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(54) Title: COMPOSITIONS COMPRISING ODORLESS 1,2-PENTANEDIOL

(57) Abstract: Suggested is a cosmetic or pharmaceutical or detergent composition comprising 1,2 pentanediol, wherein said 1,2-pentanediol is obtained from a process comprising the follow ing steps: (a) providing at least one starting material selected from furfuryl alcohol and furfural; (b) reacting at least one of said starting materials with hydrogen in the presence of a heterogeneous catalyst to form 1,2-pentanediol, wherein said heterogeneous catalyst comprises: one or more metals selected from the group consisting of platinum, rhodium, ruthenium, nickel, palladium and iridium in metallic form and/or one or more compounds of metals selected from the group consisting of platinum, rhodium, ruthenium, nickel, palladium and iridium; and one or more support materials selected from the group consisting of activated carbon, aluminum oxide, silicon dioxide, and silicon carbide; and (c) removing the 1,2-pentanediol thus obtained from the reaction mixture.

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[0007] For example, Adkins and Connor [Journal of American Chemical Society 53, 1091 (1931)] report that the hydrogenation or hydrogenolysis of furfuryl alcohol at 175 °C in a liquid phase using copper chromite as catalyst yields a mixture of 40% 1,2-pentanediol, 30% 1,5-pentanediol, 10% amyl alcohol as well as 20% tetrahydrofurfuryl alcohol and methyltetrahydrofuran. Kaufmann and Adams [**Journal of American Chemical Society 45, 3029 (1923)]** report that the hydrogenolysis/hydrogenation of furfural in the presence of platinum black at room temperature yields a mixture of furfuryl alcohol, 1-pentanol, tetrahydrofurfuryl alcohol, 1,2-pentanediol and 1,5-pentanediol.

[0008] Furthermore, studies of catalytic hydrogenations or hydrogenolyses of furan and furan derivatives in the liquid phase by means of platinum dioxide catalysts are found in the works of Smith and Fuzek [**Journal of American Chemical Society 71, 415 (1949)].** The reactions were carried out in acetic acid at a hydrogen pressure of 20, 40 or 60 psi (60 psi corresponds to about 4 bar), the mentioned catalyst was prepared according to the literature [**Organic Synthesis 8, 92 (1928**)]. In the hydrogenation or hydrogenolysis of furfuryl alcohol using platinum dioxide as catalyst, 1,2-pentanediol is allegedly formed in almost quantitative yield; the 1,2-pentanediol was separated from the acetic acid in the form of the diacetate.

[0009] US 6,528,665 B1 proposes a process for the preparation of alkanediols that are as pure as possible. According to **US 6,528,665 B1**, purification is carried out at the stage of the epoxyalkanes, before they are hydrolyzed to the corresponding alkanediols.

[0010] EP 1876162 A1 describes the preparation of alkanediols from the corresponding olefins by means of epoxidation and subsequent hydrolysis. The crude products so obtained were purified further therein by means of subsequent treatment, in order to remove secondary products having an unpleasant smell.

[0011] The preparation of 1,2-pentanediol is nowadays generally carried out from n-pent-1-ene, which is available from petrochemical sources. The n-pent-1-ene is reacted to give the corresponding epoxide with the aid of peroxides (e.g. hydrogen peroxide) and then converted into 1,2-pentanediol with organic acids such as formic acid or mineral acids.

[0012] This preparation method is described in **EP 0257243 A1** or **EP 0141775 A1** and has economic and ecological disadvantages. For example, the diester of 1,2-pentanediol that is formed as an intermediate in this process must be saponified in order to obtain 1,2-pentanediol. If the epoxidation of n-pent-1-ene is carried out, for example, with hydrogen peroxide and formic acid, sodium formate is formed as a coupling product in the subsequent saponification of the diformate of 1,2-pentanediol with sodium hydroxide solution and must be disposed of, thus leading to an high load of organics in the wast water. Furthermore, n-pent-1-ene has a very low boiling point, which requires special and more expensive protective measures when handling and storing n-pent-1-ene due to the high volatility. In addition, it would be desirable to find a simple synthesis route that is practicable on an industrial scale, preferably without using a petrochemical raw material.

[0013] Finally, international patent application **WO 2012 152 849 A1** (SYMRISE) discloses an alternative process for producing 1,2-pentanediol, comprising reacting a starting material comprising one or both compounds selected from the group consisting of furfuryl alcohol and furfural with hydrogen in the presence of an heterogeneous catalyst to form a mixture comprising 1,2-pentanediol and optionally one or more compounds selected from the group consisting of 1-hydroxy-2-pentanone, furfuryl alcohol and furfural, wherein the heterogeneous catalyst comprises: one or more metals selected from the group consisting of platinum, rhodium, ruthenium, nickel, palladium and iridium in metallic form and/or one or more compounds of metals selected from the group consisting of platinum, rhodium, ruthenium, nickel, palladium and iridium; and one or more support materials selected from the group consisting of activated carbon, aluminum oxide, silicon dioxide, and silicon carbide.

OBJECT OF THE INVENTION

[0014] Therefore, it has been the object of the present invention providing cosmetic compositions incorporating 1,2-pentanediol and optionally further 1,2-alkanediols with improved olfactory quality and stability within a formulation.

BRIEF DESCRIPTION OF THE INVENTION

[0015] A first object of the present invention refers to a cosmetic or pharmaceutical or detergent composition comprising 1,2-pentanediol, wherein said 1,2-penbtanediol is obtained from a process comprising the following steps:

(a) providing at least one starting material selected from furfuryl alcohol and furfural;

(b) reacting at least one of said starting materials with hydrogen in the presence of a heterogeneous catalyst to form 1,2-pentanediol, wherein said heterogeneous catalyst comprises:

- one or more metals selected from the group consisting of platinum, rhodium, ruthenium, nickel, palladium and iridium in metallic form and/or
- one or more compounds of metals selected from the group consisting of platinum, rhodium, ruthenium, nickel, palladium and iridium; and
- one or more support materials selected from the group consisting of activated carbon, aluminum oxide, silicon dioxide, and silicon carbide; and

(c) removing the 1,2-pentanediol thus obtained from the reaction mixture.

[0016] Surprisingly it has been observed that 1,2-pentanediol obtained according to the process of said WO 2012 152 849 A1 is not only odorless when fresh prepared, but maintains its superior odor quality also when incorporated into various cosmetic or pharmaceutical compositions, even under tough storage conditions. Applicant has discovered that these superior properties are most likely associated with the absence of traces of various byproducts, which are unstable when introduced into a complex formulation and undergo chemical degradation along with the production of a rancid odor.

[0017] Surprisingly it has been observed that the 1,2-pentanediol which is obtained according to process as described above is not only free or at least essentially free of malodour compounds, but also from compounds which themselves do not provide malodour, but develop malodour when incorporated into a consumer product formulation, particularly in case such formulation shows an alkaline pH value. Essentially free in the context of this specification has the meaning that the amount of malodour compounds or malodour causing compounds is less than 10 ppm, preferably less than 1 ppm and preferably ranges between 10 0 an 1.000 ppb. Typical examples for this kind of impurities encompass butyric acid and butyric acid esters, whereby the latter are formed from traces of butyric acid when incorporated into an alkaline consumer product formulation.

[0018] Preferably said compositions comprise said 1,2-pentanediol in amounts of from about 0.1 to about 10 wt.-percent, preferably from about 0.5 to about 5 wt.-percent and more preferably from about 1 to about 2 wt.-percent.

[0019] Preferably, said compositions further comprise 1,2-alkanediols with 6 to 12 carbon atoms, such as 1,2-alkanediols such as 1,2-pentanediol, 1,2-hexanediol, 1,2-heptanediol, 1,2-octanediol, 1,2-nonanediol, 1,2-decanediol, 1,2-undecanediol, 1,2-dodecanediol, 1,2-tetradecanediol and their mixtures, more preferably in amounts of from about 0.1 to about 5 and most preferably about 0.5 to about 2 wt.-percent. The presence of additional 1,2-alkanediols improves solubility of oil components in a synergistic manner.

[0020] Preferably, said compositions comprise 4-hydroxyacetophenone, typically in amounts from about 0.01 to about 2 wt.-percent, and more preferably from about 0.1 to about 1 wt.-percent. The presence of 4-hydroxyacetophenone also improves solubility of oil components in a synergistic manner.

MANUFACTURE OF 1,2-PENTANEDIOL

[0021] As already explained above, the 1,2-pentanediol quality, which is used in accordance with the present invention, has been prepared according to the teaching of WO 2012 152 849 A1, which is therefore incorporated by reference.

[0022] Accordingly, the present invention provides a process for the preparation of 1,2-pentanediol, comprising the step reaction of a starting material comprising one or both compounds from the group consisting of furfuryl alcohol and furfural with hydrogen in the presence of a heterogeneous catalyst to form a mixture comprising 1,2-pentanediol and optionally one or more compounds from the group consisting of 1-hydroxy-2-pentanone, furfuryl alcohol and furfural, wherein the heterogeneous catalyst (i) comprises one or more metals from the group consisting of platinum, rhodium, ruthenium, nickel, palladium and iridium in metallic form and/or one or more compounds of metals from the group consisting of platinum, rhodium, ruthenium, nickel, palladium and iridium, and (ii) one or more support materials.

HOMOGENOUS CATALYSTS

[0023] Preferably, the heterogeneous catalyst comprises (i) platinum in metallic form and/or one or more platinum (IV) compounds. Particularly preferably, the heterogeneous catalyst is selected from the group consisting of catalysts comprising (i) platinum in metallic form and (ii) activated carbon, in particular platinum on activated carbon, catalysts comprising (i) platinum in metallic form and (ii) aluminum oxide, in particular platinum on aluminum oxide, catalysts comprising (i) platinum in metallic form and (ii) silicon dioxide, in particular platinum on silicon dioxide, catalysts comprising (i) platinum in metallic form and (ii) silicon carbide, in particular platinum on silicon carbide, catalysts comprising (i) platinum (IV) oxide and (ii) aluminum oxide, in particular platinum dioxide on aluminum oxide.

[0024] Preferably, the heterogeneous catalysts to be used according to the invention are not catalysts that contain, in addition to a support material, two ingredients and are selected from the following list:

Activated carbon/Pt/ReO_2,

MgO/Pd/MnO_2,

Al_2O_3/Rh/MoO_3,

CaO/Ru/Co_3O4,

Amorphous aluminosilicate/Co/TiO_2,

SiO_2/Ni/WO_3,

CeO/PtRh/Cr_2O_3,

CaO/NiPd/Fe_3O_4,

MgO--Al_2O_3/RuFe/$_2$V'O_5,

MgO/Pt/ReO_2,

Al_2O_3/Pd/MnO_2,

BaO/Rh/MoO_3,

Amorphous aluminosilicate/Ru/Co_3O_4,

SiO_2/Co/TiO_2,

CeO/Ni/WO_3,

CoO/Pd/Cr_2O_3,

$Fe_2O_3/Rh/Fe_3O_4$,

$MnO_2/Ru/V_2O_5$,

and mixtures thereof.

[0025] Preferably, the heterogeneous catalysts to be used according to the invention are not catalysts in which the following pairs of ingredients are present:

Pt/ReO_2,

Pd/MnO_2,

Rh/MoO_3,

Ru/Co_3O_4,

Co/TiO_2,

Ni/WO_3,

$PtRh/CrO_3$,

$NiPd/Fe_3O_4$,

$RuFe/V_2O_5$,

Pd/Cr_2O_3,

Rh/Fe_3O_4,

Ru/V_2O_5,

and mixtures thereof.

[0026] If constituent (i) of the heterogeneous catalyst consists of platinum, then the heterogeneous catalyst is preferably free of ReO_2 and free of Cr_2O_3, preferably free of rhenium and free of chromium. This preferably also applies to heterogeneous catalysts whose constituent (i) comprises platinum.

[0027] If constituent (i) of the heterogeneous catalyst consists of palladium, then the heterogeneous catalyst is preferably free of Fe_3O_4 and free of MnO_2 and free of Cr_2O_3, preferably free of iron and free of manganese and free of chromium. This preferably also applies to heterogeneous catalysts whose constituent (i) comprises palladium.

[0028] If constituent (i) of the heterogeneous catalyst consists of rhodium, then the heterogeneous catalyst is preferably free of MoO_3 and free of Fe_2O_3 and free of Fe_3O_4 and free of Cr_2O_3, preferably free of molybdenum and free of iron and free of chromium. This preferably also applies to heterogeneous catalysts whose constituent (i) comprises palladium.

[0029] If constituent (i) of the heterogeneous catalyst consists of ruthenium, then the heterogeneous catalyst is preferably free of Co_3O_4 and free of V_2O_5, preferably free of cobalt and free of vanadium. This preferably also applies to heterogeneous catalysts whose constituent (i) comprises ruthenium.

[0030] If constituent (i) of the heterogeneous catalyst consists of nickel, then the heterogeneous catalyst is preferably free of WO_3 and free of Fe_3O_4, preferably free of tungsten and iron. This preferably also applies to heterogeneous catalysts whose constituent (i) comprises nickel.

[0031] Preferably, a heterogeneous catalyst to be used according to the invention is free of oxides of the elements Re, Mo, Mn, Co, Ti, W, Cr, Fe, V and Ta.

[0032] In the heterogeneous catalyst, the total concentration of (i) platinum, rhodium, ruthenium, nickel, palladium and iridium in metallic form and in the form of platinum, rhodium, ruthenium, nickel, palladium and iridium contained in compounds of those metals is preferably in the range from 0.1 wt. % to 50 wt. %, preferably from 0.5 wt. % to 20 wt. %, more preferably from 1 to 10 wt. %, particularly preferably from 1 wt. % to 5 wt. %, based on the total weight of all the constituents of the heterogeneous catalyst.

[0033] The total concentration of (i) platinum, rhodium, ruthenium, nickel, palladium and iridium in metallic form and in the form of platinum, rhodium, ruthenium, nickel, palladium and iridium contained in compounds of those metals in the heterogeneous catalyst is preferably in the range from 0.01 to 10 mol %, preferably in the range from 0.05 to 5 mol %, more preferably in the range from 0.1 to 2 mol %, based on the total amount of furfuryl alcohol and furfural that is used.

[0034] Preferably, both the total concentration, based on the total weight of all the constituents of the heterogeneous catalyst, of (i) platinum, rhodium, ruthenium, nickel, palladium and iridium in metallic form and in the form of platinum, rhodium, ruthenium, nickel, palladium and iridium contained in compounds of those metals, and the total concentration, based on the total amount of furfuryl alcohol and furfural that is used, of (i) platinum, rhodium, ruthenium, nickel, palladium and iridium in metallic form and in the form of platinum, rhodium, ruthenium, nickel, palladium and iridium contained in compounds of those metals in the heterogeneous catalyst are in the preferred ranges mentioned above.

REACTION CONDITIONS

[0035] For the reaction according to the invention in the presence of the heterogeneous catalyst, molecular hydrogen is to be metered in an at least equimolar amount. However, it has been found to be more advantageous to meter in hydrogen in an excess. Therefore, in the reaction in the presence of the heterogeneous catalyst, the molar ratio between hydrogen and the total amount of furfuryl alcohol and/or furfural is 1:1 or more and is preferably in the range from 4:1 to 100:1, particularly preferably in the range from 5:1 to 20:1.

[0036] In the reaction in the presence of the heterogeneous catalyst, the hydrogen partial pressure is preferably in the range from 1 bar to 20 bar, preferably in the range from 1 bar to 8 bar, more preferably in the range from 1 bar to 4 bar.

[0037] The reaction in the presence of the heterogeneous catalyst takes place in a liquid phase or in a gas phase.

[0038] If the reaction in the presence of the heterogeneous catalyst is carried out in a gas phase, this preferably takes place at a temperature in the range from 100° C to 250° C, more preferably in the range from 150° C to 240° C, particularly preferably in the range from 170° C to 230° C The temperature and the hydrogen partial pressure are preferably in the preferred ranges mentioned above.

[0039] The reaction in the presence of the heterogeneous catalyst preferably takes place in a reactor through which a gas stream flows continuously. On entering the reactor, the gas stream comprises the starting material (as described above) as well as hydrogen and optionally an inert gas, wherein the flow rate of the gas stream, based on the volume of the heterogeneous catalyst (gas hourly space velocity GHSV), is from 500 h^{-1} to 5000 h^{-1}, preferably from 900 h^{-1} to 3600 h^{-1} and/or the total concentration of furfuryl alcohol and furfural in the gas stream entering the reactor is from 1 mol % to 15 mol %, preferably from 3 mol % to 10 mol %.

[0040] Preferably, both the condition relating to the flow velocity and the condition relating to the total concentration of furfuryl alcohol and furfural in the gas stream entering the reactor are fulfilled.

[0041] The apparatus used for the reaction in the presence of the heterogeneous catalyst in a gas phase is preferably a tubular reactor which is charged with a heterogeneous catalyst as defined above. The feed stream, which is fed to the tubular reactor by way of suitable metering devices, consists of a starting material comprising one or both compounds from the group consisting of furfuryl alcohol and furfural and the necessary amount of hydrogen (preferably in the above-indicated molar ratio between hydrogen and the total amount of furfuryl alcohol and furfural) and optionally an inert gas. Furfuryl alcohol and/or furfural are converted into the gas phase by means of a saturator, which heats the liquid furfuryl alcohol and/or furfural to a temperature in the range from 80 to 120° C, particularly preferably from 90 to 110° C, and through which hydrogen or hydrogen and an inert gas flows. Alternatively, the liquid starting material is fed in by way of a metering pump or similar devices and an evaporator.

[0042] If the reaction in the presence of the heterogeneous catalyst is carried out in a liquid phase, then it preferably takes place at a temperature in the range from -20° C to +100° C, preferably from -20° C to +50° C, more preferably in the range from -5 to +50° C, yet more preferably in the range from -5° C to +30° C, particularly preferably in the range from 0° C to +30° C, most particularly preferably in the range from 0° C to +10° C Preferably, the temperature and the hydrogen partial pressure are in the preferred ranges mentioned above.

[0043] The reaction time for the reaction in the presence of the heterogeneous catalyst as defined above is preferably in the range from 1 to 20 hours, preferably in the range from 2 to 12 hours, more preferably in the range from 3 to 8 hours.

ORGANIC DILUENTS

[0044] According to the invention, the reaction of furfuryl alcohol with hydrogen is preferably carried out in one or more, preferably organic diluents having a pKs value at 25° C of greater than or equal to 6, preferably having a pKs value at 25° C of greater than or equal to 8, preferably having a pKs value at 25° C of greater than or equal to 10, particularly preferably having a pKs value at 25° C of greater than or equal to 12.

[0045] Preference is further given to organic diluents having a pKs value at 25° C in the range from 12 to 25, particularly preferably in the range from 13 to 20, most preferably in the range from 14 to 18.

[0046] The pKs value (also pKa value) corresponds to the negative common logarithm of the acid constant Ks. Acetic acid has a pKs value of 4.75.

[0047] The diluents to be used according to the invention are preferably inert under the reaction conditions, that is to say the diluents preferably do not themselves react, in particular are not themselves reduced, under the prevailing hydrogenation or hydrogenolysis conditions.

[0048] Diluents that are preferably to be used are or comprise one or more alcohols having from 1 to 4 carbon atoms, preferably selected from the group consisting of methanol, ethanol, n-propanol, isopropanol and mixtures thereof.

[0049] It is also possible to use non-polar and/or aprotic, inert solvents such as dibutyl ether, methyl tert-butyl ether (MTBE), cyclohexane, n-octane, isooctane or decalin, optionally in combination with one or more of the alcohols having from 1 to 4 carbon atoms characterized above as being preferred.

[0050] In a preferred embodiment, an inorganic acid, preferably having a pKs value at 25° C of less than 3, preferably having a pKs value at 25° C of less than 0, can be used in addition to a diluent, preferably in addition to one of the diluents characterized above as being preferred. A preferred inorganic acid is sulfuric acid, because it has been found to be particularly advantageous for the course of the hydrogenolysis in the process according to the invention.

[0051] In a particularly preferred embodiment, the reaction of furfuryl alcohol takes place in a diluent comprising or consisting of one or more alcohols selected from the group consisting of methanol, ethanol, n-propanol, isopropanol and mixtures thereof, and sulfuric acid. The combination of ethanol and sulfuric acid is particularly preferred.

[0052] If an inorganic acid is used, preferably sulfuric acid, the total amount is preferably in the range from 0.0001 to 1 wt. %, preferably in the range from 0.001 to 0.5 wt. %, particularly preferably in the range from 0.01 to 0.1 wt. %, based on the total mass of the diluent or diluents, the diluents in turn preferably being selected from the group consisting of methanol, ethanol, n-propanol, isopropanol and mixtures thereof.

[0053] The total amount of diluent or diluents, preferably having a pKs value at 25° C characterized above as being preferred or particularly preferred, preferably selected from the group of the diluents characterized above as being preferred, is preferably in the range from 25 to 1000 wt. %, preferably in the range from 50 to 500 wt. %, more preferably in the range from 100 to 300 wt. %, based on the total amount of furfuryl alcohol used.

PREFERRED EMBODIMENTS

[0054] A heterogeneous catalyst that is preferably to be used according to the invention is a heterogeneous platinum catalyst comprising (i) platinum and/or one or more platinum compounds (in particular platinum (IV) compounds) and (ii) one or more support materials. A heterogeneous platinum catalyst that is particularly preferably to be used according to the invention comprises (i) platinum and/or one or more platinum (IV) compounds and (ii) one or more support materials.

[0055] Preferred platinum (IV) compounds are H_2PtCl_6 and salts thereof, preferably $(NH_4)_2PtCl_6$, as well as platinum dioxide (of which PtO_2 and PtO_2 hydrate are preferred). A particularly preferred platinum (IV) compound is platinum dioxide PtO_2.

[0056] Preference is given to elemental, that is to say metallic, platinum, which can be doped with iron, vanadium and/or ruthenium.

[0057] The support material is preferably solid at 25° C and 1013 mbar, preferably also under hydrogenation conditions. The support material is preferably selected from the group consisting of activated carbon, silica, silicon dioxide and/or aluminum oxide.

[0058] Particularly preferred support materials are aluminum oxide and activated carbon, because platinum catalysts to be used according to the invention comprising aluminum oxide and/or activated carbon produced the best yields and the best selectivities of 1,2-pentanediol.

[0059] Preferably, therefore, the support material comprises activated carbon and/or aluminum oxide, consists of aluminum oxide or consists of activated carbon.

[0060] Gamma-aluminum oxide has been found to be a particularly good support material.

[0061] Particularly good results in a process according to the invention were achieved with platinum dioxide on aluminum oxide, or platinum on activated carbon or aluminum oxide; the best results were achieved with platinum dioxide on aluminum oxide, in particular with platinum dioxide on gamma-aluminum oxide.

[0062] The heterogeneous platinum catalysts to be used according to the invention are known per se and can be obtained, for example, according to Anal. Chem. 1956, 28(3), 362-365 or Thermochimica Acta 1977, 20(3), 297-308 or Proceedings of the 13th International Conference On X-Ray Absorption Fine Structure (XAFS13), Stanford, Calif., 2006, edited by B. Hedman and P. Pianetta, eConf C060709 (2006) (the complete text is available at http://www.slaCstanford.edu/econf/C060709/papers/207_WEPO17.PDF) or analogously thereto.

