixed. LAS is added. After the LAS is
neutralized, the remaining ingredients are added. The pH was Checked (=7-8) and adjusted
15 if necessary.

Example 31
Toothpaste formulation

20 A sufficient amount of microcapsule slurry R (corresponding to microcapsules of the present
invention according to Examples 1 and 3 except that a flavor is encapsulated instead of a
perfume) is weighed and mixed in the following composition to add the equivalent of 0.2%
flavor.

25 Table 34: Toothpaste formulation

Ingredients	Amount (% wt)
-------------	---------------

Polyethylene glycol 400	2.0%
Xanthan Gum	0.60%
Sorbitol 70% Solution	50.0%
Sodium Fluoride	0.220%
Sodium Benzoate	0.20%
Water	15.230%
Hydrated Silica ¹⁾	22.0%
Hydrated Silica ²⁾	7.0%
Titanium Dioxide CI77891	0.500%
Sodium Lauryl Sulfate	1.250%
Flavor	1.20%
TOTAL	100%

1) Tixosil 73; trademark and origin :

2) Tixosil 43; trademark and origin :

5

Example 32

Dicalcium Phosphate based toothpaste formulation

10 A sufficient amount of microcapsule slurry R (corresponding to microcapsules of the present invention according to Examples 1 and 3 except that a flavor is encapsulated instead of a perfume) is weighed and mixed in the following composition to add the equivalent of 0.2% flavor.

Table 35: Toothpaste formulation

Ingredients	Amount (% wt)
Sodium carboxymethyl cellulose	1.20%
Flavor	1.20%
DI/Purified Water	Q.S to Final Wt.
Sodium Lauryl Sulfate	1.30%
Glycerine	20.0%
Sodium Saccharin	0.20%
Dicalcium phosphate dihydrate	36.0%
Methylparaben	0.200%

Silica ¹⁾	3.0%
TOTAL	100%

1) Aerosil®200; trademark and origin:

Example 33

Mouthwash alcohol free formulation

5

A sufficient amount of microcapsule slurry R (corresponding to microcapsules of the present invention according to Examples 1 and 3 except that a flavor is encapsulated instead of a perfume) is weighed and mixed in the following composition to add the equivalent of 0.2% flavor.

10

Table 36: Mouthwash formulation

Ingredients	Amount (% wt)
Propylene Glycol	10.0%
Flavor	0.240%
DI/Purified Water	Q.S to Final Wt.
Poloxamer 407 NF	0.240%
Sodium Lauryl Sulfate	0.040%
Sorbitol 70% Solution	10.0%
Sodium Saccharin	0.030%
Glycerine	3.0%
Sodium Benzoate	0.10%
Sucralose	0.020%
Benzoic Acid	0.050%
TOTAL	100 %

Example 34

Mouthwash formulation

15

A sufficient amount of microcapsule slurry R (corresponding to microcapsules of the present invention according to Examples 1 and 3 except that a flavor is encapsulated instead of a perfume) is weighed and mixed in the following composition to add the equivalent of 0.2% flavor.

Table 37: Mouthwash formulation

Ingredients	Amount (% wt)
Ethyl Alcohol 190 Proof	15.00%
Flavor	0.24%
DI/Purified Water	Q.S to Final Wt.
Poloxamer 407 NF	0.24%
Sodium Lauryl Sulfate	0.04%
Sorbitol 70% Solution	10.00%
Sodium Saccharin	0.03%
Glycerine	3.00%
Sodium Benzoate	0.10%
Sucralose	0.02%
Benzoic Acid	0.05%
TOTAL	100%

CLAIMS

1. Process for preparing a core-shell microcapsule or core-shell microcapsule slurry, wherein the process comprises the steps of:
 - 5 a. Admixing a hydrophobic material, preferably a perfume oil, and a polylactone-based polyisocyanate prepolymer obtained by reacting a polylactone polyol and a polyisocyanate to form an oil phase;
 - b. Dispersing the oil phase in a dispersing phase comprising an emulsifier or stabilizer and, optionally, a cross-linker to form an emulsion;
 - 10 c. Optionally, adding into the emulsion a cross-linker;
 - d. Applying conditions sufficient to induce cross-linking of the polylactone-based polyisocyanate prepolymer to form the core-shell microcapsule or core-shell microcapsule slurry.
- 15 2. The process according to claim 1, wherein polylactone-based polyisocyanate prepolymer is obtained by a process comprising the following steps:
 - i. Providing a polylactone polyol and optionally a solvent;
 - ii. Adding a polyisocyanate to the mixture of step i. with an excess of NCO functional groups over OH groups, preferably with a molar ratio of
20 $\text{NCO/OH} > 2$, preferably with a molar ratio of $\text{NCO/OH} > 4$;
 - iii. Applying conditions to form a reaction between the OH functional groups of the polylactone polyol and the NCO functional groups of the polyisocyanate to form the polylactone-based polyisocyanate prepolymer.
- 25 3. The process according to any one of claims 1 and 2, wherein the polylactone polyol is a polycaprolactone, preferably a polycaprolactone diol or triol.
4. The process according to any one of claims 1 to 3, wherein the polylactone polyol has a molecular weight at the range from 200 g/mol to 10000 g/mol, preferably from 220
30 g/mol to 2000 g/mol, and more preferably from 240 g/mol to 550 g/mol.
5. The process according to any one of claims 1 to 4, wherein the polyisocyanate comprises an aliphatic polyisocyanate, an aromatic polyisocyanate or a mixture of an aliphatic and aromatic polyisocyanates, preferably comprising an aromatic
35 polyisocyanate.

6. The process according to any one of claims 1 to 5, wherein the polyisocyanate is xylylene diisocyanate, toluene diisocyanate, 1,5-pentamethylene diisocyanate, 1,6-hexamethylene diisocyanate, L-Lysine diisocyanate, sophorone diisocyanate, methylene diphenyl diisocyanate, L-Lysine diisocyanate ethyl ester, lysine triisocyanate, aliphatic isocyanate biuret, aliphatic or aromatic isocyanate trimethylol propane (TMP) adduct, aromatic isocyanate trimethylol propane (TMP) adduct, preferably xylylene diisocyanate, toluene diisocyanate, methylene diphenyl diisocyanate and aromatic isocyanate trimethylol propane (TMP) adduct, more preferably xylylene diisocyanate, toluene diisocyanate and aromatic isocyanate trimethylol propane (TMP) adduct.
7. The process according to any one of claims 1 to 6, wherein the emulsifier or stabilizer is polymeric stabilizer such as polyvinyl alcohol, a cellulose derivative, polyethylene oxide, a copolymer of polyethylene oxide and polyethylene or polypropylene oxide, a copolymer of acrylamide and acrylic acid, a copolymer of vinylpyrrolidone and of a quaternized vinylimidazol and sodium dodecyl sulfate; inorganic colloidal stabilizer such as hydroxyapatite, calcium carbonate, kaolin, laponite, silica, amine functionalized silica, clays, sericite mica, tri-calcium phosphate; polysaccharides such as Gum Arabic, starch, modified starch, chitosan, sodium alginate, alginic acid, cellulose, chitin, pectin, sugar beet pectin or colloidal stabilizers comprising these polysaccharides; proteins such as silk fibroin, sericin, gelatin, sodium caseinate, casein, bovine serum albumin, whey protein isolate, potato protein, soy protein isolate and mixtures thereof or colloidal stabilizers comprising these proteins.
8. The process according to any one of claims 1 to 7, wherein the cross-linker is multi-functionalized amines such as ethylenediamine, diethylenetriamine, triethylenetetramine, guanidine, 1,5-pentanediamine, 1,8-diaminooctane, 1,12-diaminododecane, 3,5-Diamino-1,2,4-triazole, urea; amino acids such as L-lysine, L-tryptophan, L-cystine, cystamine, and their hydrochloric acid salts, multi-functionalized polyols such as 1,5-pentanediol, 1,6-hexanediol, and polylactone-based polyols or multi-functionalized thiols.
9. The process according to any one of claims 1 to 8, wherein the condition sufficient to induce the cross-linking include heating the oil in water emulsion at elevated temperature, preferably at a temperature of at least 30°C, for at least 30 minutes.

10. Core-shell microcapsule or core-shell microcapsule slurry obtainable by the process according to any one of claims 1 to 9.
11. The core-shell microcapsule or core-shell microcapsule according to claim 10,
5 wherein the core-shell microcapsule comprises
- a core, preferably an oil core, comprising a hydrophobic material, preferably a perfume oil,
 - a cross-linked polymeric shell surrounding the oil core and wherein the cross-linked polymeric shell is obtained by the reaction of a polylactone-based
10 polyisocyanate prepolymer obtained by reacting polylactone polyol and a polyisocyanate and, optionally, a cross-linker.
12. A perfuming composition comprising
- a core-shell microcapsule or core-shell microcapsule slurry obtained by the
15 process according to any one of claims 1 to 9 or as defined by claims 10 and 11,
 - at least one ingredient selected from the group consisting of a perfumery carrier and a perfumery base, and
 - optionally, at least one perfumery adjuvant.
13. A perfumed consumer product comprising
- a core-shell microcapsule or core-shell microcapsule slurry obtained by the
20 process according to any one of claims 1 to 9 or as defined by claims 10 and 11,
and
 - a personal care, home care, or fabric care active base.
14. The perfume consumer product according to claim 13, wherein the perfumed
25 consumer product is preferably selected from the group consisting of personal care composition, home care composition or fabric care composition, most preferably in form of antiperspirants, hair care products, such as shampoo or hair-conditioner,
30 body care products such as a shower gel, oral care products, laundry care products, preferably a detergent or a fabric softener.