[0063] The amount of the heterogeneous platinum catalyst is preferably in the range from 0.1 to 20 wt. %, preferably in the range from 0.25 to 15 wt. %, more preferably in the range from 0.5 to 12 wt. %, based on the amount of furfuryl alcohol used.

[0064] The amount of constituent (i) of the heterogeneous platinum catalyst, that is to say the total content of platinum and/or platinum compounds, is preferably in the range from 0.5 to 50 wt. %, preferably in the range from 0.5 to 20 wt. %, more preferably in the range from 0.5 to 10 wt. %, based on the total amount of the heterogeneous platinum catalyst.

[0065] Particularly preferred platinum catalysts in a process according to the invention are platinum dioxide on aluminum oxide, preferably platinum dioxide on gamma-aluminum oxide, and/or platinum on activated carbon, the total content of platinum dioxide and/or platinum being in the range from 0.5 to 10 wt. %, based on the total amount of heterogeneous platinum catalyst used.

[0066] Preferably, a platinum catalyst (as defined above) to be used according to the invention as the heterogeneous catalyst is free of ReO_2 and free of Cr_2O_3, preferably free of rhenium and free of chromium. Preferably, a platinum catalyst (as defined above) to be used according to the invention as the heterogeneous catalyst is free of CeO_2, preferably free of cerium oxides, more preferably free of cerium, rhenium and chromium. Preferably, a platinum catalyst (as defined above) to be used according to the invention as the heterogeneous catalyst is free of oxides of the elements Re, Mo, Mn, Co, Ti, W, Cr, Fe, V and Ta.

[0067] In a preferred variant of the process according to the invention with a heterogeneous platinum catalyst as defined above, the mass ratio of furfuryl alcohol to the total amount of constituent (i) of the heterogeneous platinum catalyst is preferably in the range from 2000:1 to 10:1, preferably in the range from 1000:1 to 25:1, more preferably in the range from 500:1 to 50:1, most preferably in the range from 300:1 to 100:1.

[0068] Preferably, the hydrogenolysis of furfuryl alcohol in the process according to the invention is carried out at a temperature in the range from -20° C to +50° C, preferably in the range from -5 to +30° C, more preferably in the range from 0 to +10° C

[0069] The hydrogen pressure in the preferred variant of the process according to the invention with a heterogeneous platinum catalyst as defined above is preferably in the range from 1 to 20 bar, preferably in the range from 1 to 8 bar, more preferably in the range from 1 to 4 bar.

[0070] The reaction time in the preferred variant of the process according to the invention with a heterogeneous platinum catalyst as defined above is preferably in the range from 1 to 20 hours, preferably in the range from 2 to 12 hours, more preferably in the range from 3 to 8 hours.

[0071] The process according to the invention yields a product mixture in which 1,2-pentanediol generally represents the main product.

[0072] The reaction scheme below illustrates the reaction of furfuryl alcohol in a process according to the invention to give the desired main product 1,2-pentanediol and the secondary products that are generally obtained. In addition to the secondary products shown in the reaction scheme, which, thanks to the good yield and/or good selectivity of the process according to the invention, are formed in only small amounts, 1-hydroxy-2-pentanone is formed in particular in addition to the target product 1,2-pentanediol. In an advantageous further development of the process according to the invention (see below), the 1-hydroxy-2-pentanone is likewise reacted in a further reaction step to form the target product 1,2-pentanediol.

[0073] Preferably, the reaction is conducted in such a manner that at least 80 wt. %, preferably at least 90 wt. %, more preferably at least 95 wt. %, of the furfuryl alcohol used is reacted.

[0074] Preferably, the reaction is conducted in such a manner that the reaction mixture present when the reaction is complete comprises at least 40 wt. % 1,2-pentanediol, preferably at least 50 wt. %, more preferably at least 60 wt. %, particularly preferably at least 70 wt. %, based on the total amount of products formed.

[0075] To clarify: the indicated amounts by weight of 1,2-pentanediol in the reaction mixture are based only on the total amount of products formed from furfuryl alcohol. Accordingly, when determining the above-indicated amounts by weight of 1,2-pentanediol, any amounts of unreacted furfuryl alcohol present in the reaction mixture when the reaction is complete, and the amounts of platinum catalyst(s) and diluent(s), are not to be taken into consideration.

[0076] The above-indicated amounts by weight of 1,2-pentanediol in the reaction mixture are based in particular on the total amount of 1-pentanol, 2-pentanol, tetrahydrofurfurol, 1,2-pentanediol and 1,5-pentanediol in the reaction mixture when the reaction of furfuryl alcohol is complete.

[0077] The process according to the invention can be carried out in the liquid phase or in the gas phase.

[0078] The reaction can be carried out continuously, semi-continuously or batch-wise.

[0079] The reaction is preferably carried out in a batch process, preferably in a reaction vessel, the furfuryl alcohol and preferably the diluent that is optionally used being present in the liquid phase and being mixed with the catalyst to be used according to the invention.

[0080] The reaction is preferably carried out in a reaction tube, the catalyst to be used according to the invention being in the form of a fixed bed and the furfuryl alcohol and preferably the diluent that is optionally used being present in the liquid phase and being brought into contact with the fixed catalyst bed.

[0081] The respective process for the preparation of 1,2-pentanediol by reaction of furfuryl alcohol in the presence of a heterogeneous platinum catalyst is preferably characterized by the following steps:

(a) provision of a starting material comprising one or both compounds from the group consisting of furfuryl alcohol and furfural;

(b) provision of a heterogeneous catalyst as defined above;

(c) optional provision of one or more diluents;

(d) preparation of a mixture comprising the components provided in steps (a) and (b) and optionally (c), and contacting of the mixture with hydrogen or (d') preparation of a mixture comprising the starting material provided in step (a) and hydrogen and optionally an inert gas, and contacting of the mixture with the heterogeneous catalyst provided according to step (b); (e) in the mixture prepared in step (d) or (d'), reaction of the starting material with hydrogen in the presence of the heterogeneous catalyst to form a mixture comprising 1,2-pentanediol and optionally one or more compounds from the group consisting of 1-hydroxy-2-pentanone, furfuryl alcohol and furfural; (f) optional separation of the 1,2-pentanediol by distillation.

[0082] The diluents indicated above as being preferred or particularly preferred are thereby correspondingly preferred or particularly preferred.

[0083] The heterogeneous catalysts indicated above as being preferred or particularly preferred are thereby correspondingly preferred or particularly preferred.

[0084] Preferably one, a plurality or all of the reaction conditions indicated above as being preferred or particularly preferred are thereby established.

[0085] The order in which the components provided in steps (a) to (c) are mixed together in step (d) is not important.

[0086] In a particularly preferred variant, the process according to the invention comprises the steps:

(a) provision of furfuryl alcohol,

(b) provision of at least a heterogeneous catalyst as defined above, preferably a heterogeneous platinum catalyst, which comprises (i) platinum and/or a platinum compound and (ii) one or more support materials,

(c) optional provision of one or more diluents, preferably having a pKs value at 25° C of greater than or equal to 6,

(d) preparation of a mixture comprising the components provided in steps (a) and (b) and preferably (c), (e) contacting of the mixture prepared in step (d) with hydrogen.

[0087] In an alternative preferred variant, the process according to the invention comprises the steps:

(a) provision of a starting material comprising one or both compounds from the group consisting of furfuryl alcohol and furfural,

(b) provision of a heterogeneous catalyst as defined above,

(c) preparation of a mixture comprising the starting material provided in step (a) and hydrogen and optionally an inert gas, and

(d) contacting of the mixture with the heterogeneous catalyst provided according to step (a), in the mixture prepared in step (dc),

(e) reaction of the starting material with hydrogen in the presence of the heterogeneous catalyst to form a mixture comprising 1,2-pentanediol and optionally one or more compounds from the group consisting of 1-hydroxy-2-pentanone, furfuryl alcohol and furfural.

[0088] With the process according to the invention described above it is possible, by reaction of a starting material comprising one or both compounds from the group consisting of furfuryl alcohol and furfural, to achieve yields of 1,2-pentanediol that are superior to the known prior art. A further advantageous feature of the process according to the invention is the formation of the secondary product 1-hydroxy-2-pentanone with a high yield and selectivity. By contrast, other secondary products which are typically formed in processes known from the prior art are formed in only very small amounts in the process according to the invention. In particular, cyclic compounds can scarcely be detected in the mixture obtainable by the process according to the invention.

[0089] The sum of the selectivities for 1-hydroxy-2-pentanone and 1,2-pentanediol is generally over 80%, even in the case of almost complete conversion. In tests of processes known from the prior art for the preparation of 1,2-pentanediol, the compound 1-hydroxy-2-pentanone was not detected as a secondary product. The formation of 1-hydroxy-2-pentanone is advantageous compared with other secondary products because 1-hydroxy-2-pentanone can readily and very selectively be hydrogenated to 1,2-pentanediol under suitable conditions, in the presence of a second heterogeneous catalyst. This is the subject of an advantageous further development of the process according to the invention, which is described herein below. In an advantageous further development, the process according to the invention, in particular in the preferred variants described above, therefore comprises the further step reaction of compounds from the group consisting of 1-hydroxy-2-pentanone, furfuryl alcohol and furfural from the mixture formed in the above-described reaction in the presence of the heterogeneous catalyst with hydrogen in the presence of a second heterogeneous catalyst to form 1,2-pentanediol, wherein the second heterogeneous catalyst comprises (i') one or more metals from the group consisting of platinum, rhodium, ruthenium, nickel, palladium and iridium in metallic form and/or one or more compounds of metals from the group consisting of platinum, rhodium, ruthenium, nickel, palladium and iridium, and (ii') one or more support materials.

[0090] With this advantageous further development of the process according to the invention, the overall selectivity for 1,2-pentanediol can be increased to more than 80%. Separation of the 1,2-pentanediol before the reaction in the presence of the second heterogeneous catalyst is not necessary.

CO-CATALYSTS

[0091] If co-catalysts are applied, the total concentration of platinum, rhodium, ruthenium, nickel, palladium and iridium in metallic form and in the form of platinum, rhodium, ruthenium, nickel, palladium and iridium contained in compounds of those metals is preferably in the range from 0.1 wt. % to 20 wt. %, preferably from 0.5 wt. % to 10 wt. %, based on the total weight of all the constituents of the second heterogeneous catalyst.

[0092] In a preferred variant of this advantageous further development of the process according to the invention, the heterogeneous co-catalysts have the same composition.

[0093] Preferably, the support material (ii) of the heterogeneous catalyst and/or the support material (ii') of the heterogeneous co-catalyst is solid at 25° C and 1013 mbar, preferably also at 230° C and 1013 mbar, the support material (ii) and/or the support material (ii') preferably being selected from the group consisting of activated carbon, silica, silicon dioxide, silicon carbide, aluminum oxide, zirconium dioxide, titanium dioxide, niobium trioxide, cerium dioxide and mixtures thereof.

[0094] The reaction in the presence of the heterogeneous co-catalyst takes place in a liquid phase or in a gas phase. If the reaction in the presence of the second heterogeneous catalyst is carried out in a gas phase, then the temperature is preferably in the range from 25° C to 240° C, particularly preferably in the range from 100° C to 130° C, and/or the hydrogen partial pressure is in the range from 1 bar to 10 bar. Preferably, the temperature and the hydrogen partial pressure are in the preferred ranges mentioned here.

[0095] Preferably, the reaction in the presence of the second heterogeneous catalyst takes place in a reactor through which a gas stream flows continuously. On entering the reactor, the gas stream comprises the mixture formed in the reaction in the presence of the heterogeneous catalyst (as described above) as well as hydrogen and optionally an inert gas, wherein the flow rate of the gas stream, based on the volume of the second heterogeneous catalyst (gas hourly space velocity GHSV), is from 500 h.sup.-1 to 5000 h.sup.-1, preferably from 900 h.sup.-1 to 3600 h.sup.-1 and/or the total concentration of 1-hydroxy-2-pentanone, furfuryl alcohol and furfural in the gas stream entering the reactor is from 1 mol % to 15 mol %, preferably from 3 mol % to 10 mol %.

[0096] Preferably, both the condition relating to the flow velocity and the condition relating to the total concentration of 1-hydroxy-2-pentanone, furfuryl alcohol and furfural in the gas stream entering the reactor are fulfilled.

HYDROGENATION

[0097] In a preferred variant of the process according to the invention, both the reaction in the presence of the heterogeneous catalyst and the reaction in the presence of the second heterogeneous catalyst are carried out in the gas phase. This variant has the advantage that no diluents (solvents) are required, which represents a considerable economic and ecological advantage. For this variant of the process according to the invention there is preferably used an apparatus comprising a reaction tube and a second reaction tube, which is connected downstream of the reaction tube. The heterogeneous catalyst is disposed in the reaction tube, and the second heterogeneous catalyst is disposed in the second reaction tube. It is thereby possible to set a different temperature in the reaction tube than in the second reaction tube.

[0098] If the reaction in the presence of the second heterogeneous catalyst is carried out in a liquid phase, then the temperature is in the range from -20° C to +150° C, preferably from -20° C to +50° C, more preferably in the range from -5 to +50° C, yet more preferably in the range from -5° C to +30° C, particularly preferably in the range from 0° C to +30° C, most particularly preferably in the range from 0° C to +10° C, and/or the hydrogen partial pressure is in the range from 1 bar to 100 bar, preferably in the range from 1 bar to 50 bar, more preferably in the range from 1 bar to 20 bar. Preferably, the temperature and the hydrogen partial pressure are in the preferred ranges mentioned here.

[0099] Preferably, the liquid phase comprises one or more, preferably polar diluents, the diluent or diluents preferably being selected from the group consisting of water, alcohols having from 1 to 4 carbon atom, ethers selected from the group consisting of aliphatic ethers, oligomeric terminally hydroxy-functionalised ethers and cyclic ethers, and mixtures thereof. The diluents to be used according to the invention are preferably inert under the hydrogenation conditions, that is to say the diluents preferably do not themselves react, in particular are not themselves reduced, under the prevailing hydrogenation conditions.

[00100] Alcohols having from 1 to 4 carbon atoms that are preferably to be used as diluents are selected from the group consisting of methanol, ethanol, n-propanol, isopropanol, n-butanol, isobutanol, tert-butanol. Preferred ethers to be used as diluents are selected from the group consisting of aliphatic ethers such as methyl tert-butyl ether, oligomeric terminally hydroxy-functionalised ethers such as diethylene glycol and triethylene glycol, cyclic ethers such as tetrahydrofuran and dioxane, or mixtures thereof.

[00101] A stirrer vessel reactor is preferably used as the apparatus for the reaction in the presence of the second heterogeneous catalyst. The reaction time for the reaction in the presence of the second heterogeneous catalyst in the stirrer vessel reactor is preferably in the range from 0.25 to 20 hours, preferably in the range from 2 to 12 hours, more preferably in the range from 3 to 8 hours.

[00102] In a particularly preferred variant of the process according to the invention, the reaction of a starting material comprising one or both compounds from the group consisting of furfuryl alcohol and furfural in the presence of a heterogeneous catalyst takes place in a gas phase, and the reaction of compounds from the group consisting of 1-hydroxy-2-pentanone, furfuryl alcohol and furfural from the mixture formed in the presence of the heterogeneous catalyst with hydrogen in the presence of a second heterogeneous catalyst takes place in a liquid phase. To that end, the organic components of the mixture formed in the presence of the heterogeneous catalyst are condensed (i.e. converted into the liquid phase) in a suitable apparatus. The resulting condensate is then transferred to a reactor, preferably a stirrer vessel reactor, for carrying out the reaction in the presence of the second heterogeneous catalyst. Preferably, the reaction conditions established in this procedure for the reaction in the presence of the heterogeneous catalyst are such that almost complete conversion of the starting compound furfuryl alcohol or furfural is achieved.

[00103] One or more diluents are preferably added to the condensate that forms, the total amount of diluents added to the condensate preferably being in the range from 25 to 1000 wt. %, preferably in the range from 50 to 500 wt. %, more preferably in the range from 100 to 300 wt. %, based on the mass of the condensate.

[00104] The total concentration of (i) platinum, rhodium, ruthenium, nickel, palladium and iridium in metallic form and in the form of platinum, rhodium, ruthenium, nickel, palladium and iridium contained in compounds of those metals in the second heterogeneous catalyst is preferably in the range from 0.01 to 10 mol %, based on the amount of 1-hydroxy-2-pentanone contained in the condensate.

[00105] The process according to the invention according to the advantageous further development described above is preferably characterized by the following steps: (a) provision of a starting material comprising one or both compounds from the group consisting of furfuryl alcohol and furfural, (b) provision of a heterogeneous catalyst as defined above, (c) optional provision of one or more diluents, (d) preparation of a mixture comprising the components provided in steps (a) and (b) and optionally (c), and contacting of the mixture with hydrogen or (d') preparation of a mixture comprising the starting material provided in step (a) and hydrogen and optionally an inert gas, and contacting of the mixture with the heterogeneous catalyst provided according to step (b), (e) in the mixture prepared in step (d) or (d'), reaction of the starting material with hydrogen in the presence of the heterogeneous catalyst to form a mixture comprising 1,2-pentanediol and one or more compounds from the group consisting of 1-hydroxy-2-pentanone, furfuryl alcohol and furfural, (f) provision of a second heterogeneous catalyst as defined above, (g) optional provision of one or more diluents, (h) optional condensation of organic components of the mixture formed in step (e), and preparation of a mixture comprising the mixture formed in step (e), or organic components condensed therefrom, and the components provided in steps (f) and optionally (g), and contacting of the mixture with hydrogen or (h') contacting of the mixture formed in step (e), in the presence of hydrogen and optionally an inert gas, with the second heterogeneous catalyst provided according to step (f), (i) reaction of compounds from the group consisting of 1-hydroxy-2-pentanone, furfuryl alcohol and furfural from the mixture formed in step (e) with hydrogen in the presence of the second heterogeneous catalyst to form 1,2-pentanediol, (j) optional separation of the 1,2-pentanediol by distillation.

[00106] The diluents indicated above as being preferred or particularly preferred are thereby correspondingly preferred or particularly preferred.

[00107] The heterogeneous catalysts indicated above as being preferred or particularly preferred are thereby correspondingly preferred or particularly preferred.

[00108] Preferably one, a plurality or all of the reaction conditions indicated above as being preferred or particularly preferred are thereby established. The order in which the components provided in steps (a) to (c) are mixed together in step (d) is not important.

[00109] In all the process variants according to the invention, unreacted hydrogen can very easily be separated from the organic constituents of the reaction mixture, for example in a condenser, and fed to the reaction in the presence of the heterogeneous catalyst again.

[00110] In a preferred variant, the process according to the invention comprises the steps:

(a) provision of a starting material comprising one or both compounds from the group consisting of furfuryl alcohol and furfural,

(b) provision of a heterogeneous catalyst as defined above, (d') preparation of a mixture comprising the starting material provided in step (a) and hydrogen and optionally an inert gas, and contacting of the mixture with the heterogeneous catalyst provided according to step (b), (e) in the mixture prepared in step (d'), reaction of the starting material with hydrogen in the presence of the heterogeneous catalyst to form a mixture comprising 1,2-pentanediol and one or more compounds from the group consisting of 1-hydroxy-2-pentanone, furfuryl alcohol and furfural, (f) provision of a second heterogeneous catalyst as defined above, (h') contacting of the mixture formed in step (e), in the presence of hydrogen and optionally an inert gas, with the second heterogeneous catalyst provided according to step (f), (i) reaction of compounds from the group consisting of 1-hydroxy-2-pentanone, furfuryl alcohol and furfural from the mixture formed in step (e) with hydrogen in the presence of the second heterogeneous catalyst to form 1,2-pentanediol, (j) optional separation of the 1,2-pentanediol by distillation.

[00111] In a second preferred variant, the process according to the invention comprises the steps:

(a) provision of a starting material comprising one or both compounds from the group consisting of furfuryl alcohol and furfural,

(b) provision of a heterogeneous catalyst as defined above,

(c) optional provision of one or more diluents, (d) preparation of a mixture comprising the components provided in steps (a) and (b) and optionally (c), and contacting of the mixture with hydrogen, (e) in the mixture prepared in step (d), reaction of the starting material with hydrogen in the presence of the heterogeneous catalyst to form a mixture comprising 1,2-pentanediol and one or more compounds from the group consisting of 1-hydroxy-2-pentanone, furfuryl alcohol and furfural, (f) provision of a second heterogeneous catalyst as defined above, (g) optional provision of one or more diluents, (h) preparation of a mixture comprising the mixture formed in step (e) and the components provided in steps (f) and optionally (g), and contacting of the mixture with hydrogen, (i) reaction of compounds from the group consisting of 1-hydroxy-2-pentanone, furfuryl alcohol and furfural from the mixture formed in step (e) with hydrogen in the presence of the second heterogeneous catalyst to form 1,2-pentanediol, (j) optional separation of the 1,2-pentanediol by distillation.

[00112] In a third preferred variant, the process according to the invention comprises the steps:

(a) provision of a starting material comprising one or both compounds from the group consisting of furfuryl alcohol and furfural,

(b) provision of a heterogeneous catalyst as defined above, (d') preparation of a mixture comprising the starting material provided in step (a) and hydrogen and optionally an inert gas, and contacting of the mixture with the heterogeneous catalyst provided according to step (b), (e) in the mixture prepared in step (d'), reaction of the starting material with hydrogen in the presence of the heterogeneous catalyst to form a mixture comprising 1,2-pentanediol and one or more compounds from the group consisting of 1-hydroxy-2-pentanone, furfuryl alcohol and furfural, (f) provision of a second heterogeneous catalyst as defined above, (g) optional provision of one or more diluents, (h) condensation of organic components of the mixture formed in step (e), and preparation of a mixture comprising organic components condensed from the mixture formed in step (e) and the components provided in steps (f) and optionally (g), and contacting of the mixture with hydrogen, (i) reaction of compounds from the group consisting of 1-hydroxy-2-pentanone, furfuryl alcohol and furfural from the mixture formed in step (e) with hydrogen in the presence of the second heterogeneous catalyst to form 1,2-pentanediol, (j) optional separation of the 1,2-pentanediol by distillation.

[00113] In a fourth preferred variant, the process according to the invention comprises the steps:

(a) provision of a starting material comprising one or both compounds from the group consisting of furfuryl alcohol and furfural,

(b) provision of a heterogeneous catalyst as defined above,

(c) optional provision of one or more diluents,

(d) preparation of a mixture comprising the components provided in steps (a) and (b) and optionally (c), and contacting of the mixture with hydrogen, (e) in the mixture prepared in step (d) or (d'), reaction of the starting material with hydrogen in the presence of the heterogeneous catalyst to form a mixture comprising 1,2-pentanediol and one or more compounds from the group consisting of 1-hydroxy-2-pentanone, furfuryl alcohol and furfural, (f) provision of a second heterogeneous catalyst as defined above, (h') contacting of the mixture formed in step (e), in the presence of hydrogen and optionally an inert gas, with the second heterogeneous catalyst provided according to step (f), (i) reaction of compounds from the group consisting of 1-hydroxy-2-pentanone, furfuryl alcohol and furfural from the mixture formed in step (e) with hydrogen in the presence of the second heterogeneous catalyst to form 1,2-pentanediol, (j) optional separation of the 1,2-pentanediol by distillation.

[00114] The process according to the invention, in particular in its preferred variants and the advantageous further development described above, yields a product mixture in which 1,2-pentanediol generally represents the main product.

[00115] The reaction scheme below illustrates the reaction of furfural or furfuryl alcohol in a process according to the invention by way of the intermediate 1-hydroxy-2-pentanone to give the desired main product 1,2-pentanediol and the secondary products generally obtained thereby. If furfural is used as the starting material, it is first converted into furfuryl alcohol.

[00116] If the process according to the invention is carried out as a single-stage process (comprising a reaction step in the presence of a heterogeneous catalyst as described above but not a further reaction step in the presence of a heterogeneous co-catalyst as described above), then there are formed, in addition to the target product 1,2-pentanediol, the secondary products indicated in brackets in the lower part of the scheme, as well as 1-hydroxy-2-pentanone. If the process according to the invention is carried out according to the advantageous further development as a two-stage process (comprising a reaction step in the presence of a heterogeneous catalyst as described above and a further reaction step in the presence of a second heterogeneous catalyst as described above), then there are formed, in addition to the target product 1,2-pentanediol, the secondary products indicated in brackets in the lower part of the scheme, while 1-hydroxy-2-pentanone formed in the reaction in the presence of the heterogeneous catalyst is largely converted into 1,2-pentanediol in the reaction in the presence of the second heterogeneous catalyst. This variant is symbolized in the above scheme by the two-part arrow labeled "two-stage process".

[00117] Preferably, the reaction is conducted in such a manner that at least 80 wt. %, preferably at least 90 wt. %, more preferably at least 95 wt. %, of the furfural and/or furfuryl alcohol used is reacted.

[00118] Preferably, the reaction is conducted in such a manner that the reaction mixture present after the single-or two-stage process comprises at least 30 wt. % 1,2-pentanediol, preferably at least 50 wt. %, more preferably at least 70 wt. %, particularly preferably at least 80 wt. %, based on the total amount of products formed. The amounts of 1,2-pentanediol or 1-hydroxy-2-pentanone in the reaction mixture are based on the total amount of the products formed from furfuryl alcohol or furfural. Accordingly, when determining the amount Y of 1,2-pentanediol, any amounts of unreacted furfuryl alcohol or furfural still present in the reaction mixture when the reaction is complete, and the amounts of catalyst(s) and diluent(s), are not to be taken into consideration. The amounts Y of 1,2-pentanediol or 1-hydroxy-2-pentanone in the reaction mixture are based in particular on the total amount of 1-pentanol, 2-pentanol, pentane, tetrahydrofurfuryl alcohol, 1-hydroxy-2-pentanone, methylfuran, methyltetrahydrofuran, 1,2-pentanediol and 1,5-pentanediol in the reaction mixture when the reaction is complete.

COSMETIC AND/OR PHARMACEUTICAL COMPOSITIONS

[00119] The cosmetic or pharmaceutical compositions according to the present invention may represent a skin care, hair care, personal care, sun care and/or oral care product, such as for example a cosmetic cream, lotion, spray, emulsion, ointment, gel or mousse and the like.

[00120] The compositions pursuant the present invention may contain abrasives, anti-acne agents, agents against ageing of the skin, anti-cellulitis agents, antidandruff agents, anti-inflammatory agents, irritation-preventing agents, irritation-inhibiting agents, antioxidants, astringents, perspiration-inhibiting agents, antiseptic agents, ant-statics, binders, buffers, carrier materials, chelating agents, cell stimulants, cleansing agents, care agents, depilatory agents, surface-active substances, deodorizing agents, antiperspirants, softeners, emulsifiers, enzymes, essential oils, fibres, film-forming agents, fixatives, foam-forming agents, foam stabilizers, substances for preventing foaming, foam boosters, gelling agents, gel-forming agents, hair care agents, hair-setting agents, hair-straightening agents, moisture-donating agents, moisturizing substances, moisture-retaining substances, bleaching agents, strengthening agents, stain-removing agents, optically brightening agents, impregnating agents, dirt-repellent agents, friction-reducing agents, lubricants, moisturizing creams, ointments, opacifying agents, plasticizing agents, covering agents, polish, gloss agents, polymers, powders, proteins, re-oiling agents, abrading agents, silicones, skin-soothing agents, skin-cleansing agents, skin care agents, skin-healing agents, skin-lightening agents, skin-protecting agents, skin-softening agents, hair promotion agents, cooling agents, skin-cooling agents, warming agents, skin-warming agents, stabilizers, UV-absorbing agents, UV filters, detergents, fabric conditioning agents, suspending agents, skin-tanning agents, thickeners, vitamins, oils, waxes, fats, phospholipids, saturated fatty acids, mono- or polyunsaturated fatty acids, α-hydroxy acids, polyhydroxyfatty acids, liquefiers, dyestuffs, colour-protecting agents, pigments, anti-corrosives, aromas, flavouring substances, odoriferous substances, polyols, surfactants, electrolytes, organic solvents or silicone derivatives and the like as additional auxiliaries and additives.

SURFACTANTS

[00121] Preferred auxiliaries and additives are anionic and/or amphoteric or zwitterionic surfactants. Typical examples of anionic surfactants are soaps, alkyl benzenesulfonates, alkanesulfonates, olefin sulfonates, alkylether sulfonates, glycerol ether sulfonates, methyl ester sulfonates, sulfofatty acids, alkyl sulfates, fatty alcohol ether sulfates, glycerol ether sulfates, fatty acid ether sulfates, hydroxy mixed ether sulfates, monoglyceride (ether) sulfates, fatty acid amide (ether) sulfates, mono- and dialkyl sulfosuccinates, mono- and dialkyl sulfosuccinamates, sulfotriglycerides, amide soaps, ether carboxylic acids and salts thereof, fatty acid isethionates, fatty acid sarcosinates, fatty acid taurides, N-acylamino acids such as, for example, acyl lactylates, acyl tartrates, acyl glutamates and acyl aspartates, alkyl oligoglucoside sulfates, protein fatty acid condensates (particularly wheat-based vegetable products) and alkyl (ether) phosphates. If the anionic surfactants contain polyglycol ether chains, they may have a conventional homolog distribution although they preferably have a narrow-range homolog distribution. Typical examples of amphoteric or zwitterionic surfactants are alkylbetaines, alkylamidobetaines, aminopropionates, aminoglycinates, imidazolinium betaines and sulfobetaines. The surfactants mentioned are all known compounds. Information on their structure and production can be found in relevant synoptic works, cf. for example **J. Falbe (ed.), "Surfactants in Consumer Products", Springer Verlag, Berlin, 1987, pages 54 to 124** or **J. Falbe (ed.), "Katalysatoren, Tenside und Mineralöladditive (Catalysts, Surfactants and Mineral Oil Additives)", Thieme Verlag, Stuttgart, 1978, pages 123-217**. The percentage content of surfactants in the preparations may be from 0.1 to 10% by weight and is preferably from 0.5 to 5% by weight, based on the preparation.

OIL BODIES

[00122] Suitable oil bodies, which form constituents of the O/W emulsions, are, for example, Guerbet alcohols based on fatty alcohols having 6 to 18, preferably 8 to 10, carbon atoms, esters of linear C_6-C_{22}-fatty acids with linear or branched C_6-C_{22}-fatty alcohols or esters of branched C_6-C_{13}-carboxylic acids with linear or branched C_6-C_{22}-fatty alcohols, such as, for example, myristyl myristate, myristyl palmitate, myristyl stearate, myristyl isostearate, myristyl oleate, myristyl behenate, myristyl erucate, cetyl myristate, cetyl palmitate, cetyl stearate, cetyl isostearate, cetyl oleate, cetyl behenate, cetyl erucate, stearyl myristate, stearyl palmitate, stearyl stearate, stearyl isostearate, stearyl oleate, stearyl behenate, stearyl erucate, isostearyl myristate, isostearyl palmitate, isostearyl stearate, isostearyl isostearate, isostearyl oleate, isostearyl behenate, isostearyl oleate, oleyl myristate, oleyl palmitate, oleyl stearate, oleyl isostearate, oleyl oleate, oleyl behenate, oleyl erucate, behenyl myristate, behenyl palmitate, behenyl stearate, behenyl isostearate, behenyl oleate, behenyl behenate, behenyl erucate, erucyl myristate, erucyl palmitate, erucyl stearate, erucyl isostearate, erucyl oleate, erucyl behenate and erucyl erucate. Also suitable are esters of linear C_6-C_{22}-fatty acids with branched alcohols, in particular 2-ethylhexanol, esters of C_{18}-C_{38}- alkylhydroxy carboxylic acids with linear or branched C_6-C_{22}-fatty alcohols, in particular Dioctyl Malate, esters of linear and/or branched fatty acids with polyhydric alcohols (such as, for example, propylene glycol, dimerdiol or trimertriol) and/or Guerbet alcohols, triglycerides based on C_6 -C_{10}-fatty acids, liquid mono-/di-/triglyceride mixtures based on C_6-C_{18}-fatty acids, esters of C_6- C_{22}-fatty alcohols and/or Guerbet alcohols with aromatic carboxylic acids, in particular benzoic acid, esters of C_2- C_{12}-dicarboxylic acids with linear or branched alcohols having 1 to 22 carbon atoms or polyols having 2 to 10 carbon atoms and 2 to 6 hydroxyl groups, vegetable oils, branched primary alcohols, substituted cyclohexanes, linear and branched C_6-C_{22}-fatty alcohol carbonates, such as, for example, Dicaprylyl Carbonate (Cetiol® CC), Guerbet carbonates, based on fatty alcohols having 6 to 18, preferably 8 to 10, carbon atoms, esters of benzoic acid with linear and/or branched C_6-C_{22}-alcohols (e.g. Finsolv® TN), linear or branched, symmetrical or asymmetrical dialkyl ethers having 6 to 22 carbon atoms per alkyl group, such as, for example, dicaprylyl ether (Cetiol® OE), ring-opening products of epoxidized fatty acid esters with polyols, silicone oils (cyclomethicones, silicone methicone grades, etC) and/or aliphatic or naphthenic hydrocarbons, such as, for example, squalane, squalene or dialkylcyclohexanes.

EMULSIFIERS

[00123] Other surfactants may also be added to the preparations as emulsifiers, including for example:

- products of the addition of 2 to 30 mol ethylene oxide and/or 0 to 5 mol propylene oxide onto linear C_{8-22} fatty alcohols, onto C_{12-22} fatty acids and onto alkyl phenols containing 8 to 15 carbon atoms in the alkyl group;
- $C_{12/18}$ fatty acid monoesters and diesters of addition products of 1 to 30 mol ethylene oxide onto glycerol;
- glycerol mono- and diesters and sorbitan mono- and diesters of saturated and unsaturated fatty acids containing 6 to 22 carbon atoms and ethylene oxide addition products thereof;
- addition products of 15 to 60 mol ethylene oxide onto castor oil and/or hydrogenated castor oil;
- polyol esters and, in particular, polyglycerol esters such as, for example, polyglycerol

polyricinoleate, polyglycerol poly-12-hydroxystearate or polyglycerol dimerate isostearate. Mixtures of compounds from several of these classes are also suitable;

- addition products of 2 to 15 mol ethylene oxide onto castor oil and/or hydrogenated castor oil;
- partial esters based on linear, branched, unsaturated or saturated $C_{6/22}$ fatty acids, ricinoleic acid and 12-hydroxystearic acid and glycerol, polyglycerol, pentaerythritol, -dipentaerythritol, sugar alcohols (for example sorbitol), alkyl glucosides (for example methyl glucoside, butyl glucoside, lauryl glucoside) and polyglucosides (for example cellulose);
- mono-, di and trialkyl phosphates and mono-, di- and/or tri-PEG-alkyl phosphates and salts thereof;
- wool wax alcohols;
- polysiloxane/polyalkyl polyether copolymers and corresponding derivatives;
- mixed esters of pentaerythritol, fatty acids, citric acid and fatty alcohol and/or mixed esters of C_{6-22} fatty acids, methyl glucose and polyols, preferably glycerol or polyglycerol,
- polyalkylene glycols and
- glycerol carbonate.

[00124] The addition products of ethylene oxide and/or propylene oxide onto fatty alcohols, fatty acids, alkylphenols, glycerol mono- and diesters and sorbitan mono- and diesters of fatty acids or onto castor oil are known commercially available products. They are homologue mixtures of which the average degree of alkoxylation corresponds to the ratio between the quantities of ethylene oxide and/or propylene oxide and substrate with which the addition reaction is carried out. $C_{12/18}$ fatty acid monoesters and diesters of addition products of ethylene oxide onto glycerol are known as lipid layer enhancers for cosmetic formulations. The preferred emulsifiers are described in more detail as follows:

[00125] Partial glycerides. Typical examples of suitable partial glycerides are hydroxystearic acid monoglyceride, hydroxystearic acid diglyceride, isostearic acid monoglyceride, isostearic acid diglyceride, oleic acid monoglyceride, oleic acid diglyceride, ricinoleic acid monoglyceride, ricinoleic acid diglyceride, linoleic acid monoglyceride, linoleic acid diglyceride, linolenic acid monoglyceride, linolenic acid diglyceride, erucic acid monoglyceride, erucic acid diglyceride, tartaric acid monoglyceride, tartaric acid diglyceride, citric acid monoglyceride, citric acid diglyceride, malic acid monoglyceride, malic acid diglyceride and technical mixtures thereof which may still contain small quantities of triglyceride from the production process.

Addition products of 1 to 30 and preferably 5 to 10 mol ethylene oxide onto the partial glycerides mentioned are also suitable.

[00126] Sorbitan esters. Suitable sorbitan esters are sorbitan monoisostearate, sorbitan sesquiisostearate, sorbitan diisostearate, sorbitan triisostearate, sorbitan monooleate, sorbitan sesquioleate, sorbitan dioleate, sorbitan trioleate, sorbitan monoerucate, sorbitan sesquierucate, sorbitan dierucate, sorbitan trierucate, sorbitan monoricinoleate, sorbitan sesquiricinoleate, sorbitan diricinoleate, sorbitan triricinoleate, sorbitan monohydroxystearate, sorbitan sesquihydroxystearate, sorbitan dihydroxystearate, sorbitan trihydroxystearate, sorbitan monotartrate, sorbitan sesquitartrate, sorbitan ditartrate, sorbitan tritartrate, sorbitan monocitrate, sorbitan sesquicitrate, sorbitan dicitrate, sorbitan tricitrate, sorbitan monomaleate, sorbitan sesquimaleate, sorbitan dimaleate, sorbitan trimaleate and technical mixtures thereof. Addition products of 1 to 30 and preferably 5 to 10 mol ethylene oxide onto the sorbitan esters mentioned are also suitable.

[00127] Polyglycerol esters. Typical examples of suitable polyglycerol esters are Polyglyceryl-2 Dipolyhydroxystearate (Dehymuls® PGPH), Polyglycerin-3-Diisostearate (Lameform® TGI), Polyglyceryl-4 Isostearate (Isolan® GI 34), Polyglyceryl-3 Oleate, Diisostearoyl Polyglyceryl-3 Diisostearate (Isolan® PDI), Polyglyceryl-3 Methylglucose Distearate (Tego Care® 450), Polyglyceryl-3 Beeswax (Cera Bellina®), Polyglyceryl-4 Caprate (Polyglycerol Caprate T2010/90), Polyglyceryl-3 Cetyl Ether (Chimexane® NL), Polyglyceryl-3 Distearate (Cremophor® GS 32) and Polyglyceryl Polyricinoleate (Admul® WOL 1403), Polyglyceryl Dimerate Isostearate and mixtures thereof. Examples of other suitable polyolesters are the mono-, di- and triesters of trimethylol propane or pentaerythritol with lauric acid, cocofatty acid, tallow fatty acid, palmitic acid, stearic acid, oleic acid, behenic acid and the like optionally reacted with 1 to 30 mol ethylene oxide.

[00128] Anionic emulsifiers. Typical anionic emulsifiers are aliphatic C_{12-22} fatty acids, such as palmitic acid, stearic acid or behenic acid for example, and C_{12-22} dicarboxylic acids, such as azelaic acid or sebacic acid for example.

[00129] Amphoteric emulsifiers. Other suitable emulsifiers are amphboteric or zwitterionic surfactants. Zwitterionic surfactants are surface-active compounds which contain at least one quaternary ammonium group and at least one carboxylate and one sulfonate group in the molecule. Particularly suitable zwitterionic surfactants are the so-called betaines, such as the N-alkyl-N,N-dimethyl ammonium glycinates, for example cocoalkyl dimethyl ammonium glycinate, N-acylaminopropyl-N,N-dimethyl ammonium glycinates, for example cocoacylaminopropyl dimethyl ammonium glycinate, and 2-alkyl-3-carboxymethyl-3-hydroxyethyl imidazolines containing 8 to 18 carbon atoms in the alkyl or acyl group and cocoacylaminoethyl hydroxyethyl carboxymethyl glycinate. The fatty acid amide derivative known under the CTFA name of *Cocamidopropyl Betaine* is particularly preferred. Ampholytic surfactants are also suitable emulsifiers. Ampholytic surfactants are surface-active compounds which, in addition to a $C_{8/18}$ alkyl or acyl group, contain at least one free amino group and at least one –COOH- or -SO_3H- group in the molecule and which are capable of forming inner salts. Examples of suitable ampholytic surfactants are N-alkyl glycines, N-alkyl propionic acids, N-alkylaminobutyric acids, N-alkyliminodipropionic acids, N-hydroxyethyl-N-alkylamidopropyl glycines, N-alkyl taurines, N-alkyl sarcosines, 2-alkylaminopropionic acids and alkylaminoacetic acids containing around 8 to 18 carbon atoms in the alkyl group. Particularly preferred ampholytic surfactants are N-cocoalkylaminopropionate, cocoacylaminoethyl aminopropionate and $C_{12/18}$ acyl sarcosine.

SUPERFATTING AGENTS AND CONSISTENCY FACTORS

[00130] Superfatting agents may be selected from such substances as, for example, lanolin and lecithin and also polyethoxylated or acylated lanolin and lecithin derivatives, polyol fatty acid esters, monoglycerides and fatty acid alkanolamides, the fatty acid alkanolamides also serving as foam stabilizers.

[00131] The consistency factors mainly used are fatty alcohols or hydroxyfatty alcohols containing 12 to 22 and preferably 16 to 18 carbon atoms and also partial glycerides, fatty acids or hydroxyfatty acids. A combination of these substances with alkyl oligoglucosides and/or fatty acid N-methyl glucamides of the same chain length and/or polyglycerol poly-12-hydroxystearates is preferably used.

THICKENING AGENTS AND RHEOLOGY ADDITIVES

[00132] Suitable thickeners are polymeric thickeners, such as Aerosil® types (hydrophilic silicas), polysaccharides, more especially xanthan gum, guar-guar, agar-agar, alginates and tyloses, carboxymethyl cellulose and hydroxyethyl cellulose, also relatively high molecular weight polyethylene glycol monoesters and diesters of fatty acids, polyacrylates (for example Carbopols® [Goodrich] or Synthalens® [Sigma]), polyacrylamides, polyvinyl alcohol and polyvinyl pyrrolidone, surfactants such as, for example, ethoxylated fatty acid glycerides, esters of fatty acids with polyols, for example pentaerythritol or trimethylol propane, narrow-range fatty alcohol ethoxylates and electrolytes, such as sodium chloride and ammonium chloride.

POLYMERS

[00133] Suitable cationic polymers are, for example, cationic cellulose derivatives such as, for example, the quaternized hydroxyethyl cellulose obtainable from Amerchol under the name of Polymer JR 400®, cationic starch, copolymers of diallyl ammonium salts and acrylamides, quaternized vinyl pyrrolidone/vinyl imidazole polymers such as, for example, Luviquat® (BASF), condensation products of polyglycols and amines, quaternized collagen polypeptides such as, for example, Lauryldimonium Hydroxypropyl Hydrolyzed Collagen (Lamequat® L, Grünau), quaternized wheat polypeptides, polyethyleneimine, cationic silicone polymers such as, for example, amodimethicone, copolymers of adipic acid and dimethylaminohydroxypropyl diethylenetriamine (Cartaretine®, Sandoz), copolymers of acrylic acid with dimethyl diallyl ammonium chloride (Merquat® 550, Chemviron), polyaminopolyamides and crosslinked water-soluble polymers thereof, cationic chitin derivatives such as, for example, quaternized chitosan, optionally in microcrystalline distribution, condensation products of dihaloalkyls, for example dibromobutane, with bis-dialkylamines, for example bis-dimethylamino-1,3-propane, cationic guar gum such as, for example, Jaguar®CBS, Jaguar®C-17, Jaguar®C-16 of Celanese, quaternized ammonium salt polymers such as, for example, Mirapol® A-15, Mirapol® AD-1, Mirapol® AZ-1 of Miranol and the various polyquaternium types (for example 6, 7, 32 or 37) which can be found in the market under the tradenames Rheocare® CC or Ultragel® 300.

[00134] Suitable anionic, zwitterionic, amphoteric and nonionic polymers are, for example, vinyl acetate/crotonic acid copolymers, vinyl pyrrolidone/vinyl acrylate copolymers, vinyl acetate/butyl maleate/isobornyl acrylate copolymers, methyl vinylether/maleic anhydride copolymers and esters thereof, uncrosslinked and polyol-crosslinked polyacrylic acids, acrylamidopropyl trimethylammonium chloride/acrylate copolymers, octylacrylamide/methyl methacrylate/tert.-butylaminoethyl methacrylate/2-hydroxypropyl methacrylate copolymers, polyvinyl pyrrolidone, vinyl pyrrolidone/vinyl acetate copolymers, vinyl pyrrolidone/dimethylaminoethyl methacrylate/vinyl caprolactam terpolymers and optionally derivatized cellulose ethers and silicones.

PEARLIZING WAXES

[00135] Suitable pearlising waxes are, for example, alkylene glycol esters, especially ethylene glycol distearate; fatty acid alkanolamides, especially cocofatty acid diethanolamide; partial glycerides, especially stearic acid monoglyceride; esters of polybasic, optionally hydroxysubstituted carboxylic acids with fatty alcohols containing 6 to 22 carbon atoms, especially long-chain esters of tartaric acid; fatty compounds, such as for example fatty alcohols, fatty ketones, fatty aldehydes, fatty ethers and fatty carbonates which contain in all at least 24 carbon atoms, especially laurone and distearylether; fatty acids, such as stearic acid, hydroxystearic acid or behenic acid, ring opening products of olefin epoxides containing 12 to 22 carbon atoms with fatty alcohols containing 12 to 22 carbon atoms and/or polyols containing 2 to 15 carbon atoms and 2 to 10 hydroxyl groups and mixtures thereof.

SILICONES

[00136] Suitable silicone compounds are, for example, dimethyl polysiloxanes, methylphenyl polysiloxanes, cyclic silicones and amino-, fatty acid-, alcohol-, polyether-, epoxy-, fluorine-, glycoside- and/or alkyl-modified silicone compounds which may be both liquid and resin-like at room temperature. Other suitable silicone compounds are simethicones which are mixtures of dimethicones with an average chain length of 200 to 300 dimethylsiloxane units and hydrogenated silicates. A detailed overview of suitable volatile silicones can be found in **Todd et al. in Cosm. Toil. 91, 27 (1976)**.

WAXES AND STABILIZERS

[00137] Besides natural oils used, waxes may also be present in the preparations, more especially natural waxes such as, for example, candelilla wax, carnauba wax, Japan wax, espartograss wax, cork wax, guaruma wax, rice oil wax, sugar cane wax, ouricury wax, montan wax, beeswax, shellac wax, spermaceti, lanolin (wool wax), uropygial fat, ceresine, ozocerite (earth wax), petrolatum, paraffin waxes and microwaxes; chemically modified waxes (hard waxes) such as, for example, montan ester waxes, sasol waxes, hydrogenated jojoba waxes and synthetic waxes such as, for example, polyalkylene waxes and polyethylene glycol waxes.

[00138] Metal salts of fatty acids such as, for example, magnesium, aluminium and/or zinc stearate or ricinoleate may be used as stabilizers.

PRIMARY SUN PROTECTION FACTORS

[00139] Primary sun protection factors in the context of the invention are, for example, organic substances (light filters) which are liquid or crystalline at room temperature and which are capable of absorbing ultraviolet radiation and of releasing the energy absorbed in the form of longer-wave radiation, for example heat.

[00140] The formulations according to the invention advantageously contain at least one UV-A filter and/or at least one UV-B filter and/or a broadband filter and/or at least one inorganic pigment. Formulations according to the invention preferably contain at least one UV-B filter or a broadband filter, more particularly preferably at least one UV-A filter and at least one UV-B filter.

[00141] Preferred cosmetic compositions, preferably topical formulations according to the present invention comprise one, two, three or more sun protection factors selected from the group consistiung of 4-aminobenzoic acid and derivatives, salicylic acid derivatives, benzophenone derivatives, dibenzoylmethane derivatives, diphenyl acrylates, 3-imidazol-4-yl acrylic acid and esters thereof, benzofuran derivatives, benzylidene malonate derivatives, polymeric UV absorbers containing one or more organosilicon radicals, cinnamic acid derivatives, camphor derivatives, trianilino-s-triazine derivatives, 2-hydroxyphenylbenzotriazole derivatives, phenylbenzimidazole sulfonic acid derivatives and salts thereof, anthranilic acid menthyl esters, benzotriazole derivativesand indole derivatives.

[00142] In addition, it is advantageous to combine compounds of formula (I) with active ingredients which penetrate into the skin and protect the skin cells from inside against sunlight-induced damage and reduce the level of cutaneous matrix metalloproteases. Preferred respective ingredients, so called arylhydrocarbon receptor antagonists, are described in WO 2007/128723, incorporated herein by reference. Preferred is 2-benzylidene-5,6-dimethoxy-3,3-dimethylindan-1-one.

[00143] The UV filters cited below which can be used within the context of the present invention are preferred but naturally are not limiting.

[00144] UV filters which are preferably used are selected from the group consisting of

- p-aminobenzoic acid
- p-aminobenzoic acid ethyl ester (25 mol) ethoxylated (INCI name: PEG-25 PABA)
- p-dimethylaminobenzoic acid-2-ethylhexyl ester
- p-aminobenzoic acid ethyl ester (2 mol) N-propoxylated
- p-aminobenzoic acid glycerol ester
- salicylic acid homomenthyl ester (homosalates) (Neo Heliopan®HMS)
- salicylic acid-2-ethylhexyl ester (Neo Heliopan®OS)
- triethanolamine salicylate
- 4-isopropyl benzyl salicylate
- anthranilic acid menthyl ester (Neo Heliopan®MA)
- diisopropyl cinnamic acid ethyl ester
- p-methoxycinnamic acid-2-ethylhexyl ester (Neo Heliopan®AV)
- diisopropyl cinnamic acid methyl ester
- p-methoxycinnamic acid isoamyl ester (Neo Heliopan®E 1000)
- p-methoxycinnamic acid diethanolamine salt
- p-methoxycinnamic acid isopropyl ester
- 2-phenylbenzimidazole sulfonic acid and salts (Neo Heliopan®Hydro)
- 3-(4'-trimethylammonium) benzylidene bornan-2-one methyl sulfate
- beta-imidazole-4(5)-acrylic acid (urocanic acid)
- 3-(4'-sulfo)benzylidene bornan-2-one and salts
- 3-(4'-methyl benzylidene)-D,L-camphor (Neo Heliopan®MBC)
- 3-benzylidene-D,L-camphor

- N-[(2 and 4)-[2-(oxoborn-3-ylidene) methyl]benzyl] acrylamide polymer
- 4,4'-[(6-[4-(1,1-dimethyl)aminocarbonyl) phenylamino]-1,3,5-triazine-2,4-diyl)diimino]-bis-(benzoic acid-2-ethylhexyl ester) (Uvasorb®HEB)
- benzylidene malonate polysiloxane (Parsol®SLX)
- glyceryl ethylhexanoate dimethoxycinnamate
- dipropylene glycol salicylate
- tris(2-ethylhexyl)-4,4',4''-(1,3,5-triazine-2,4,6-triyltriimino)tribenzoate (= 2,4,6-trianilino-(p-carbo-2'-ethylhexyl-1'-oxy)-1,3,5-triazine) (Uvinul®T150).

[00145] Broadband filters which are preferably combined with one or more compounds of formula (I) in a preparation according to the present invention are selected from the group consisting of

- 2-ethylhexyl-2-cyano-3,3-diphenyl acrylate (Neo Heliopan®303)
- ethyl-2-cyano-3,3'-diphenyl acrylate
- 2-hydroxy-4-methoxybenzophenone (Neo Heliopan®BB)
- 2-hydroxy-4-methoxybenzophenone-5-sulfonic acid
- dihydroxy-4-methoxybenzophenone
- 2,4-dihydroxybenzophenone
- tetrahydroxybenzophenone
- 2,2'-dihydroxy-4,4'-dimethoxybenzophenone
- 2-hydroxy-4-n-octoxybenzophenone
- 2-hydroxy-4-methoxy-4'-methyl benzophenone
- sodium hydroxymethoxybenzophenone sulfonate
- disodium-2,2'-dihydroxy-4,4'-dimethoxy-5,5'-disulfobenzophenone
- phenol, 2-(2H-benzotriazol-2-yl)-4-methyl-6-(2-methyl-3(1,3,3,3-tetramethyl-1-(trimethylsilyl)oxy)disiloxyanyl) propyl) (Mexoryl®XL)
- 2,2'-methylene bis-(6-(2H-benzotriazol-2-yl)-4-1,1,3,3-tetramethylbutyl) phenol) (Tinosorb®M)
- 2,4-bis-[4-(2-ethylhexyloxy)-2-hydroxyphenyl]-1,3,5-triazine
- 2,4-bis-[{(4-(2-ethylhexyloxy)-2-hydroxy}phenyl]-6-(4-methoxyphenyl)-1,3,5-triazine (Tinosorb®S)

- 2,4-bis-[{(4-(3-sulfonato)-2-hydroxypropyloxy)-2-hydroxy}phenyl]-6-(4-methoxyphenyl)-1,3,5-triazine sodium salt
- 2,4-bis-[{(3-(2-propyloxy)-2-hydroxypropyloxy)-2-hydroxy}phenyl]-6-(4-methoxyphenyl)-1,3,5-triazine
- 2,4-bis-[{4-(2-ethylhexyloxy)-2-hydroxy}phenyl]-6-[4-(2-methoxyethyl carbonyl) phenylamino]-1,3,5-triazine
- 2,4-bis-[{4-(3-(2-propyloxy)-2-hydroxypropyloxy)-2-hydroxy}phenyl]-6-[4-(2-ethylcarboxyl) phenylamino]-1,3,5-triazine
- 2,4-bis-[{4-(2-ethylhexyloxy)-2-hydroxy}phenyl]-6-(1-methylpyrrol-2-yl)-1,3,5-triazine
- 2,4-bis-[{4-tris-(trimethylsiloxysilylpropyloxy)-2-hydroxy}phenyl]-6-(4-methoxyphenyl)-1,3,5-triazine
- 2,4-bis-[{4-(2''-methylpropenyloxy)-2-hydroxy}phenyl]-6-(4-methoxyphenyl)-1,3,5-triazine
- 2,4-bis-[{4-(1',1',1',3',5',5',5'-heptamethylsiloxy-2''-methylpropyloxy)-2-hydroxy}phenyl]-6-(4-methoxyphenyl)-1,3,5-triazine.

[00146] The compositions can comprise further typical detergent and cleansing composition ingredients such as UV-A filters which are preferably combined with one or more compounds of formula (I) in a preparation according to the present invention are selected from the group consisting of

- 4-isopropyl dibenzoyl methane
- terephthalylidene dibornane sulfonic acid and salts (Mexoryl®SX)
- 4-t-butyl-4'-methoxydibenzoyl methane (avobenzone) / (Neo Heliopan®357)
- phenylene bis-benzimidazyl tetrasulfonic acid disodium salt (Neo Heliopan®AP)
- 2,2'-(1,4-phenylene)-bis-(1H-benzimidazole-4,6-disulfonic acid), monosodium salt
- 2-(4-diethylamino-2-hydroxybenzoyl) benzoic acid hexyl ester (Uvinul® A Plus)
- indanylidene compounds in accordance with DE 100 55 940 A1 (= WO 2002 038537 A1)

[00147] The compositions can comprise further typical detergent and cleansing composition ingredients such as UV filters which are more preferably combined with one or more compounds of formula (I) in a preparation according to the present invention are selected from the group consisting of

- p-aminobenzoic acid
- 3-(4'-trimethylammonium) benzylidene bornan-2-one methyl sulfate

- salicylic acid homomenthyl ester (Neo Heliopan®HMS)
- 2-hydroxy-4-methoxybenzophenone (Neo Heliopan®BB)
- 2-phenylbenzimidazole sulfonic acid (Neo Heliopan®Hydro)
- terephthalylidene dibornane sulfonic acid and salts (Mexoryl®SX)
- 4-tert-butyl-4'-methoxydibenzoyl methane (Neo Heliopan®357)
- 3-(4'-sulfo)benzylidene bornan-2-one and salts
- 2-ethylhexyl-2-cyano-3,3-diphenyl acrylate (Neo Heliopan®303)
- N-[(2 and 4)-[2-(oxoborn-3-ylidene) methyl]benzyl] acrylamide polymer
- p-methoxycinnamic acid-2-ethylhexyl ester (Neo Heliopan®AV)
- p-aminobenzoic acid ethyl ester (25 mol) ethoxylated (INCI name: PEG-25 PABA)
- p-methoxycinnamic acid isoamyl ester (Neo Heliopan®E1000)
- 2,4,6-trianilino-(p-carbo-2'-ethylhexyl-1'-oxy)-1,3,5-triazine (Uvinul®T150)
- phenol, 2-(2H-benzotriazol-2-yl)-4-methyl-6-(2-methyl-3(1,3,3,3-tetramethyl-1-(trimethylsilyl)oxy)disiloxyanyl) propyl) (Mexoryl®XL)
- 4,4’-[(6-[4-(1,1-dimethyl)aminocarbonyl) phenylamino]-1,3,5-triazine-2,4-diyl)diimino]-bis-(benzoic acid-2-ethylhexyl ester) (Uvasorb HEB)
- 3-(4'-methyl benzylidene)-D,L-camphor (Neo Heliopan®MBC)
- 3-benzylidene camphor
- salicylic acid-2-ethylhexyl ester (Neo Heliopan®OS)
- 4-dimethylaminobenzoic acid-2-ethylhexyl ester (Padimate O)
- hydroxy-4-methoxybenzophenone-5-sulfonic acid and Na salt
- 2,2'-methylene bis-(6-(2H-benzotriazol-2-yl)-4-1,1,3,3-tetramethylbutyl) phenol) (Tinosorb®M)
- phenylene bis-benzimidazyl tetrasulfonic acid disodium salt (Neo Heliopan®AP)
- 2,4-bis-[{(4-(2-ethylhexyloxy)-2-hydroxy}phenyl]-6-(4-methoxyphenyl)-1,3,5-triazine (Tinosorb®S)
- benzylidene malonate polysiloxane (Parsol®SLX)
- menthyl anthranilate (Neo Heliopan®MA)
- 2-(4-diethylamino-2-hydroxybenzoyl) benzoic acid hexyl ester (Uvinul® A Plus)
- indanylidene compounds in accordance with DE 100 55 940 (= WO 02/38537).

[00148] Advantageous primary and also secondary sun protection factors are mentioned in **WO 2005 123101 A1**. Advantageously, these preparations contain at least one UVA filter and/or at least one UVB filter and/or at least one inorganic pigment. The preparations may be present here in various forms such as are conventionally used for sun protection preparations. Thus, they may be in form of a solution, an emulsion of the water-in-oil type (W/O) or of the oil-in-water type (O/W) or a multiple emulsion, for example of the water-in-oil-in-water type (W/O/W), a gel, a hydrodispersion, a solid stick or else an aerosol.

[00149] In a further preferred embodiment a formulation according to the invention contains a total amount of sunscreen agents, i.e. in particular UV filters and/or inorganic pigments (UV filtering pigments) so that the formulation according to the invention has a light protection factor of greater than or equal to 2 (preferably greater than or equal to 5). Such formulations according to the invention are particularly suitable for protecting the skin and hair.

SECONDARY SUN PROTECTION FACTORS

[00150] Besides the groups of primary sun protection factors mentioned above, secondary sun protection factors of the antioxidant type may also be used. Secondary sun protection factors of the antioxidant type interrupt the photochemical reaction chain which is initiated when UV rays penetrate into the skin. Typical examples are amino acids (for example glycine, histidine, tyrosine, tryptophane) and derivatives thereof, imidazoles (for example urocanic acid) and derivatives thereof, peptides, such as D,L-carnosine, D-carnosine, L-carnosine and derivatives thereof (for example anserine), carotinoids, carotenes (for example alpha-carotene, beta-carotene, lycopene) and derivatives thereof, chlorogenic acid and derivatives thereof, liponic acid and derivatives thereof (for example dihydroliponic acid), aurothioglucose, propylthiouracil and other thiols (for example thioredoxine, glutathione, cysteine, cystine, cystamine and glycosyl, N-acetyl, methyl, ethyl, propyl, amyl, butyl and lauryl, palmitoyl, oleyl, alpha-linoleyl, cholesteryl and glyceryl esters thereof) and their salts, dilaurylthiodipropionate, distearylthiodipropionate, thiodipropionic acid and derivatives thereof (esters, ethers, peptides, lipids, nucleotides, nucleosides and salts) and sulfoximine compounds (for example butionine sulfoximines, homocysteine sulfoximine, butionine sulfones, penta-, hexa- and hepta-thionine sulfoximine) in very small compatible dosages, also (metal) chelators (for example alpha-hydroxyfatty acids, palmitic acid, phytic acid, lactoferrine), alpha-hydroxy acids (for example citric acid, lactic acid, malic acid), humic acid, bile acid, bile extracts, bilirubin, biliverdin, EDTA, EGTA and derivatives thereof, unsaturated fatty acids and derivatives thereof (for example linoleic acid, oleic acid), folic acid and derivatives thereof, ubiquinone and ubiquinol and derivatives thereof, vitamin C and derivatives thereof (for example ascorbyl palmitate, Mg ascorbyl phosphate, ascorbyl acetate), tocopherols and derivatives (for example vitamin E acetate), vitamin A and derivatives (vitamin A palmitate) and coniferyl benzoate of benzoin resin, rutinic acid and derivatives thereof, glycosyl rutin, ferulic acid, furfurylidene glucitol, carnosine, butyl hydroxytoluene, butyl hydroxyanisole, nordihydroguaiac resin acid, nordihydroguaiaretic acid, trihydroxybutyrophenone, uric acid and derivatives thereof, mannose and derivatives thereof, superoxide dismutase, titanium dioxide (for example dispersions in ethanol), zinc and derivatives thereof (for example ZnO, $ZnSO_4$), selenium and derivatives thereof (for example selenium methionine), stilbenes and derivatives thereof (for example stilbene oxide, trans-stilbene oxide) and derivatives of these active substances suitable for the purposes of the invention (salts, esters, ethers, sugars, nucleotides, nucleosides, peptides and lipids).

[00151] Advantageous inorganic secondary light protection pigments are finely dispersed metal oxides and metal salts which are also mentioned in **WO 2005 123101 A1**. The total quantity of inorganic pigments, in particular hydrophobic inorganic micro-pigments in the finished cosmetic preparation according to the present invention is advantageously from 0.1 to 30% by weight, preferably 0.5 to 10.0% by weight, in each case based on the total weight of the preparation.

[00152] Also preferred are particulate UV filters or inorganic pigments, which can optionally be hydrophobed, can be used, such as the oxides of titanium (TiO_2), zinc (ZnO), iron (Fe_2O_3), zirconium (ZrO_2), silicon (SiO_2), manganese (e.g. MnO), aluminium (Al_2O_3), cerium (e.g. Ce_2O_3) and/or mixtures thereof.

ACTIVES MODULATING SKIN AND/OR HAIR PIGMENTATION

[00153] Preferred active ingredients for skin and/or hair lightening are selected from the group consisting of: kojic acid (5-hydroxy-2-hydroxymethyl-4-pyranone), kojic acid derivatives, preferably kojic acid dipalmitate, arbutin, ascorbic acid, ascorbic acid derivatives, preferably magnesium ascorbyl phosphate, hydroquinone, hydroquinone derivatives, resorcinol, resorcinol derivatives, preferably 4-alkylresorcinols and 4-(1-phenylethyl)1,3-dihydroxybenzene (phenylethyl resorcinol), cyclohexylcarbamates (preferably one or more cyclohexyl carbamates disclosed in WO 2010/122178 and WO 2010/097480), sulfur-containing molecules, preferably glutathione or cysteine, alpha-hydroxy acids (preferably citric acid, lactic acid, malic acid), salts and esters thereof, N-acetyl tyrosine and derivatives, undecenoyl phenylalanine, gluconic acid, chromone derivatives, preferably aloesin, flavonoids, 1-aminoethyl phosphinic acid, thiourea derivatives, ellagic acid, nicotinamide (niacinamide), zinc salts, preferably zinc chloride or zinc gluconate, thujaplicin and derivatives, triterpenes, preferably maslinic acid, sterols, preferably ergosterol, benzofuranones, preferably senkyunolide, vinyl guiacol, ethyl guiacol, dionic acids, preferably octodecene dionic acid and/or azelaic acid, inhibitors of nitrogen oxide synthesis, preferably L-nitroarginine and derivatives thereof, 2,7-dinitroindazole or thiocitrulline, metal chelators (preferably alpha-hydroxy fatty acids, phytic acid, humic acid, bile acid, bile extracts, EDTA, EGTA and derivatives thereof), retinoids, soy milk and extract, serine protease inhibitors or lipoic acid or other synthetic or natural active ingredients for skin and hair lightening, the latter preferably used in the form of an extract from plants, preferably bearberry extract, rice extract, papaya extract, turmeric extract, mulberry extract, bengkoang extract, nutgrass extract, liquorice root extract or constituents concentrated or isolated therefrom, preferably glabridin or licochalcone A, artocarpus extract, extract of rumex and ramulus species, extracts of pine species (pinus), extracts of vitis species or stilbene derivatives isolated or concentrated therefrom, saxifrage extract, scutelleria extract, grape extract and/or microalgae extract, in particular Tetraselmis suecica Extract .

[00154] Preferred skin lighteners as component (b) are kojic acid and phenylethyl resorcinol as tyrosinase inhibitors, beta- and alpha-arbutin, hydroquinone, nicotinamide, dioic acid, Mg ascorbyl phosphate and vitamin C and its derivatives, mulberry extract, Bengkoang extract, papaya extract, turmeric extract, nutgrass extract, licorice extract (containing glycyrrhizin), alpha-hydroxy-acids, 4-alkylresorcinols, 4-hydroxyanisole. These skin lighteners are preferred due to their very good activity, in particular in combination with sclareolide according to the present invention. In addition, said preferred skin lighteners are readily available.

[00155] Advantageous skin and hair tanning active ingredients in this respect are substrates or substrate analogues of tyrosinase such as L-tyrosine, N-acetyl tyrosine, L-DOPA or L-dihydroxyphenylalanine, xanthine alkaloids such as caffeine, theobromine and theophyl-line and derivatives thereof, proopiomelanocortin peptides such as ACTH, alpha-MSH, peptide analogues thereof and other substances which bind to the melanocortin receptor, peptides such as Val-Gly-Val-Ala-Pro-Gly, Lys-lle- Gly-Arg-Lys or Leu-lle-Gly-Lys, purines, pyrimidines, folic acid, copper salts such as copper gluconate, chloride or pyrrolidonate, 1,3,4-oxadiazole-2-thiols such as 5-pyrazin-2-yl-1,3,4-oxadiazole-2-thiol, curcumin, zinc diglycinate (Zn(Gly)2), manganese(II) bicarbonate complexes ("pseudocat-alases") as described for example in EP 0 584 178, tetrasubstituted cyclohexene deriva-tives as described for example in WO 2005/032501 , isoprenoids as described in WO 2005/102252 and in WO 2006/010661 , melanin derivatives such as Melasyn-100 and MelanZe, diacyl glycerols, aliphatic or cyclic diols, psoralens, prostaglandins and ana-logues thereof, activators of adenylate cyclase and compounds which activate the transfer of melanosomes to keratinocytes such as serine proteases or agonists of the PAR-2 receptor, extracts of plants and plant parts of the chrysanthemum species, san-guisorba species, walnut extracts, urucum extracts, rhubarb extracts, microalgae extracts, in particular Isochrysis galbana, trehalose, erythru-lose and dihydroxyacetone. Flavonoids which bring about skin and hair tinting or brown-ing (e.g. quercetin, rhamnetin, kaempferol, fisetin, genistein, daidzein, chrysin and api-genin, epicatechin, diosmin and diosmetin, morin, quercitrin, naringenin, hesperidin, phloridzin and phloretin) can also be used.

[00156] The amount of the aforementioned examples of additional active ingredients for the modulation of skin and hair pigmentation (one or more compounds) in the products according to the invention is then preferably 0.00001 to 30 wt.%, preferably 0.0001 to 20 wt.%, particularly preferably 0.001 to 5 wt.%, based on the total weight of the preparation.

ANTI-AGEING ACTIVES

[00157] In the context of the invention, anti-ageing or biogenic agents are, for example antioxidants, matrix-metalloproteinase inhibitors (MMPI), skin moisturizing agents, glycosaminglycan stimulkators, anti-inflammatory agents, TRPV1 antagonists and plant extracts.

[00158] Antioxidants. Suitable antioxidants encompass amino acids (preferably glycine, histidine, tyrosine, tryptophane) and derivatives thereof, imidazoles (preferably urocanic acid) and derivatives thereof, peptides, preferably D,L-carnosine, D-carnosine, L-carnosine and derivatives thereof (preferably anserine), carnitine, creatine, matrikine peptides (preferably lysyl-threonyl-threonyl-lysyl-serine) and palmitoylated pentapeptides, carotenoids, carotenes (preferably alpha-carotene, beta-carotene, lycopene) and derivatives thereof, lipoic acid and derivatives thereof (preferably dihydrolipoic acid), aurothioglucose, propyl thiouracil and other thiols (preferably thioredoxine, glutathione, cysteine, cystine, cystamine and glycosyl, N-acetyl, methyl, ethyl, propyl, amyl, butyl and lauryl, palmitoyl, oleyl, gamma-linoleyl, cholesteryl, glyceryl and oligoglyceryl esters thereof) and salts thereof, dilauryl thiodipropionate, distearyl thiodipropionate, thiodipropionic acid and derivatives thereof (preferably esters, ethers, peptides, lipids, nucleotides, nucleosides and salts) and sulfoximine compounds (preferably buthionine sulfoximines, homocysteine sulfoximine, buthionine sulfones, penta-, hexa-, heptathionine sulfoximine) in very small tolerated doses (e.g. pmol to µmol/kg), also (metal) chelators (preferably alpha-hydroxy fatty acids, palmitic acid, phytic acid, lactoferrin, alpha-hydroxy acids (preferably citric acid, lactic acid, malic acid), humic acid, bile acid, bile extracts, tannins, bilirubin, biliverdin, EDTA, EGTA and derivatives thereof), unsaturated fatty acids and derivatives thereof (preferably gamma-linolenic acid, linoleic acid, oleic acid), folic acid and derivatives thereof, ubiquinone and derivatives thereof, ubiquinol and derivatives thereof, vitamin C and derivatives (preferably ascorbyl palmitate, Mg ascorbyl phosphate, ascorbyl acetate, ascorbyl glucoside), tocopherols and derivatives (preferably vitamin E acetate), vitamin A and derivatives (vitamin A palmitate) and coniferyl benzoate of benzoic resin, rutinic acid and derivatives thereof, flavonoids and glycosylated precursors thereof, in particular quercetin and derivatives thereof, preferably alpha-glucosyl rutin, rosmarinic acid, carnosol, carnosolic acid, resveratrol, caffeic acid and derivatives thereof, sinapic acid and derivatives thereof, ferulic acid and derivatives thereof, curcuminoids, chlorogenic acid and derivatives thereof, retinoids, preferably retinyl palmitate, retinol or tretinoin, ursolic acid, levulinic acid, butyl hydroxytoluene, butyl hydroxyanisole, nordihydroguaiac acid, nordihydroguaiaretic acid, trihydroxybutyrophenone, uric acid and derivatives thereof, mannose and derivatives thereof, zinc and derivatives thereof (preferably ZnO, $ZnSO_4$), selenium and derivatives thereof (preferably selenium methionine), superoxide dismutase, stilbenes and derivatives thereof (preferably stilbene oxide, trans-stilbene oxide) and the derivatives (salts, esters, ethers, sugars, nucleotides, nucleosides, peptides and lipids) of these cited active ingredients which are suitable according to the invention or extracts or fractions of plants having an antioxidant effect, preferably green tea, rooibos, honeybush, grape, rosemary, sage, melissa, thyme, lavender, olive, oats, cocoa, ginkgo, ginseng, liquorice, honeysuckle, sophora, pueraria, pinus, citrus, Phyllanthus emblica or St. John's wort, grape seeds, wheat germ, Phyllanthus emblica, coenzymes, preferably coenzyme Q10, plastoquinone and menaquinone. Preferred antioxidants are selected from the group consisting of vitamin A and derivatives, vitamin C and derivatives, tocopherol and derivatives, preferably tocopheryl acetate, and ubiquinone.

[00159] If vitamin E and/or derivatives thereof are used as the antioxidant(s), it is advantageous to choose their concentrations from the range from about 0.001 to about 10 % b.w. based on the total weight of the formulation. If vitamin A or vitamin A derivatives or carotenes or derivatives thereof are used as the antioxidant(s), it is advantageous to choose their concentrations from the range from about 0.001 to aout 10 % b.w. based on the total weight of the formulation.

[00160] Matrix-Metalloproteinase inhibitors (MMPI). Preferred compositions comprise matrix-metalloproteinase inhibitors, especially those inhibiting matrix-metalloproteinases enzymatically cleaving collagen, selected from the group consisting of: ursolic acid, retinyl palmitate, propyl gallate, precocenes, 6-hydroxy-7-methoxy-2,2-dimethyl-1(2H)-benzopyran, 3,4-dihydro-6-hydroxy-7-methoxy-2,2-dimethyl-1(2H)-benzopyran, benzamidine hydrochloride, the cysteine proteinase inhibitors N-ethylmalemide and epsilon-amino-n-caproic acid of the serinprotease inhibitors: phenylmethylsufonylfluoride, collhibin (company Pentapharm; INCI: hydrolysed rice protein), oenotherol (company Soliance; INCI: propylene glycol, aqua, Oenothera biennis root extract, ellagic acid and ellagitannins, for example from pomegranate), phosphoramidone hinokitiol, EDTA, galardin, EquiStat (company Collaborative Group; apple fruit extract, soya seed extract, ursolic acid, soya isoflavones and soya proteins), sage extracts, MDI (company Atrium; INCI: glycosaminoglycans), fermiskin (company Silab/Mawi; INCI: water and lentinus edodes extract), actimp 1.9.3 (company Expanscience/Rahn; INCI: hydrolysed lupine protein), lipobelle soyaglycone (company Mibelle; INCI: alcohol, polysorbate 80, lecithin and soy isoflavones), extracts from green and black tea and further plant extracts, which are listed in **WO 02 069992 A1** (see tables 1-12 there, incorporated herein by reference), proteins or glycoproteins from soya, hydrolysed proteins from rice, pea or lupine, plant extracts which inhibit MMPs, preferably extracts from shitake mushrooms, extracts from the leaves of the Rosaceae family, sub-family Rosoideae, quite particularly extracts of blackberry leaf (preferably as described in **WO 2005 123101 A1**, incorporated herein by reference) as e.g. SymMatrix (company Symrise, INCI: Maltodextrin, Rubus Fruticosus (Blackberry) Leaf Extract). Preferred actives of are selected from the group consisting of retinyl palmitate, ursolic acid, extracts from the leaves of the Rosaceae family, sub-family Rosoideae, genistein and daidzein.

[00161] Skin-moisturizing agents. Preferred skin moisturizing agents are selected from the group consisting of alkane diols or alkane triols comprising 3 to 12 carbon atoms, preferably C_3-C_{10}-alkane diols and C_3-C_{10}-alkane triols. More preferably the skin moisturizing agents are selected from the group consisting of: glycerol, 1,2-propylene glycol, 1,2-butylene glycol, 1,3-butylene glycol, 1,2-pentanediol, 1,2-hexanediol, 1,2-octanediol and 1,2-decanediol.

[00162] Glycosaminoglycan stimulators. Preferred compositions comprise substances stimulating the synthesis of glycosaminoglycans selected from the group consisting of hyaluronic acid and derivatives or salts, Subliskin (Sederma, INCI: Sinorhizobium Meliloti Ferment Filtrate, Cetyl Hydroxyethylcellulose, Lecithin), Hyalufix (BASF, INCI: Water, Butylene Glycol, Alpinia galanga leaf extract, Xanthan Gum, Caprylic/Capric Triglyceride), Stimulhyal (Soliance, INCI: Calcium ketogluconate), Syn-Glycan (DSM, INCI: Tetradecyl Aminobutyroylvalylaminobutyric Urea Trifluoroacetate, Glycerin, Magnesium chloride), Kalpariane (Biotech Marine), DC Upregulex (Distinctive Cosmetic Ingredients, INCI: Water, Butylene Glycol, Phospholipids, Hydrolyzed Sericin), glucosamine, N-acetyl glucosamine, retinoids, preferably retinol and vitamin A, Arctium lappa fruit extract, Eriobotrya japonica extract, Genkwanin, N-Methyl-L-serine, (-)-alpha-bisabolol or synthetic alpha-bisabolol such as e.g. Dragosantol and Dragosantol 100 from Symrise, oat glucan, Echinacea purpurea extract and soy protein hydrolysate. Preferred actives are selected from the group consisting of hyaluronic acid and derivatives or salts, retinol and derivatives, (-)-alpha-bisabolol or synthetic alpha-bisabolol such as e.g. Dragosantol and Dragosantol 100 from Symrise, oat glucan, Echinacea purpurea extract, Sinorhizobium Meliloti Ferment Filtrate, Calcium ketogluconate, Alpinia galanga leaf extract and tetradecyl aminobutyroylvalylaminobutyric urea trifluoroacetate.

[00163] TRPV1 antagonists. Suitable compounds which reduce the hypersensitivity of skin nerves based on their action as TRPV1 antagonists, encompass e.g. trans-4-tert-butyl cyclohexanol as described in **WO 2009 087242 A1**, or indirect modulators of TRPV1 by an activation of the μ-receptor, e.g. acetyl tetrapeptide-15, are preferred.

[00164] Desquamating agents. The compositions may also contain desquamating agents (component b5) in amounts of about 0.1 to about 30 % b.w. preferably about 0.5 to about 15 % b.w., particularly preferably about 1 to about 10 % b.w. based on the total weight of the preparation. The expression “desquamating agent” is understood to mean any compound capable of acting:

- either directly on desquamation by promoting exfoliation, such as β-hydroxy acids, in particular salicylic acid and its derivatives (including 5-n-octanoylsalicylic acid); α-hydroxy acids, such as glycolic, citric, lactic, tartaric, malic or mandelic acids; urea; gentisic acid; oligofucoses; cinnamic acid; extract of Sophora japonica; resveratrol and some derivatives of jasmonic acid;
- or on the enzymes involved in the desquamation or the degradation of the corneodesmosomes, glycosidases, stratum corneum chymotryptic enzyme (SCCE) or other proteases (trypsin, chymotrypsin-like). There may be mentioned agents chelating inorganic salts: EDTA; N-acyl-N,N′,N′-ethylenediaminetriacetic acid; aminosulphonic compounds and in particular (N-2-hydroxyethylpiperazine-N-2-ethane)sulphonic acid (HEPES); derivatives of 2-oxothiazolidine-4-carboxylic acid

(procysteine); derivatives of alpha-amino acids of the glycine type (as described in EP-0 852 949, and sodium methylglycine diacetate marketed by BASF under the trade name TRILON M); honey; sugar derivatives such as O-octanoyl-6-D-maltose and N-acetylglucosamine; chestnut extracts such as those marketed by the company SILAB under the name Recoverine®, prickly pear extracts such as those marketed under the name Exfolactive® by the company SILAB, or Phytosphingosine SLC® (phytosphingosine grafted with a salicylic acid) marketed by the company Degussa.

[00165] Desquamating agents suitable for the invention may be chosen in particular from the group comprising sulphonic acids, calcium chelators, α-hydroxy acids such as glycolic, citric, lactic, tartaric, malic or mandelic acids; ascorbic acid and its derivatives such as ascorbyl glucoside and magnesium ascorbyl phosphate; nicotinamide; urea; (N-2-hydroxyethylpiperazine-N-2-ethane)sulphonic acid (HEPES), β-hydroxy acids such as salicylic acid and its derivatives, retinoids such as retinol and its esters, retinal, retinoic acid and its derivatives, those described in the **documents FR 2570377 A1, EP 0199636 A1, EP 0325540 A1, EP 0402072 A1,** chestnut or prickly pear extracts, in particular marketed by SILAB; reducing compounds such as cysteine or cysteine precursors.

[00166] Desquamating agents which can be used are also nicotinic acid and its esters and nicotinamide, also called vitamin B3 or vitamin PP, and ascorbic acid and its precursors, as described in particular in application **EP 1529522 A1**.

[00167] Anti-cellulite agents. Anti-cellulite agents and lipolytic agents are preferably selected from the group consisting of those described in WO 2007/077541, and beta-adrenergic receptor agonists such as synephrine and its derivatives, and cyclohexyl carbamates described in **WO 2010/097479**. Agents enhancing or boosting the activity of anti-cellulite agents, in particular agents which stimulate and/or depolarise C nerve fibres, are preferably selected from the group consisting of capsaicin and derivatives thereof, vanillyl-nonylamid and derivatives thereof, L-carnitine, coenzym A, isoflavonoides, soy extracts, ananas extract and conjugated linoleic acid.

[00168] Fat enhancing agents. Formulations and products according to the present invention may also comprise one or more fat enhancing and/or adipogenic agents as well as agents enhancing or boosting the activity of fat enhancing agents. A fat enhancing agent is for example hydroxymethoxyphenyl propylmethylmethoxybenzofuran (trade name: Sym3D®).

HAIR GROWTH ACTIVATORS OR INHIBITORS

[00169] Formulations and products according to the present invention may also comprise one or more hair growth activators, i.e. agents to stimulate hair growth. Hair growth activators are preferably selected from the group consisting of pyrimidine derivatives such as 2,4-diaminopyrimidine-3-oxide (Aminexil), 2,4-diamino-6-piperidinopyrimidine-3-oxide (Minoxidil) and derivatives thereof, 6-amino-1,2-dihydro-1-hydroxy-2-imino-4-piperidinopyrimidine and its derivatives, xanthine alkaloids such as caffeine, theobromine and theophylline and derivatives thereof, quercetin and derivatives, dihydroquercetin (taxifolin) and derivatives, potassium channel openers, antiandrogenic agents, synthetic or natural 5-reductase inhibitors, nicotinic acid esters such as tocopheryl nicotinate, benzyl nicotinate and C1-C6 alkyl nicotinate, proteins such as for example the tripeptide Lys-Pro-Val, diphencypren, hormons, finasteride, dutasteride, flutamide, bicalutamide, pregnane derivatives, progesterone and its derivatives, cyproterone acetate, spironolactone and other diuretics, calcineurin inhibitors such as FK506 (Tacrolimus, Fujimycin) and its derivatives, Cyclosporin A and derivatives thereof, zinc and zinc salts, polyphenols, procyanidins, proanthocyanidins, phytosterols such as for example beta-sitosterol, biotin, eugenol, (±)-beta-citronellol, panthenol, glycogen for example from mussels, extracts from microorganisms, algae, plants and plant parts of for example the genera dandelion (Leontodon or Taraxacum), Orthosiphon, Vitex, Coffea, Paullinia, Theobroma, Asiasarum, Cucurbita or Styphnolobium, Serenoa repens (saw palmetto), Sophora flavescens, Pygeum africanum, Panicum miliaceum, Cimicifuga racemosa, Glycine max, Eugenia caryophyllata, Cotinus coggygria, Hibiscus rosa-sinensis, Camellia sinensis, Ilex paraguariensis, Isochrysis galbana, licorice, grape, apple, barley or hops or/nd hydrolysates from rice or wheat.

[00170] Alternatively, formulations and products according to the present invention may comprise one or more hair growth inhibitors (as described above), i.e. agents to reduce or prevent hair growth. Hair growth inhibitors are preferably selected from the group consisting of activin, activin derivatives or activin agonists, ornithine decarboxylase inhibitors such as alpha-difluoromethylornithine or pentacyclic triterpenes like for example ursolic acid, betulin, betulinic acid, oleanolic acid and derivatives thereof, 5alpha-reductase inhibitors, androgen receptor antagonists, S-adenosylmethionine decarboxylase inhibitors, gamma-glutamyl transpeptidase inhibitors, transglutaminase inhibitors, soybean-derived serine protease inhibitors, extracts from microorganisms, algae, different microalgae or plants and plant parts of for example the families Leguminosae, Solanaceae, Graminae, Asclepiadaceae or Cucurbitaceae, the genera Chondrus, Gloiopeltis, Ceramium, Durvillea, Glycine max, Sanguisorba officinalis, Calendula officinalis, Hamamelis virginiana, Arnica montana, Salix alba, Hypericum perforatum or Gymnema sylvestre.

PHYSIOLOGICAL COOLING AGENTS

[00171] The compositions may also contain one or more substances with a physiological cooling effect (cooling agents), which are preferably selected here from the following list: menthol and menthol derivatives (for example L-menthol, D-menthol, racemic menthol, isomenthol, neoisomenthol, neomenthol) menthylethers (for example (l-menthoxy)-1,2-propandiol, (l-menthoxy)-2-methyl-1,2-propandiol, l-menthyl-methylether), menthone glyceryl acetal, menthone glyceryl ketal or mixtures of both, menthylesters (for example menthylformiate, menthylacetate, menthylisobutyrate, menthyhydroxyisobutyrat, menthyllactates, L-menthyl-L-lactate, L-menthyl-D-lactate, menthyl-(2-methoxy)acetate, menthyl-(2-methoxyethoxy)acetate, menthylpyroglutamate), menthylcarbonates (for example menthylpropyleneglycolcarbonate, menthylethyleneglycolcarbonate, menthylglycerolcarbonate or mixtures thereof), the semi-esters of menthols with a dicarboxylic acid or derivatives thereof (for example mono-menthylsuccinate, mono-menthylglutarate, mono-menthylmalonate, O-menthyl succinic acid ester-N,N-(dimethyl)amide, O-menthyl succinic acid ester amide), menthanecarboxylic acid amides (in this case preferably menthanecarboxylic acid-N-ethylamide [WS3] or N$^{\alpha}$-(menthanecarbonyl)glycinethylester [WS5], as described in **US 4,150,052**, menthanecarboxylic acid-N-(4-cyanophenyl)amide or menthanecarboxylic acid-N-(4-cyanomethylphenyl)amide as described in **WO 2005 049553 A1**, menthanecarboxylic acid-N-(alkoxyalkyl)amides), menthone and menthone derivatives (for example L-menthone glycerol ketal), 2,3-dimethyl-2-(2-propyl)-butyric acid derivatives (for example 2,3-dimethyl-2-(2-propyl)-butyric acid-N-methylamide [WS23]), isopulegol or its esters (I-(-)-isopulegol, I-(-)-isopulegolacetate), menthane derivatives (for example p-menthane-3,8-diol), cubebol or synthetic or natural mixtures, containing cubebol, pyrrolidone derivatives of cycloalkyldione derivatives (for example 3-methyl-2(1-pyrrolidinyl)-2-cyclopentene-1-one) or tetrahydropyrimidine-2-one (for example iciline or related compounds, as described in WO 2004/026840), further carboxamides (for example N-(2-(pyridin-2-yl)ethyl)-3-p-menthanecarboxamide or related compounds), (1R,2S,5R)-N-(4-Methoxyphenyl)-5-methyl-2-(1-isopropyl)cyclohexane-carboxamide [WS12], oxamates (preferably those described in **EP 2033688 A2**) and [(1R,2S,5R)-2-isopropyl-5-methyl-cyclohexyl] 2-(ethylamino)-2-oxo-acetate (X Cool).

ANTI-INFLAMMATORY AGENTS

The compositions may also contain anti-inflammatory and/or redness and/or itch ameliorating ingredients, in particular steroidal substances of the corticosteroid type selected from the group consisting of hydrocortisone, dexamethasone, dexamethasone phosphate, methyl prednisolone or cortisone, are advantageously used as anti-inflammatory active ingredients or active ingredients to relieve reddening and itching, the list of which can be extended by the addition of other steroidal anti-inflammatories. Non-steroidal anti-inflammatories can also be used. More particularly:

(i) steroidal anti-inflammatory substances of the corticosteroid type, in particular hydrocortisone, hydrocortisone derivatives such as hydrocortisone 17-butyrate, dexamethasone, dexamethasone phosphate, methylprednisolone or cortisone,

(ii) non-steroidal anti-inflammatory substances, in particular oxicams such as piroxicam or tenoxicam, salicylates such as aspirin, disalcid, solprin or fendosal, acetic acid derivatives such as diclofenac, fenclofenac, indomethacin, sulindac, tolmetin or clindanac, fenamates such as mefenamic, meclofenamic, flufenamic or niflumic, propionic acid derivatives such as ibuprofen, naproxen or benoxaprofen, pyrazoles such as phenylbutazone, oxyphenylbutazone, febrazone or azapropazone,

(iii) natural or naturally occuring anti-inflammatory substances or substances that alleviate reddening and/or itching, in particular extracts or fractions from camomile, Aloe vera, Commiphora species, Rubia species, willow, willow-herb, oats, calendula, arnica, St John's wort, honeysuckle, rosemary, Passiflora incarnata, witch hazel, ginger or Echinacea, or single active compounds thereof,

(iv) histamine receptor antagonists, serine protease inhibitors (e.g. of Soy extracts), TRPV1 antagonists (e.g. 4-t-Butylcyclohexanol), NK1 antagonists (e.g. Aprepitant, Hydroxyphenyl Propamidobenzoic Acid), cannabinoid receptor agonists (e.g. Palmitoyl Ethanolamine) and TRPV3 antagonists.

[00172] Examples which can be cited here are oxicams such as piroxicam or tenoxicam; salicylates such as aspirin, disalcid, solprin or fendosal; acetic acid derivatives such as diclofenac, fenclofenac, indomethacin, sulindac, tolmetin or clindanac; fenamates such as mefenamic, meclofenamic, flufenamic or niflumic; propionic acid derivatives such as ibuprofen, naproxen, benoxaprofen or pyrazoles such as phenylbutazone, oxyphenylbutazone, febrazone or azapropazone. Anthranilic acid derivatives, in particular avenanthramides described in **WO 2004 047833 A1**, are preferred anti-itch ingredients in a composition according to the present invention.

[00173] Also useful are natural or naturally occurring anti-inflammatory mixtures of substances or mixtures of substances that alleviate reddening and/or itching, in particular extracts or fractions from camomile, Aloe vera, Commiphora species, Rubia species, willow, willow-herb, oats, calendula, arnica, St John’s wort, honeysuckle, rosemary, Passiflora incarnata, witch hazel, ginger or Echinacea; preferably selected from the group consisting of extracts or fractions from camomile, Aloe vera, oats, calendula, arnica, honeysuckle, rosemary, witch hazel, ginger or Echinacea, and/or pure substances, preferably alpha-bisabolol, apigenin, apigenin-7-glucoside, gingerols, shogaols, gingerdiols, dehydrogingerdiones, paradols, natural or naturally occuring avenanthramides, preferably tranilast, avenanthramide A, avenanthramide B, avenanthramide C, non-natural or non-naturally occuring avenanthramides, preferably dihydroavenanthramide D, dihydroavenanthramide E, avenanthramide D, avenan-thramide E, avenanthramide F, boswellic acid, phytosterols, glycyrrhizin, glabridin and licochalcone A; preferably selected from the group consisting of alpha-bisabolol, natural avenanthramides, non-natural avenanthramides, preferably dihydroavenanthramide D (as described in **WO 2004 047833 A1**), boswellic acid, phytosterols, glycyrrhizin, and licochalcone A, and/or allantoin, panthenol, lanolin, (pseudo-)ceramides [preferably Ceramide 2, hydroxypropyl bispalmitamide MEA, cetyloxypropyl glyceryl methoxypropyl myristamide, N-(1-hexadecanoyl)-4-hydroxy-L-proline (1-hexadecyl) ester, hydroxyethyl palmityl oxyhydroxypropyl palmitamide], glycosphingolipids, phytosterols, chitosan, mannose, lactose and â-glucans, in particular 1,3-1,4-â-glucan from oats.

[00174] When bisabolol is used in the context of the present invention it can be of natural or synthetic origin, and is preferably "alpha-bisabolol". Preferably, the bisabolol used is synthetically prepared or natural (-)-alpha-bisabolol and/or synthetic mixed-isomer alpha-bisabolol. If natural (-)-alpha-bisabolol is used, this can also be employed as a constituent of an essential oil or of a plant extract or of a fraction thereof, for example as a constituent of (fractions of) oil or extracts of camomile or of Vanillosmopsis (in particular Vanillosmopsis erythropappa or Vanillosmopsis arborea). Synthetic alpha-bisabolol is obtainable, for example, under the name "Dragosantol" from Symrise.

[00175] In case ginger extract is used in the context of the present invention, preferably extracts of the fresh or dried ginger root are used which are prepared by extraction with methanol, ethanol, iso-propanol, acetone, ethyl acetate, carbon dioxide (CO2), hexane, methylene chloride, chloroform or other solvents or solvent mixtures of comparable polarity. The extracts are characterized by the presence of active skin irritation-reducing amounts of constituents such as e.g. gingerols, shogaols, gingerdiols, dehydrogingerdiones and/or paradols.

ANTI-MICROBIAL AGENTS

[00176] Suitable anti-microbial agents are, in principle, all substances effective against Gram-positive bacteria, such as, for example, 4- hydroxybenzoic acid and its salts and esters, N-(4-chlorophenyl)-N'-(3,4- dichlorophenyl)urea, 2,4,4'-trichloro-2'-hydroxy-diphenyl ether (triclosan), 4-chloro-3,5-dimethyl-phenol, 2,2'-methylenebis(6-bromo-4- chlorophenol), 3-methyl-4-(1-methylethyl)phenol, 2-benzyl-4-chloro-phenol, 3-(4-chlorophenoxy)-1,2-propanediol, 3-iodo-2-propynyl butylcarbamate, chlorhexidine, 3,4,4'-trichlorocarbanilide (TTC), antibacterial fragrances, thymol, thyme oil, eugenol, oil of cloves, menthol, mint oil, farnesol, phenoxyethanol, glycerol monocaprate, glycerol monocaprylate, glycerol monolaurate (GML), diglycerol monocaprate (DMC), salicylic acid N-alkylamides, such as, for example, n-octylsalicylamide or n- decylsalicylamide.

ENZYME INHIBITORS

[00177] Suitable enzyme inhibitors are, for example, esterase inhibitors. These are preferably trialkyl citrates, such as trimethyl citrate, tripropyl citrate, triisopropyl citrate, tributyl citrate and, in particular, triethyl citrate (Hydagen CAT). The substances inhibit enzyme activity, thereby reducing the formation of odour. Other substances which are suitable esterase inhibitors are sterol sulfates or phosphates, such as, for example, lanosterol, cholesterol, campesterol, stigmasterol and sitosterol sulfate or phosphate, dicarboxylic acids and esters thereof, such as, for example, glutaric acid, monoethyl glutarate, diethyl glutarate, adipic acid, monoethyl adipate, diethyl adipate, malonic acid and diethyl malonate, hydroxycarboxylic acids and esters thereof, such as, for example, citric acid, malic acid, tartaric acid or diethyl tartrate, and zinc glycinate.

ODOUR ABSORBERS AND ANTIPERSPIRANT ACTIVE AGENTS

[00178] Suitable odour absorbers are substances which are able to absorb and largely retain odour-forming compounds. They lower the partial pressure of the individual components, thus also reducing their rate of diffusion. It is important that perfumes must remain unimpaired in this process. Odour absorbers are not effective against bacteria. They comprise, for example, as main constituent, a complex zinc salt of ricinoleic acid or specific, largely odour-neutral fragrances which are known to the person skilled in the art as "fixatives", such as, for example, extracts of labdanum or styrax or certain abietic acid derivatives. The odour masking agents are fragrances or perfume oils, which, in addition to their function as odour masking agents, give the deodorants their respective fragrance note. Perfume oils which may be mentioned are, for example, mixtures of natural and synthetic fragrances. Natural fragrances are extracts from flowers, stems and leaves, fruits, fruit peels, roots, woods, herbs and grasses, needles and branches, and resins and balsams. Also suitable are animal products, such as, for example, civet and castoreum. Typical synthetic fragrance compounds are products of the ester, ether, aldehyde, ketone, alcohol, and hydrocarbon type. Fragrance compounds of the ester type are, for example, benzyl acetate, p-tert-butylcyclohexyl acetate, linalyl acetate, phenylethyl acetate, linalyl benzoate, benzyl formate, allyl cyclohexylpropionate, styrallyl propionate and benzyl salicylate. The ethers include, for example, benzyl ethyl ether, and the aldehydes include, for example, the linear alkanals having 8 to 18 carbon atoms, citral, citronellal, citronellyloxyacetaldehyde, cyclamen aldehyde, hydroxycitronellal, lilial and bourgeonal, the ketones include, for example, the ionones and methyl cedryl ketone, the alcohols include anethole, citronellol, eugenol, isoeugenol, geraniol, linaool, phenylethyl alcohol and terpineol, and the hydrocarbons include mainly the terpenes and balsams. Preference is, however, given to using mixtures of different fragrances which together produce a pleasing fragrance note. Essential oils of relatively low volatility, which are mostly used as aroma components, are also suitable as perfume oils, e.g. sage oil, camomile oil, oil of cloves, melissa oil, mint oil, cinnamon leaf oil, linden flower oil, juniperberry oil, vetiver oil, olibanum oil, galbanum oil, labdanum oil and lavandin oil. Preference is given to using bergamot oil, dihydromyrcenol, lilial, lyral, citronellol, phenylethyl alcohol, α-hexylcinnamaldehyde, geraniol, benzylacetone, cyclamen aldehyde, linalool, boisambrene forte, ambroxan, indole, hedione, sandelice, lemon oil, mandarin oil, orange oil, allyl amyl glycolate, cyclovertal, lavandin oil, clary sage oil, β- damascone, geranium oil bourbon, cyclohexyl salicylate, Vertofix coeur, iso-E-super, Fixolide NP, evernyl, iraldein gamma, phenylacetic acid, geranyl acetate, benzyl acetate, rose oxide, romilat, irotyl and floramat alone or in mixtures.

[00179] Suitable astringent antiperspirant active ingredients are primarily salts of aluminium, zirconium or of zinC Such suitable antihydrotic active ingredients are, for example, aluminium chloride, aluminium chlorohydrate, aluminium dichlorohydrate, aluminium sesquichlorohydrate and complex compounds thereof, e.g. with 1,2- propylene glycol, aluminium hydroxyallantoinate, aluminium chloride tartrate, aluminium zirconium trichlorohydrate, aluminium zirconium tetrachlorohydrate, aluminium zirconium pentachlorohydrate and complex compounds thereof, e.g. with amino acids, such as glycine.

FILM FORMERS AND ANTI-DANDRUFF AGENTS

[00180] Standard film formers are, for example, chitosan, microcrystalline chitosan, quaternized chitosan, polyvinyl pyrrolidone, vinyl pyrrolidone/vinyl acetate copolymers, polymers of the acrylic acid series, quaternary cellulose derivatives, collagen, hyaluronic acid and salts thereof and similar compounds.

[00181] Suitable antidandruff agents are Pirocton Olamin (1-hydroxy-4-methyl-6-(2,4,4-trimethylpentyl)-2-(1H)-pyridinone monoethanolamine salt), Baypival® (Climbazole), Ketoconazol® (4-acetyl-1-{4-[2-(2,4-dichlorophenyl) r-2-(1H-imidazol-1-ylmethyl)-1,3-dioxylan-c-4-ylmethoxyphenyl}-piperazine, ketoconazole, elubiol, selenium disulfide, colloidal sulfur, sulfur polyethylene glycol sorbitan monooleate, sulfur ricinol polyethoxylate, sulfur tar distillate, salicylic acid (or in combination with hexachlorophene), undecylenic acid, monoethanolamide sulfosuccinate Na salt, Lamepon® UD (protein/undecylenic acid condensate), zinc pyrithione, aluminium pyrithione and magnesium pyrithione/dipyrithione magnesium sulfate.

CARRIERS AND HYDROTROPES

[00182] Preferred cosmetics carrier materials are solid or liquid at 25°C and 1013 mbar (including highly viscous substances) as for example glycerol, 1,2-propylene glycol, 1,2-butylene glycol, 1,3-propylene glycol, 1,3-butylene glycol, ethanol, water and mixtures of two or more of said liquid carrier materials with water. Optionally, these preparations according to the invention may be produced using preservatives or solubilizers. Other preferred liquid carrier substances, which may be a component of a preparation according to the invention are selected from the group consisting of oils such as vegetable oil, neutral oil and mineral oil.

[00183] Preferred solid carrier materials, which may be a component of a preparation according to the invention are hydrocolloids, such as starches, degraded starches, chemically or physically modified starches, dextrins, (powdery) maltodextrins (preferably with a dextrose equivalent value of 5 to 25, preferably of 10 – 20), lactose, silicon dioxide, glucose, modified celluloses, gum arabic, ghatti gum, traganth, karaya, carrageenan, pullulan, curdlan, xanthan gum, gellan gum, guar flour, carob bean flour, alginates, agar, pectin and inulin and mixtures of two or more of these solids, in particular maltodextrins (preferably with a dextrose equivalent value of 15 – 20), lactose, silicon dioxide and/or glucose.

[00184] In addition, hydrotropes, for example ethanol, isopropyl alcohol or polyols, may be used to improve flow behaviour. Suitable polyols preferably contain 2 to 15 carbon atoms and at least two hydroxyl groups. The polyols may contain other functional groups, more especially amino groups, or may be modified with nitrogen. Typical examples are

- glycerol;
- alkylene glycols such as, for example, ethylene glycol, diethylene glycol, propylene glycol, butylene glycol, hexylene glycol and polyethylene glycols with an average molecular weight of 100 to 1000 Dalton;
- technical oligoglycerol mixtures with a degree of self-condensation of 1.5 to 10, such as for example technical diglycerol mixtures with a diglycerol content of 40 to 50% by weight;
- methylol compounds such as, in particular, trimethylol ethane, trimethylol propane, trimethylol butane, pentaerythritol and dipentaerythritol;
- lower alkyl glucosides, particularly those containing 1 to 8 carbon atoms in the alkyl group, for example methyl and butyl glucoside;
- sugar alcohols containing 5 to 12 carbon atoms, for example sorbitol or mannitol,
- sugars containing 5 to 12 carbon atoms, for example glucose or sucrose;
- amino sugars, for example glucamine;
- dialcoholamines, such as diethanolamine or 2-aminopropane-1,3-diol.

PRESERVATIVES

[00185] Suitable preservatives are, for example, phenoxyethanol, formaldehyde solution, parabens, pentanediol or sorbic acid and the other classes of compounds listed in Appendix 6, Parts A and B of the Kosmetikverordnung (“Cosmetics Directive”).

PERFUME OILS AND FRAGRANCES

[00186] Suitable perfume oils are mixtures of natural and synthetic perfumes. Natural perfumes include the extracts of blossoms (lily, lavender, rose, jasmine, neroli, ylang-ylang), stems and leaves (geranium, patchouli, petitgrain), fruits (anise, coriander, caraway, juniper), fruit peel (bergamot, lemon, orange), roots (nutmeg, angelica, celery, cardamom, costus, iris, calmus), woods (pinewood, sandalwood, guaiac wood, cedarwood, rosewood), herbs and grasses (tarragon, lemon grass, sage, thyme), needles and branches (spruce, fir, pine, dwarf pine), resins and balsams (galbanum, elemi, benzoin, myrrh, olibanum, opoponax). Animal raw materials, for example civet and beaver, may also be used. Typical synthetic perfume compounds are products of the ester, ether, aldehyde, ketone, alcohol and hydrocarbon type. Examples of perfume compounds of the ester type are benzyl acetate, phenoxyethyl isobutyrate, p-tert.butyl cyclohexylacetate, linalyl acetate, dimethyl benzyl carbinyl acetate, phenyl ethyl acetate, linalyl benzoate, benzyl formate, ethylmethyl phenyl glycinate, allyl cyclohexyl propionate, styrallyl propionate and benzyl salicylate. Ethers include, for example, benzyl ethyl ether while aldehydes include, for example, the linear alkanals containing 8 to 18 carbon atoms, citral, citronellal, citronellyloxyacetaldehyde, cyclamen aldehyde, hydroxycitronellal, lilial and bourgeonal. Examples of suitable ketones are the ionones, □ isomethylionone and methyl cedryl ketone. Suitable alcohols are anethol, citronellol, eugenol, isoeugenol, geraniol, linalool, phenylethyl alcohol and terpineol. The hydrocarbons mainly include the terpenes and balsams. However, it is preferred to use mixtures of different perfume compounds which, together, produce an agreeable perfume. Other suitable perfume oils are essential oils of relatively low volatility which are mostly used as aroma components. Examples are sage oil, camomile oil, clove oil, melissa oil, mint oil, cinnamon leaf oil, lime-blossom oil, juniper berry oil, vetiver oil, olibanum oil, galbanum oil, ladanum oil and lavendin oil. The following are preferably used either individually or in the form of mixtures: bergamot oil, dihydromyrcenol, lilial, lyral, citronellol, phenylethyl alcohol, hexylcinnamaldehyde, geraniol, benzyl acetone, cyclamen aldehyde, linalool, Boisambrene Forte, Ambroxan, indole, hedione, sandelice, citrus oil, mandarin oil, orange oil, allylamyl glycolate, cyclovertal, lavendin oil, clary oil, damascone, geranium oil bourbon, cyclohexyl salicylate, Vertofix Coeur, Iso-E-Super, Fixolide NP, evernyl, iraldein gamma, phenylacetic acid, geranyl acetate, benzyl acetate, rose oxide, romillat, irotyl and floramat.

DYES

[00187] Suitable dyes are any of the substances suitable and approved for cosmetic purposes as listed, for example, in the publication **"Kosmetische Färbemittel"** of the Farbstoffkommission der Deutschen Forschungsgemeinschaft**, Verlag Chemie, Weinheim, 1984, pages 81 to 106.** Examples include cochineal red A (CI. 16255), patent blue V (CI. 42051), indigotin (CI. 73015), chlorophyllin (CI. 75810), quinoline yellow (CI. 47005), titanium dioxide (CI. 77891), indanthrene blue RS (CI. 69800) and madder lake (CI. 58000). Luminol may also be present as a luminescent dye. Advantageous coloured pigments are for example titanium dioxide, mica, iron oxides (e.g. Fe_2O_3 Fe_3O_4, $FeO(OH)$) and/or tin oxide. Advantageous dyes are for example carmine, Berlin blue, chromium oxide green, ultramarine blue and/or manganese violet.

PREPARATIONS

[00188] Preferred compositions according to the present inventions are selected from the group of products for treatment, protecting, care and cleansing of the skin and/or hair or as a make-up product, preferably as a leave-on product (meaning that the one or more compounds of formula (I) stay on the skin and/or hair for a longer period of time, compared to rinse-off products, so that the moisturizing and/or anti-ageing and/or wound healing promoting action thereof is more pronounced).

[00189] The formulations according to the invention are preferably in the form of an emulsion, e.g. W/O (water-in-oil), O/W (oil-in-water), W/O/W (water-in-oil-in-water), O/W/O (oil-in-water-in-oil) emulsion, PIT emulsion, Pickering emulsion, emulsion with a low oil content, micro- or nanoemulsion, a solution, e.g. in oil (fatty oils or fatty acid esters, in particular C_6-C_{32} fatty acid C_2-C_{30} esters) or silicone oil, dispersion, suspension, creme, lotion or milk, depending on the production method and ingredients, a gel (including hydrogel, hydrodispersion gel, oleogel), spray (e.g. pump spray or spray with propellant) or a foam or an impregnating solution for cosmetic wipes, a detergent, e.g. soap, synthetic detergent, liquid washing, shower and bath preparation, bath product (capsule, oil, tablet, salt, bath salt, soap, etC), effervescent preparation, a skin care product such as e.g. an emulsion (as described above), ointment, paste, gel (as described above), oil, balsam, serum, powder (e.g. face powder, body powder), a mask, a pencil, stick, roll-on, pump, aerosol (foaming, non-foaming or post-foaming), a deodorant and/or antiperspirant, mouthwash and mouth rinse, a foot care product (including keratolytic, deodorant), an insect repellent, a sunscreen, aftersun preparation, a shaving product, aftershave balm, pre- and aftershave lotion, a depilatory agent, a hair care product such as e.g. shampoo (including 2-in-1 shampoo, anti-dandruff shampoo, baby shampoo, shampoo for dry scalps, concentrated shampoo), conditioner, hair tonic, hair water, hair rinse, styling creme, pomade, perm and setting lotion, hair spray, styling aid (e.g. gel or wax), hair smoothing agent (detangling agent, relaxer), hair dye such as e.g. temporary direct-dyeing hair dye, semi-permanent hair dye, permanent hair dye, hair conditioner, hair mousse, eye care product, make-up, make-up remover or baby product.

[00190] The formulations according to the invention are particularly preferably in the form of an emulsion, in particular in the form of a W/O, O/W, W/O/W, O/W/O emulsion, PIT emulsion, Pickering emulsion, emulsion with a low oil content, micro- or nanoemulsion, a gel (including hydrogel, hydrodispersion gel, oleogel), a solution e.g. in oil (fatty oils or fatty acid esters, in particular C_6-C_{32} fatty acid C_2-C_{30} esters)) or silicone oil, or a spray (e.g. pump spray or spray with propellant).

[00191] Auxiliary substances and additives can be included in quantities of 5 to 99 % b.w., preferably 10 to 80 % b.w., based on the total weight of the formulation. The amounts of cosmetic or dermatological auxiliary agents and additives and perfume to be used in each case can easily be determined by the person skilled in the art by simple trial and error, depending on the nature of the particular product.

[00192] The preparations can also contain water in a quantity of up to 99 % b.w., preferably 5 to 80 % b.w., based on the total weight of the preparation.

DETERGENT COMPOSITIONS

[00193] Another object of the present invention refers to a detergent composition comprising said 1,2-pentanediol of improved quality Suitable examples for detergents encompass heavy duty powder detergents, heavy duty liquid detergents, light duty powder detergents, light duty liquid detergents, fabric softeners, manual dish wash agents, all-purpose cleaners and the like.

[00194] The detergent compositions according to the present invention may comprise any of the ingredients customarily found in such compositions, such as, for example, anionic, nonionic, cationic, amphoteric or zwitterionic (co-)surfactants, organic solvents, builders, enzymes and additional auxiliaries such as soil repellents, thickeners, colorants and fragrances or the like.

ANIONIC CO-SURFACTANTS

[00195] Preferably, surfactants of the sulfonate type, alk(en)yl sulfonates, alkoxylated alk(en)yl sulfates, ester sulfonates and/or soaps are used as the anionic surfactants. Suitable surfactants of the sulfonate type are advantageously C_{9-13} alkylbenzene sulfonates, olefin sulfonates, i.e. mixtures of alkene- and hydroxyalkane sulfonates, and disulfonates, as are obtained, for example, by the sulfonation with gaseous sulfur trioxide of C_{12-18} monoolefins having a terminal or internal double bond and subsequent alkaline or acidic hydrolysis of the sulfonation products.

[00196] Alk(en)yl sulfates. Preferred alk(en)yl sulfates are the alkali and especially the sodium salts of the sulfuric acid half-esters of the C_{12}-C_{18} fatty alcohols, for example, from coconut butter alcohol, tallow alcohol, lauryl, myristyl, cetyl or stearyl alcohol or from C_8-C_{20} oxo alcohols and those half-esters of secondary alcohols of these chain lengths. Alk(en)yl sulfates of the cited chain lengths that comprise a synthetic straight chain alkyl group manufactured petrochemically are also preferred. The C_{12}-C_{16} alkyl sulfates and C_{12}-C_{15} alkyl sulfates as well as C_{14}-C_{15} alkyl sulfates and C_{14}-C_{16} alkyl sulfates are particularly preferred on the grounds of laundry performance. The 2,3-alkyl sulfates, which can be obtained from Shell Oil Company under the trade name DAN^{TM}, are also suitable anionic surfactants.

[00197] Alk(en)yl ether sulfates. Sulfuric acid mono-esters derived from straight-chained or branched C_7-C_{21} alcohols ethoxylated with 1 to 6 moles ethylene oxide are also suitable, such as 2-methyl-branched C_9-C_{11} alcohols with an average of 3.5 mol ethylene oxide (EO) or C_{12}-C_{18} fatty alcohols with 1 to 4 EO.

[00198] Ester sulfonates. The esters of alpha-sulfo fatty acids (ester sulfonates), e.g., the alpha-sulfonated methyl esters of hydrogenated coco-, palm nut- or tallow acids are likewise suitable.

[00199] Soaps. Soaps, in particular, can be considered as further anionic surfactants. Saturated fatty acid soaps are particularly suitable, such as the salts of lauric acid, myristic acid, palmitic acid, stearic acid, hydrogenated erucic acid and behenic acid, and especially soap mixtures derived from natural fatty acids such as coconut oil fatty acid, palm kernel oil fatty acid or tallow fatty acid. Those soap mixtures are particularly preferred that are composed of 50 to 100 wt. % of saturated C_{12}-C_{24} fatty acid soaps and 0 to 50 wt. % of oleic acid soap.

[00200] Ether carboxylic acids. A further class of anionic surfactants is that of the ether carboxylic acids, obtainable by treating fatty alcohol ethoxylates with sodium chloroacetate in the presence of basic catalysts. They have the general formula: $RO(CH_2CH_2O)_pCH_2COOH$ with R = C_1-C_{18} and p = 0.1 to 20. Ether carboxylic acids are insensitive to water hardness and possess excellent surfactant properties.

NON-IONIC (CO-)SURFACTANTS

[00201] Alkohol alkoxylates. The added nonionic surfactants are preferably alkoxylated and/or propoxylated, particularly primary alcohols having preferably 8 to 18 carbon atoms and an average of 1 to 12 mol ethylene oxide (EO) and/or 1 to 10 mol propylene oxide (PO) per mol alcohol. C_8-C_{16}-Alcohol alkoxylates, advantageously ethoxylated and/or propoxylated C_{10}-C_{15}-alcohol alkoxylates, particularly C_{12}-C_{14} alcohol alkoxylates, with an ethoxylation degree between 2 and 10, preferably between 3 and 8, and/or a propoxylation degree between 1 and 6, preferably between 1.5 and 5, are particularly preferred. The cited degrees of ethoxylation and propoxylation constitute statistical average values that can be a whole or a fractional number for a specific product. Preferred alcohol ethoxylates and propoxylates have a narrowed homolog distribution (narrow range ethoxylates/propoxylates, NRE/NRP). In addition to these nonionic surfactants, fatty alcohols with more than 12 EO can also be used. Examples of these are (tallow) fatty alcohols with 14 EO, 16 EO, 20 EO, 25 EO, 30 EO or 40 EO.

[00202] Alkylglycosides (APG®). Furthermore, as additional nonionic surfactants, alkyl glycosides that satisfy the general Formula $RO(G)_x$, can be added, e.g., as compounds, particularly with anionic surfactants, in which R means a primary linear or methyl-branched, particularly 2-methyl-branched, aliphatic group containing 8 to 22, preferably 12 to 18 carbon atoms and G stands for a glycose unit containing 5 or 6 carbon atoms, preferably for glucose. The degree of oligomerization x, which defines the distribution of monoglycosides and oligoglycosides, is any number between 1 and 10, preferably between 1.1 and 1.4.

[00203] Fatty acid ester alkoxylates. Another class of preferred nonionic surfactants, which are used either as the sole nonionic surfactant or in combination with other nonionic surfactants, in particular, together with alkoxylated fatty alcohols and/or alkyl glycosides, are alkoxylated, preferably ethoxylated or ethoxylated and propoxylated fatty acid alkyl esters preferably containing 1 to 4 carbon atoms in the alkyl chain, more particularly the fatty acid methyl esters which are described, for example, in Japanese Patent Application JP-A-58/217598 or which are preferably produced by the process described in International Patent Application WO-A-90/13533. Methyl esters of C_{12}-C_{18} fatty acids containing an average of 3 to 15 EO, particularly containing an average of 5 to 12 EO, are particularly preferred.

[00204] Amine oxides. Nonionic surfactants of the amine oxide type, for example, N-coco alkyl-N,N-dimethylamine oxide and N-tallow alkyl-N,N-dihydroxyethylamine oxide, and the fatty acid alkanolamides may also be suitable. The quantity in which these nonionic surfactants are used is preferably no more than the quantity in which the ethoxylated fatty alcohols are used and, particularly no more than half that quantity.

[00205] Gemini surfactants. The so-called gemini surfactants can be considered as further surfactants. Generally speaking, such compounds are understood to mean compounds that have two hydrophilic groups and two hydrophobic groups per molecule. As a rule, these groups are separated from one another by a "spacer". The spacer is usually a hydrocarbon chain that is intended to be long enough such that the hydrophilic groups are a sufficient distance apart to be able to act independently of one another. These types of surfactants are generally characterized by an unusually low critical micelle concentration and the ability to strongly reduce the surface tension of water. In exceptional cases, however, not only dimeric but also trimeric surfactants are meant by the term gemini surfactants. Suitable gemini surfactants are, for example, sulfated hydroxy mixed ethers according to German Patent Application DE 4321022 A1 or dimer alcohol bis- and trimer alcohol tris sulfates and ether sulfates according to International Patent Application WO 96/23768 A1. Blocked end group dimeric and trimeric mixed ethers according to German Patent Application DE 19513391 A1 are especially characterized by their bifunctionality and multifunctionality. Gemini polyhydroxyfatty acid amides or polyhydroxyfatty acid amides, such as those described in International Patent Applications WO 95/19953 A1, WO 95/19954 A1 and WO 95/19955 A1 can also be used.

CATIONIC CO-SURFACTANTS

[00206] Tetraalkyl ammonium salts. Cationically active surfactants comprise the hydrophobic high molecular group required for the surface activity in the cation by dissociation in aqueous solution. A group of important representatives of the cationic surfactants are the tetraalkyl ammonium salts of the general formula: $(R^1R^2R^3R^4N^+)\ X^-$. Here R1 stands for C_1-C_8 alk(en)yl, R^2, R^3 and R^4, independently of each other, for alk(en)yl radicals having 1 to 22 carbon atoms. X is a counter ion, preferably selected from the group of the halides, alkyl sulfates and alkyl carbonates. Cationic surfactants, in which the nitrogen group is substituted with two long acyl groups and two short alk(en)yl groups, are particularly preferred.

[00207] Esterquats. A further class of cationic surfactants particularly useful as co-surfactants for the present invention is represented by the so-called esterquats. Esterquats are generally understood to be quaternised fatty acid triethanolamine ester salts. These are known compounds which can be obtained by the relevant methods of preparative organic chemistry. Reference is made in this connection to International patent application WO 91/01295 A1, according to which triethanolamine is partly esterified with fatty acids in the presence of hypophosphorous acid, air is passed through the reaction mixture and the whole is then quaternised with dimethyl sulphate or ethylene oxide. In addition, German patent DE 4308794 C1 describes a process for the production of solid esterquats in which the quaternisation of triethanolamine esters is carried out in the presence of suitable dispersants, preferably fatty alcohols.

[00208] Typical examples of esterquats suitable for use in accordance with the invention are products of which the acyl component derives from monocarboxylic acids corresponding to formula RCOOH in which RCO is an acyl group containing 6 to 10 carbon atoms, and the amine component is triethanolamine (TEA). Examples of such monocarboxylic acids are caproic acid, caprylic acid, capric acid and technical mixtures thereof such as, for example, so-called head-fractionated fatty acid. Esterquats of which the acyl component derives from monocarboxylic acids containing 8 to 10 carbon atoms, are preferably used. Other esterquats are those of which the acyl component derives from dicarboxylic acids like malonic acid, succinic acid, maleic acid, fumaric acid, glutaric acid, sorbic acid, pimelic acid, azelaic acid, sebacic acid and/or dodecanedioic acid, but preferably adipic acid. Overall, esterquats of which the acyl component derives from mixtures of monocarboxylic acids containing 6 to 22 carbon atoms, and adipic acid are preferably used. The molar ratio of mono and dicarboxylic acids in the final esterquat may be in the range from 1:99 to 99:1 and is preferably in the range from 50:50 to 90:10 and more particularly in the range from 70:30 to 80:20. Besides the quaternised fatty acid triethanolamine ester salts, other suitable esterquats are quaternized ester salts of mono-/dicarboxylic acid mixtures with diethanolalkyamines or 1,2-dihydroxypropyl dialkylamines. The esterquats may be obtained both from fatty acids and from the corresponding triglycerides in admixture with the corresponding dicarboxylic acids. One such process, which is intended to be representative of the relevant prior art, is proposed in European patent EP 0750606 B1. To produce the quaternised esters, the mixtures of mono- and dicarboxylic acids and the triethanolamine - based on the available carboxyl functions - may be used in a molar ratio of 1.1:1 to 3:1. With the performance properties of the esterquats in mind, a ratio of 1.2:1 to 2.2:1 and preferably 1.5:1 to 1.9:1 has proved to be particularly advantageous. The preferred esterquats are technical mixtures of mono-, di- and triesters with an average degree of esterification of 1.5 to 1.9.

AMPHOTERIC OR ZWITTERIONIC CO-SURFACTANTS

[00209] Betaines. Amphoteric or ampholytic surfactants possess a plurality of functional groups that can ionize in aqueous solution and thereby--depending on the conditions of the medium--lend anionic or cationic character to the compounds (see DIN 53900, July 1972). Close to the isoelectric point (around pH 4), the amphoteric surfactants form inner salts, thus becoming poorly soluble or insoluble in water. Amphoteric surfactants are subdivided into ampholytes and betaines, the latter existing as zwitterions in solution. Ampholytes are amphoteric electrolytes, i.e. compounds that possess both acidic as well as basic hydrophilic groups and therefore behave as acids or as bases depending on the conditions. Especially betaines are known surfactants which are mainly produced by carboxyalkylation, preferably carboxymethylation, of amine compounds. The starting materials are preferably condensed with halocarboxylic acids or salts thereof, more particularly sodium chloroacetate, one mole of salt being formed per mole of betaine. The addition of unsaturated carboxylic acids, such as acrylic acid for example, is also possible. Examples of suitable betaines are the carboxy alkylation products of secondary and, in particular, tertiary amines which correspond to formula $R^1R^2R^3N\text{-}(CH_2)_qCOOX$ where R^1 is a an alkyl radical having 6 to 22 carbon atoms, R^2 is hydrogen or an alkyl group containing 1 to 4 carbon atoms, R^3 is an alkyl group containing 1 to 4 carbon atoms, q is a number of 1 to 6 and X is an alkali and/or alkaline earth metal or ammonium. Typical examples are the carboxymethylation products of hexylmethylamine, hexyldimethylamine, octyldimethylamine, decyldimethylamine, $C_{12/14}$-cocoalkyldimethylamine, myristyldimethylamine, cetyldimethylamine, stearyldimethylamine, stearylethylmethylamine, oleyldimethylamine, $C_{16/18}$-tallowalkyldimethylamine and their technical mixtures, and particularly dodecyl methylamine, dodecyl dimethylamine, dodecyl ethylmethylamine and technical mixtures thereof.

[00210] Alkylamido betaines. Other suitable betaines are the carboxyalkylation products of amidoamines corresponding to formula $R^1CO(R^3)(R^4)\text{-}NH\text{-}(CH_2)_p\text{-}N\text{-}(CH_2)_qCOOX$ in which R^1CO is an aliphatic acyl radical having 6 to 22 carbon atoms and 0 or 1 to 3 double bonds, R^2 is hydrogen or an alkyl radical having 1 to 4 carbon atoms, R^3 is an alkyl radical having 1 to 4 carbon atoms, p is a number from 1 to 6, q is a number from 1 to 3 and X is an alkali and/or alkaline earth metal or ammonium. Typical examples are reaction products of fatty acids having 6 to 22 carbon atoms, like for example caproic acid, caprylic acid, caprinic acid, lauric acid, myristic acid, palmitic acid, palmoleic acid, stearic acid, isostearic acid, oleic acid, elaidic acid, petroselinic acid, linolic acid linoleic acid, elaeostearic acid, arachidonic acid, gadoleic acid, behenic acid, erucic acid and their technical mixtures with N,N-dimethylaminoethylamine, N,N-dimethylaminopropylamine, N,N-diethylaminoethylamine und N,N-diethylaminopropylamine, which are condensed with sodium chloroacetate. The commercially available products include Dehyton® K and Dehyton® PK (Cognis Deutschland GmbH & Co., KG) as well as Tego®Betaine (Goldschmidt).

[00211] Imidazolines. Other suitable starting materials for the betaines to be used for the purposes of the invention are imidazolines. These substances are also known and may be obtained, for example, by cyclizing condensation of 1 or 2 moles of C_6-C_{22} fatty acids with polyfunctional amines, such as for example aminoethyl ethanolamine (AEEA) or diethylenetriamine. The corresponding carboxyalkylation products are mixtures of different open-chain betaines. Typical examples are condensation products of the above- mentioned fatty acids with AEEA, preferably imidazolines based on lauric acid, which are subsequently betainised with sodium chloroacetate. The commercially available products include Dehyton® G (Cognis Deutschland GmbH & Co., KG)

[00212] The amount of (co-)surfactant comprised in the inventive compositions is advantageously 0.1 wt. % to 90 wt. %, particularly 10 wt. % to 80 wt. % and particularly preferably 20 wt. % to 70 wt.-%.

ORGANIC SOLVENTS

[00213] Liquid light or heavy duty detergents may comprise organic solvents, preferably those miscible with water. Polydiols, ethers, alcohols, ketones, amides and/or esters are preferably used as the organic solvent for this in amounts of 0 to 90 wt. %, preferably 0.1 to 70 wt. %, particularly 0.1 to 60 wt. %. Low molecular weight polar substances, such as for example, methanol, ethanol, propylene carbonate, acetone, acetonylacetone, diacetone alcohol, ethyl acetate, 2-propanol, ethylene glycol, propylene glycol, glycerin, diethylene glycol, dipropylene glycol monomethyl ether and dimethylformamide or their mixtures are preferred.

ENZYMES

[00214] Cellulase Enzymes. Cellulase enzymes optionally used in the instant detergent composition are preferably incorporated, when present, at levels sufficient to provide up to about 5 mg by weight, more preferably about 0.01 mg to about 3 mg, of active enzyme per gram of the composition. Unless stated otherwise, the compositions herein preferably comprise from about 0.001% to about 5%, preferably 0.01%-1% by weight of a commercial enzyme preparation.

[00215] The cellulases suitable for the present invention include either bacterial or fungal cellulase. Preferably, they will have a pH optimum of between 5 and 9.5. Suitable cellulases are fungal cellulase produced from Humicola insolens and Humicola strain DSM1800 or a cellulase 212-producing fungus belonging to the genus Aeromonas, and cellulase extracted from the hepatopancreas of a marine mollusk (Dolabella Auricula Solander), suitable cellulases are also disclosed in **GB 2,075,028 A**. In addition, cellulase especially suitable for use herein are disclosed in **WO 1992 013057 A1**. Most preferably, the cellulases used in the instant detergent compositions are purchased commercially from NOVO Industries A/S under the product names CAREZYMEO and CELLUZYMEO.

[00216] Other Enzymes. Additional enzymes can be included in the detergent compositions herein for a wide variety of fabric laundering purposes, including removal of protein-based, carbohydrate-based, or triglyceride-based stains, for example, and for the prevention of refugee dye transfer, and for fabric restoration. The additional enzymes to be incorporated include proteases, amylases, lipases, and peroxidases, as well as mixtures thereof. Other types of enzymes can also be included. They can be of any suitable origin, such as vegetable, animal, bacterial, fungal and yeast origin. However, their choice is governed by several factors such as pH-activity and/or stability optima, thermostability, stability versus active detergents, builders as well as their potential to cause malodors during use. In this respect bacterial or fungal enzymes are preferred, such as bacterial amylases and proteases.

[00217] Enzymes are normally incorporated at levels sufficient to provide up to about 5 mg by weight, more typically about 0.01 mg to about 3 mg, of active enzyme per gram of the composition. Stated otherwise, the compositions herein will typically comprise from about 0.001% to about 5%, preferably 0.01%-1% by weight of a commercial enzyme preparation. Protease enzymes are usually present in such commercial preparations at levels sufficient to provide from 0.005 to 0.1 Anson units (AU) of activity per gram of composition.

[00218] Suitable examples of proteases are the subtilisins which are obtained from particular strains of B. subtilis and B. licheniforms. Another suitable protease is obtained from a strain of Bacillus, having maximum activity throughout the pH range of 8-12, developed and sold by Novo Industries A/S under the registered trade name ESPERASE®. The preparation of this enzyme and analogous enzymes is described in GB 1,243,784 of Novo. Proteolytic enzymes suitable for removing protein-based stains that are commercially available include those sold under the trade names ALCALASE® and SAVINASE® by Novo Industries A/S and MAXATASE® by International Bio-Synthetics, Inc.. Other proteases include Protease A; Protease B and proteases made by Genencor International, Inc., according to US 5,204,015 and US 5,244,791.

[00219] Amylases include, for example, alpha-amylases like RAPIDASE®, International Bio-Synthetics, Inc. and TERMAMYL®, Novo Industries.

[00220] Suitable lipase enzymes for detergent usage include those produced by microorganisms of the Pseudomonas group, such as Pseudomonas stutzeri ATCC 19154. This lipase is available from Amano Pharmaceutical Co. Ltd., under the trade name Lipase P "Amano". Other commercial lipases include Amano-CES, lipases ex Chromobacter viscosum, e.g. Chromobacter viscosum var. lipolyticum NRRLB 3673, commercially available from Toyo Jozo Co., and further Chromobacter viscosum lipases from U.S. Biochemical Corp. and Disoynth Co., and lipases ex Pseudomonas gladioli. The LIPOLASE® enzyme derived from Humicola lanuginosa (commercially available from Novo Industries A/S) is a preferred lipase for use herein.

[00221] Peroxidase enzymes are used in combination with oxygen sources, e.g., percarbonate, perborate, persulfate, hydrogen peroxide, etc. They are used for "solution bleaching," i.e. to prevent transfer of dyes or pigments removed from substrates during wash operations to other substrates in the wash solution. Peroxidase enzymes are known in the art, and include, for example, horseradish peroxidase, ligninase, and haloperoxidase such as chloro- and bromo-peroxidase. Peroxidase-containing detergent compositions are disclosed, for example, in **WO 1989 099813 A1**.

[00222] Enzyme Stabilizers. The enzymes employed herein are stabilized by the presence of water-soluble sources of calcium and/or magnesium ions in the finished detergent compositions which provide such ions to the enzymes. (Calcium ions are generally somewhat more effective than magnesium ions and are preferred herein if only one type of cation is being used.) Additional stability can be provided by the presence of various other art-disclosed stabilizers, especially borate species, see **US 4,537,706**, incorporated herein in its entirety. Typical detergents, especially liquids, will comprise from about 1 to about 30, preferably from about 2 to about 20, more preferably from about 5 to about 15, and most preferably from about 8 to about 12, millimoles of calcium ion per liter of finished composition. In solid detergent compositions the formulation can include a sufficient quantity of a water-soluble calcium ion source to provide such amounts in the laundry liquor. In the alternative, natural water hardness can suffice.

[00223] It is to be understood that the foregoing levels of calcium and/or magnesium ions are sufficient to provide enzyme stability. More calcium and/or magnesium ions can be added to the compositions to provide an additional measure of grease removal performance. Accordingly, as a general proposition the compositions herein will typically comprise from about 0.05% to about 2% by weight of a water-soluble source of calcium or magnesium ions, or both. The amount can vary, of course, with the amount and type of enzyme employed in the composition.

[00224] The compositions herein can also optionally, but preferably, contain various additional stabilizers, especially borate-type stabilizers. Typically, such stabilizers will be used at levels in the compositions from about 0.25% to about 10%, preferably from about 0.5% to about 5%, more preferably from about 0.75% to about 3%, by weight of boric acid or other borate compound capable of forming boric acid in the composition (calculated on the basis of boric acid). Boric acid is preferred, although other compounds such as boric oxide, borax and other alkali metal borates (e.g., sodium ortho-, meta- and pyroborate, and sodium pentaborate) are suitable. Substituted boric acids (e.g., phenylboronic acid, butane boronic acid, and p-bromo phenylboronic acid) can also be used in place of boric acid.

BUILDERS

[00225] Zeolites. Fine crystalline, synthetic zeolites containing bound water can be used as builders, for example, preferably zeolite A and/or P. Zeolite MAP.RTM. (commercial product of the Crosfield company), is particularly preferred as the zeolite P. However, zeolite X and mixtures of A, X, Y and/or P are also suitable. A co-crystallized sodium/potassium aluminum silicate from Zeolite A and Zeolite X, which is available as Vegobond® RX. (commercial product from Condea Augusta S.p.A.), is also of particular interest. Preferably, the zeolite can be used as a spray-dried powder. For the case where the zeolite is added as a suspension, this can comprise small amounts of nonionic surfactants as stabilizers, for example, 1 to 3 wt. %, based on the zeolite, of ethoxylated C_{12}-C_{18} fatty alcohols with 2 to 5 ethylene oxide groups, C_{12}-C_{14} fatty alcohols with 4 to 5 ethylene oxide groups or ethoxylated isotridecanols. Suitable zeolites have an average particle size of less than 10µm (test method: volumetric distribution Coulter counter) and preferably comprise 18 to 22 wt. %, particularly 20 to 22 wt. % of bound water. Apart from this, phosphates can also be used as builders.

[00226] Layered silicates. Suitable substitutes or partial substitutes for phosphates and zeolites are crystalline, layered sodium silicates. These types of crystalline layered silicates are described, for example, in European Patent Application EP 0164514 A1. Preferred crystalline layered silicates are those obtained for example, from the process described in International Patent Application WO 91/08171 A1.

[00227] Amorphous silicates. Preferred builders also include amorphous sodium silicates with a modulus (Na_2O:SiO_2 ratio) of 1:2 to 1:3.3, preferably 1:2 to 1:2.8 and more preferably 1:2 to 1:2.6, which dissolve with a delay and exhibit multiple wash cycle properties. The delay in dissolution compared with conventional amorphous sodium silicates can have been obtained in various ways, for example, by surface treatment, compounding, compressing/compacting or by over-drying. In the context of this invention, the term "amorphous" also means "X-ray amorphous". In other words, the silicates do not produce any of the sharp X-ray reflexions typical of crystalline substances in X-ray diffraction experiments, but at best one or more maxima of the scattered X-radiation, which have a width of several degrees of the diffraction angle. However, particularly good builder properties may even be achieved where the silicate particles produce indistinct or even sharp diffraction maxima in electron diffraction experiments. This is to be interpreted to mean that the products have microcrystalline regions between 10 and a few hundred nm in size, values of up to at most 50 nm and especially up to at most 20 nm being preferred. This type of X-ray amorphous silicates, which similarly possess a delayed dissolution in comparison with the customary water glasses, are described, for example, in German Patent Application DE 4400024 A1. Compacted/densified amorphous silicates, compounded amorphous silicates and over dried X-ray-amorphous silicates are particularly preferred.

[00228] Phosphates. Also the generally known phosphates can also be added as builders, in so far that their use should not be avoided on ecological grounds. The sodium salts of the orthophosphates, the pyrophosphates and especially the tripolyphosphates are particularly suitable. Their content is generally not more than 25 wt. %, preferably not more than 20 wt. %, each based on the finished composition. In some cases it has been shown that particularly tripolyphosphates, already in low amounts up to maximum 10 wt. %, based on the finished composition, in combination with other builders, lead to a synergistic improvement of the secondary washing power. Preferred amounts of phosphates are under 10 wt. %, particularly 0 wt. %.

CO-BUILDERS

[00229] Polycarboxylic acids. Useful organic cobuilders are, for example, the polycarboxylic acids usable in the form of their sodium salts of polycarboxylic acids, wherein polycarboxylic acids are understood to be carboxylic acids that carry more than one acid function. These include, for example, citric acid, adipic acid, succinic acid, glutaric acid, malic acid, tartaric acid, maleic acid, fumaric acid, sugar acids, aminocarboxylic acids, nitrilotriacetic acid (NTA) and its derivatives and mixtures thereof. Preferred salts are the salts of polycarboxylic acids such as citric acid, adipic acid, succinic acid, glutaric acid, tartaric acid, sugar acids and mixtures thereof.

[00230] Organic acids. Acids per se can also be used. Besides their building effect, the acids also typically have the property of an acidifying component and, hence also serve to establish a relatively low and mild pH in detergents or cleansing compositions. Citric acid, succinic acid, glutaric acid, adipic acid, gluconic acid and any mixtures thereof are particularly mentioned in this regard. Further suitable acidifiers are the known pH regulators such as sodium hydrogen carbonate and sodium hydrogen sulfate.

[00231] Polymers. Particularly suitable polymeric cobuilders are polyacrylates, which preferably have a molecular weight of 2,000 to 20,000 g/mol. By virtue of their superior solubility, preferred representatives of this group are again the short-chain polyacrylates, which have molecular weights of 2,000 to 10,000 g/mol and, more particularly, 3,000 to 5,000 g/mol. Suitable polymers can also include substances that consist partially or totally of vinyl alcohol units or its derivatives.

[00232] Further suitable copolymeric polycarboxylates are particularly those of acrylic acid with methacrylic acid and of acrylic acid or methacrylic acid with maleic acid. Copolymers of acrylic acid with maleic acid, which comprise 50 to 90 wt. % acrylic acid and 50 to 10 wt. % maleic acid, have proven to be particularly suitable. Their relative molecular weight, based on free acids, generally ranges from 2,000 to 70,000 g/mol, preferably 20,000 to 50,000 g/mol and especially 30,000 to 40,000 g/mol. The (co)polymeric polycarboxylates can be added either as an aqueous solution or preferably as powder. In order to improve the water solubility, the polymers can also comprise allylsulfonic acids as monomers, such as, for example, allyloxybenzene sulfonic acid and methallyl sulfonic acid as in the **EP 0727448 B1**.

[00233] Biodegradable polymers comprising more than two different monomer units are particularly preferred, examples being those comprising, as monomers, salts of acrylic acid and of maleic acid, and also vinyl alcohol or vinyl alcohol derivatives, as in **DE 4300772 A1**, or those comprising, as monomers, salts of acrylic acid and of 2-alkylallyl sulfonic acid, and also sugar derivatives. Further preferred copolymers are those that are described in German

Patent Applications DE 4303320 A1 and **DE 4417734 A1** and preferably include acrolein and acrylic acid/acrylic acid salts or acrolein and vinyl acetate as monomers.

[00234] Similarly, other preferred builders are polymeric aminodicarboxylic acids, salts or precursors thereof. Those polyaspartic acids or their salts and derivatives disclosed in German Patent Application **DE 19540086 A1** as having a bleach-stabilizing action in addition to cobuilder properties are particularly preferred.

[00235] Further suitable builders are polyacetals that can be obtained by treating dialdehydes with polyol carboxylic acids that possess 5 to 7 carbon atoms and at least 3 hydroxyl groups, as described in European Patent Application **EP 0280223 A1**. Preferred polyacetals are obtained from dialdehydes like glyoxal, glutaraldehyde, terephthalaldehyde as well as their mixtures and from polycarboxylic acids like gluconic acid and/or glucoheptonic acid.

[00236] Carbohydrates. Further suitable organic cobuilders are dextrins, for example, oligomers or polymers of carbohydrates that can be obtained by the partial hydrolysis of starches. The hydrolysis can be carried out using typical processes, for example, acidic or enzymatic catalyzed processes. The hydrolysis products preferably have average molecular weights in the range of 400 to 500,000 g/mol. A polysaccharide with a dextrose equivalent (DE) of 0.5 to 40 and, more particularly, 2 to 30 is preferred, the DE being an accepted measure of the reducing effect of a polysaccharide in comparison with dextrose, which has a DE of 100. Both maltodextrins with a DE between 3 and 20 and dry glucose syrups with a DE between 20 and 37 and also so-called yellow dextrins and white dextrins with relatively high molecular weights of 2,000 to 30,000 g/mol may be used. A preferred dextrin is described in British Patent Application 94 19 091.

[00237] The oxidized derivatives of such dextrins concern their reaction products with oxidizing compositions that are capable of oxidizing at least one alcohol function of the saccharide ring to the carboxylic acid function. Such oxidized dextrins and processes for their manufacture are known for example, from European Patent Applications **EP 0232202 A1**. A product oxidized at C6 of the saccharide ring can be particularly advantageous.

[00238] Oxydisuccinates and other derivatives of disuccinates, preferably ethylenediamine disuccinate are also further suitable cobuilders. Here, ethylene diamine-N,N'-disuccinate (EDDS), the synthesis of which is described for example, in **US 3,158,615**, is preferably used in the form of its sodium or magnesium salts. In this context, glycerine disuccinates and glycerine trisuccinates are also particularly preferred, such as those described in **US 4,524,009**. Suitable addition quantities in zeolite-containing and/or silicate-containing formulations range from 3 to 15% by weight.

[00239] (**Lactones.** Other useful organic co-builders are, for example, acetylated hydroxycarboxylic acids and salts thereof which optionally may also be present in lactone form and which contain at least 4 carbon atoms, at least one hydroxyl group and at most two acid groups. Such cobuilders are described, for example, in International Patent Application **WO 1995 020029 A1**.

BLEACHING COMPOUNDS, BLEACHING AGENTS AND BLEACH ACTIVATORS

[00240] The detergent compositions herein can optionally contain bleaching agents or bleaching compositions containing a bleaching agent and one or more bleach activators. When present, bleaching agents will typically be at levels of from about 1% to about 30%, more typically from about 5% to about 20%, of the detergent composition, especially for fabric laundering. If present, the amount of bleach activators will typically be from about 0.1% to about 60%, more typically from about 0.5% to about 40% of the bleaching composition comprising the bleaching agent-plus-bleach activator.

[00241] The bleaching agents used herein can be any of the bleaching agents useful for detergent compositions in textile cleaning, hard surface cleaning, or other cleaning purposes that are now known or become known. These include oxygen bleaches as well as other bleaching agents. Perborate bleaches, e.g., sodium perborate (e.g., mono- or tetra-hydrate) can be used herein.

[00242] Another category of bleaching agent that can be used without restriction encompasses percarboxylic acid bleaching agents and salts thereof. Suitable examples of this class of agents include magnesium monoperoxyphthalate hexahydrate, the magnesium salt of meta-chloro perbenzoic acid, 4-nonylamino-4-oxoperoxybutyric acid and diperoxydodecanedioic acid.

[00243] Peroxygen bleaching agents can also be used. Suitable peroxygen bleaching compounds include sodium carbonate peroxyhydrate and equivalent "percarbonate" bleaches, sodium pyrophosphate peroxyhydrate, urea peroxyhydrate, and sodium peroxide. Persulfate bleach (e.g., OXONEO®, manufactured commercially by DuPont) can also be used.

[00244] A preferred percarbonate bleach comprises dry particles having an average particle size in the range from about 500 micrometers to about 1,000 micrometers, not more than about 10% by weight of said particles being smaller than about 200 micrometers and not more than about 10% by weight of said particles being larger than about 1,250 micrometers. Optionally, the percarbonate can be coated with silicate, borate or water-soluble surfactants. Percarbonate is available from various commercial sources.

[00245] Mixtures of bleaching agents can also be used.

[00246] Peroxygen bleaching agents, the perborates, the percarbonates, etc., are preferably combined with bleach activators, which lead to the in situ production in aqueous solution (i.e., during the washing process) of the peroxy acid corresponding to the bleach activator. The nonanoyloxybenzene sulfonate (NOBS) and tetraacetyl ethylene diamine (TAED) activators are typical, and mixtures thereof can also be used.

[00247] Preferred amido-derived bleach activators include (6-octanamido-caproyl)oxybenzene-sulfonate, (6-nonanamidocaproyl)oxybenzenesulfonate, (6-decanamido-caproyl)-oxyben-zenesulfonate, and mixtures thereof.

[00248] Another class of bleach activators comprises the benzoxazin-type activators disclosed in **US 4,966,723**, incorporated herein by reference.

[00249] Highly preferred lactam activators include benzoyl caprolactam, octanoyl caprolactam, 3,5,5-trimethylhexanoyl caprolactam, nonanoyl caprolactam, decanoyl caprolactam, undecenoyl caprolactam, benzoyl valerolactam, octanoyl valerolactam, decanoyl valerolactam, undecenoyl valerolactam, nonanoyl valerolactam, 3,5,5-trimethylhexanoyl valerolactam and mixtures thereof, optionally adsorbed into solid carriers, e.g acyl caprolactams, preferably benzoyl caprolactam, adsorbed into sodium perborate.

[00250] Bleaching agents other than oxygen bleaching agents are also known in the art and can be utilized herein. One type of non-oxygen bleaching agent of particular interest includes photoactivated bleaching agents such as the sulfonated zinc and/or aluminum phthalocyanines. If used, detergent compositions will typically contain from about 0.025% to about 1.25%, by weight, of such bleaches, especially sulfonate zinc phthalocyanine.

[00251] If desired, the bleaching compounds can be catalyzed by means of a manganese compound. Such manganese-based catalysts are well known in the art and include Mn^{IV}_2 (u-O)$_3$ (1,4,7-trimethyl-1,4,7-triazacyclononane)$_2$ $(PF_6)_2$, Mn^{III}_2 (u-O)$_1$ (u-OAc)$_2$ (1,4,7-trimethyl-1,4,7-triazacyclononane)$_2$$(ClO_4)_2$, Mn^{IV}_4 (u-O)$_6$ (1,4,7-triazacyclononane)$_4$ $(ClO_4)_4$, $Mn^{III}Mn^{IV}_4$ (u-O)$_1$ (u-OAc)$_2$ (1,4,7-trimethyl-1,4,7-triazacyclononane)$_2$ $(ClO_4)_3$, Mn^{IV} (1,4,7-trimethyl-1,4,7-triazacyclononane)-$(OCH_3)_3$ (PF_6), and mixtures thereof.

[00252] As a practical matter, and not by way of limitation, the compositions and processes herein can be adjusted to provide on the order of at least one part per ten million of the active bleach catalyst species in the aqueous washing liquor, and will preferably provide from about 0.1 ppm to about 700 ppm, more preferably from about 1 ppm to about 500 ppm, of the catalyst species in the laundry liquor.

POLYMERIC SOIL RELEASE AGENTS

[00253] Any polymeric soil release agent known to those skilled in the art can optionally be employed in the detergent compositions and processes of this invention. Polymeric soil release agents are characterized by having both hydrophilic segments, to hydrophilize the surface of hydrophobic fibers, such as polyester and nylon, and hydrophobic segments, to deposit upon hydrophobic fibers and remain adhered thereto through completion of washing and rinsing cycles and, thus, serve as an anchor for the hydrophilic segments. This can enable stains occurring subsequent to treatment with the soil release agent to be more easily cleaned in later washing procedures.

[00254] The polymeric soil release agents useful herein especially include those soil release agents having: (a) one or more nonionic hydrophile components consisting essentially of (i) polyoxyethylene segments with a degree of polymerization of at least 2, or (ii) oxypropylene or polyoxypropylene segments with a degree of polymerization of from 2 to 10, wherein said hydrophile segment does not encompass any oxypropylene unit unless it is bonded to adjacent moieties at each end by ether linkages, or (iii) a mixture of oxyalkylene units comprising oxyethylene and from 1 to about 30 oxypropylene units wherein said mixture contains a sufficient amount of oxyethylene units such that the hydrophile component has hydrophilicity great enough to increase the hydrophilicity of conventional polyester synthetic fiber surfaces upon deposit of the soil release agent on such surface, said hydrophile segments preferably comprising at least about 25% oxyethylene units and more preferably, especially for such components having about 20 to 30 oxypropylene units, at least about 50% oxyethylene units; or (b) one or more hydrophobe components comprising (i) C_3 oxyalkylene terephthalate segments, wherein, if said hydrophobe components also comprise oxyethylene terephthalate, the ratio of oxyethylene terephthalate: C_3 oxyalkylene terephthalate units is about 2:1 or lower, (ii) C_4 - C_6 alkylene or oxy C_4 - C_6 alkylene segments, or mixtures therein, (iii) poly (vinyl ester) segments, preferably polyvinyl acetate), having a degree of polymerization of at least 2, or (iv) C_1 - C_4 alkyl ether or C_4 hydroxyalkyl ether substituents, or mixtures therein, wherein said substituents are present in the form of C_1 - C_4 alkyl ether or C_4 hydroxyalkyl ether cellulose derivatives, or mixtures therein, and such cellulose derivatives are amphiphilic, whereby they have a sufficient level of C_1 - C_4 alkyl ether and/or C_4 hydroxyalkyl ether units to deposit upon conventional polyester synthetic fiber surfaces and retain a sufficient level of hydroxyls, once adhered to such conventional synthetic fiber surface, to increase fiber surface hydrophilicity, or a combination of (a) and (b).

[00255] Typically, the polyoxyethylene segments of (a) (i) will have a degree of polymerization of from about 200, although higher levels can be used, preferably from 3 to about 150, more preferably from 6 to about 100. Suitable oxy C_4 - C_6 alkylene hydrophobe segments include, but are not limited to, end-caps of polymeric soil release agents.

[00256] Polymeric soil release agents useful in the present invention also include cellulosic derivatives such as hydroxyether cellulosic polymers, copolymeric blocks of ethylene terephthalate or propylene terephthalate with polyethylene oxide or polypropylene oxide terephthalate, and the like. Such agents are commercially available and include hydroxyethers of cellulose such as METHOCEL® (Dow). Cellulosic soil release agents for use herein also include those selected from the group consisting of C_1 - C_4 alkyl and C_4 hydroxyalkyl cellulose.

[00257] Soil release agents characterized by poly(vinyl ester) hydrophobe segments include graft copolymers of poly(vinyl ester), e.g., C_1 - C_6 vinyl esters, preferably poly(vinyl acetate) grafted onto polyalkylene oxide backbones, such as polyethylene oxide backbones, see EP 0 219 048, incorporated herein in its entirety. Commercially available soil release agents of this kind include the SOKALAN® type of material, e.g., SOKALAN® HP-22, available from BASF.

[00258] One type of preferred soil release agent is a copolymer having random blocks of ethylene terephthalate and polyethylene oxide (PEO) terephthalate. The molecular weight of this polymeric soil release agent preferably is in the range of from about 25,000 to about 55,000.

[00259] Another preferred polymeric soil release agent is a polyester with repeat units of ethylene terephthalate units contains 10-15% by weight of ethylene terephthalate units together with 90-80% by weight of polyoxyethylene terephthalate units, derived from a polyoxyethylene glycol of average molecular weight 300-5,000. Examples of this polymer include the commercially available material ZELCON® 5126 (from DuPont) and MILEASE® T (from ICI).

[00260] Another preferred polymeric soil release agent is a sulfonated product of a substantially linear ester oligomer comprised of an oligomeric ester backbone of terephthaloyl and oxyalkyleneoxy repeat units and terminal moieties covalently attached to the backbone. These soil release agents are described fully in US 4,968,451. Other suitable polymeric soil release agents include the terephthalate polyesters of US 4,711,730, the anionic end-capped oligomeric esters of US 4,721,580, the block polyester oligomeric compounds of US 4,702,857, and anionic, especially sulfoaroyl, end-capped terephthalate esters of US 4,877,896 all cited patents incorporated herein in their entirety.

[00261] Still another preferred soil release agent is an oligomer with repeat units of terephthaloyl units, sulfoisoterephthaloyl units, oxyethyleneoxy and oxy-1,2-propylene units. The repeat units form the backbone of the oligomer and are preferably terminated with modified isethionate end-caps. A particularly preferred soil release agent of this type comprises about one sulfoisophthaloyl unit, 5 terephthaloyl units, oxyethyleneoxy and oxy-1,2-propyleneoxy units in a ratio of from about 1.7 to about 1.8, and two end-cap units of sodium 2-(2-hydroxyethoxy)-ethanesulfonate. Said soil release agent also comprises from about 0.5% to about 20%, by weight of the oligomer, of a crystalline-reducing stabilizer, preferably selected from the group consisting of xylene sulfonate, cumene sulfonate, toluene sulfonate, and mixtures thereof.

[00262] If utilized, soil release agents will generally comprise from about 0.01% to about 10.0%, by weight, of the detergent compositions herein, typically from about 0.1% to about 5%, preferably from about 0.2% to about 3.0%.

POLYMERIC DISPERSING AGENTS

[00263] Polymeric dispersing agents can advantageously be utilized at levels from about 0.1% to about 7%, by weight, in the detergent compositions herein, especially in the presence of zeolite and/or layered silicate builders. Suitable polymeric dispersing agents include polymeric polycarboxylates and polyethylene glycols, although others known in the art can also be used. It is believed, though it is not intended to be limited by theory, that polymeric dispersing agents enhance overall detergent builder performance, when used in combination with other builders (including lower molecular weight polycarboxylates) by crystal growth inhibition, particulate soil release peptization, and anti-redeposition.

[00264] Polymeric polycarboxylate materials can be prepared by polymerizing or copolymerizing suitable unsaturated monomers, preferably in their acid form. Unsaturated monomeric acids that can be polymerized to form suitable polymeric polycarboxylates include acrylic acid, maleic acid (or maleic anhydride), fumaric acid, itaconic acid, aconitic acid, mesaconic acid, citraconic acid and methylenemalonic acid. The presence in the polymeric polycarboxylates herein or monomeric segments, containing no carboxylate radicals such as vinylmethyl ether, styrene, ethylene, etc. is suitable provided that such segments do not constitute more than about 40% by weight.

[00265] Particularly suitable polymeric polycarboxylates can be derived from acrylic acid. Such acrylic acid-based polymers which are useful herein are the water-soluble salts of polymerized acrylic acid. The average molecular weight of such polymers in the acid form preferably ranges from about 2,000 to 10,000, more preferably from about 4,000 to 7,000 and most preferably from about 4,000 to 5,000. Water-soluble salts of such acrylic acid polymers can include, for example, the alkali metal, ammonium and substituted ammonium salts. Soluble polymers of this type are known materials. Use of polyacrylates of this type in detergent compositions has been disclosed, for example **US 3,308,067**.

[00266] Acrylic/maleic-based copolymers can also be used as a preferred component of the dispersing/anti-redeposition agent. Such materials include the water-soluble salts of copolymers of acrylic acid and maleic acid. The average molecular weight of such copolymers in the acid form preferably ranges from about 2,000 to 100,000, more preferably from about 5,000 to 75,000, most preferably from about 7,000 to 65,000. The ratio of acrylate to maleate segments in such copolymers will generally range from about 30:1 to about 1:1, more preferably from about 10:1 to 2:1. Water-soluble salts of such acrylic acid/maleic acid copolymers can include, for example, the alkali metal, ammonium and substituted ammonium salts. Soluble acrylate/maleate copolymers of this type are known materials which are described in EP 0193360 A1, which also describes such polymers comprising hydroxypropylacrylate. Still other useful dispersing agents include the maleic/acrylic/vinyl alcohol terpolymers, for example, a 45/45/10 terpolymer of acrylic/maleic/vinyl alcohol.

[00267] Another polymeric material which can be included is polyethylene glycol (PEG). PEG can exhibit dispersing agent performance as well as act as a clay soil removal-antiredeposition agent. Typical molecular weight ranges for these purposes range from about 500 to about 100,000, preferably from about 1,000 to about 50,000, more preferably from about 1,500 to about 10,000.

[00268] Polyaspartate and polyglutamate dispersing agents can also be used, especially in conjunction with zeolite builders. Dispersing agents such as polyaspartate preferably have a molecular weight (avg.) of about 10,000.

FOAM INHIBITORS/SUD SUPRESSORS

[00269] Especially when used in automatic washing processes, it can be advantageous to add conventional foam inhibitors to the compositions. Suitable foam inhibitors include for example, soaps of natural or synthetic origin, which have a high content of C_{18}-C_{24} fatty acids. Suitable non-surface-active types of foam inhibitors are, for example, organopolysiloxanes and mixtures thereof with microfine, optionally silanised silica and also paraffins, waxes, microcrystalline waxes and mixtures thereof with silanised silica or bis-stearyl ethylenediamide. Mixtures of various foam inhibitors, for example, mixtures of silicones, paraffins or waxes, are also used with advantage. Preferably, the foam inhibitors, especially silicone-containing and/or paraffin-containing foam inhibitors, are loaded onto a granular, water-soluble or dispersible carrier material. Especially in this case, mixtures of paraffins and bis-stearylethylene diamides are preferred.

[00270] Compounds for reducing or suppressing the formation of suds can be incorporated into the detergent compositions of the present invention. Suds suppression can be of particular importance in the so-called "high concentration cleaning process" and in front-loading European-style washing machines.

[00271] A wide variety of materials can be used as suds suppressors, and suds suppressors are well known to those skilled in the art. See, for example, Kirk Othmer Encyclopedia of Chemical Technology, Third Edition, Volume 7, pages 430-447 (John Wiley & Sons, Inc., 1979). One category of suds suppressor of particular interest encompasses monocarboxylic fatty acid and soluble salts therein. The monocarboxylic fatty acids and salts thereof used as suds suppressor typically have hydrocarbyl chains of 10 to about 24 carbon atoms, preferably 12 to 18 carbon atoms. Suitable salts include the alkali metal salts such as sodium, potassium, and lithium salts, and ammonium and alkanolammonium salts.

[00272] The detergent compositions herein can also contain non-surfactant suds suppressors. These include, for example: high molecular weight hydrocarbons such as paraffin, fatty acid esters (e.g., fatty acid triglycerides), fatty acid esters of monovalent alcohols, aliphatic C_{18}- C_{40} ketones (e.g., stearone), etc. Other suds inhibitors include N-alkylated amino triazines such as tri- to hexa-alkylmelamines or di- to tetra-alkyldiamine chlortriazines formed as products of cyanuric chloride with two or three moles of a primary or secondary amine containing 1 to 24 carbon atoms, propylene oxide, and monostearyl phosphates such as monostearyl alcohol phosphate ester and monostearyl di-alkali metal (e.g., K, Na, and Li) phosphates and phosphate esters. The hydrocarbons such as paraffin and haloparaffin can be utilized in liquid form. The liquid hydrocarbons will be liquid at room temperature and atmospheric pressure, and will have a pour point in the range of about -

40°C and about 50°C, and a minimum boiling point not less than about 110°C (atmospheric pressure). It is also known to utilize waxy hydrocarbons, preferably having a melting point below about 100°C. Hydrocarbon suds suppressors are known in the art and include aliphatic, alicyclic, aromatic, and heterocyclic saturated or unsaturated hydrocarbons having from about 12 to about 70 carbon atoms. The term "paraffin," as used in this suds suppressor discussion, is intended to include mixtures of true paraffins and cyclic hydrocarbons.

[00273] Another preferred category of non-surfactant suds suppressors comprises silicone suds suppressors. This category includes the use of polyorganosiloxane oils, such as polydimethylsiloxane, dispersions or emulsions of polyorganosiloxane oils or resins, and combinations of polyorganosiloxane with silica particles wherein the polyorganosiloxane is chemisorbed or fused onto the silica. Silicone suds suppressors are well known in the art.

[00274] Other silicone suds suppressors are disclosed in **US 3,455,839**, incorporated herein in its entirety, which relates to compositions and processes for defoaming aqueous solutions by incorporating therein small amounts of polydimethylsiloxane fluids.

[00275] Mixtures of silicone and silanated silica are described, for instance, in **DE-OS 2124526**, incorporated herein in its entirety. Silicone defoamers and suds controlling agents in granular detergent compositions are disclosed in **US 4,652,392**, incorporated herein in its entirety.

[00276] In the preferred silicone suds suppressor used herein, the solvent for a continuous phase is made up of certain polyethylene glycols or polyethylene-polypropylene glycol copolymers or mixtures thereof (preferred), or polypropylene glycol. The primary silicone suds suppressor is branched/crosslinked and preferably not linear.

[00277] The silicone suds suppressor herein preferably comprises polyethylene glycol and a copolymer of polyethylene glycol/polypropylene glycol, all having an average molecular weight of less than about 1,000, preferably between about 100 and 800. The polyethylene glycol and polyethylene/polypropylene copolymers herein have a solubility in water at room temperature of more than about 2 weight %, preferably more than about 5 weight %.

[00278] The preferred solvent herein is polyethylene glycol having an average molecular weight of less than about 1,000, more preferably between about 100 and 800, most preferably between 200 and 400, and a copolymer of polyethylene glycol/polypropylene glycol, preferably PPG 200/PEG 300. Preferred is a weight ratio of between about 1:1 and 1:10, most preferably between 1:3 and 1:6, of polyethylene glycol:copolymer of polyethylene-polypropylene glycol.

[00279] The preferred silicone suds suppressors used herein do not contain polypropylene glycol, particularly of 4,000 molecular weight. They also preferably do not contain block copolymers of ethylene oxide and propylene oxide, like PLURONIC® L101.

[00280] Other suds suppressors useful herein comprise the secondary alcohols (e.g., 2-alkyl alkanols) and mixtures of such alcohols with silicone oils. The secondary alcohols include the C_6 - C_{16} alkyl alcohols having a C_1 - C_{16} chain. A preferred alcohol is 2-butyl octanol, which is available from Condea under the trademark ISOFOL® 12. Mixtures of secondary alcohols are available under the trademark ISALCHEM® 123 from Enichem. Mixed suds suppressors typically comprise mixtures of alcohol+silicone at a weight ratio of 1:5 to 5:1.

[00281] The compositions herein will generally comprise from 0% to about 5% of suds suppressor. When utilized as suds suppressors, monocarboxylic fatty acids, and salts therein, will be present typically in amounts up to about 5%, by weight, of the detergent composition. Preferably, from about 0.5% to about 3% of fatty monocarboxylate suds suppressor is utilized. Silicone suds suppressors are typically utilized in amounts up to about 2.0%, by weight, of the detergent composition, although higher amounts can be used. This upper limit is practical in nature, due primarily to concern with keeping costs minimized and effectiveness of lower amounts for effectively controlling sudsing. Preferably from about 0.01% to about 1% of silicone suds suppressor is used, more preferably from about 0.25% to about 0.5%. As used herein, these weight percentage values include any silica that can be utilized in combination with polyorganosiloxane, as well as any adjunct materials that can be utilized. Monostearyl phosphate suds suppressors are generally utilized in amounts ranging from about 0.1% to about 2%, by weight, of the composition. Hydrocarbon suds suppressors are typically utilized in amounts ranging from about 0.01% to about 5.0%, although higher levels can be used. The alcohol suds suppressors are typically used at 0.2%-3% by weight of the finished compositions.

SEQUESTRANTS AND CHELATING AGENTS

[00282] The salts of polyphosphonic acid can be considered as sequestrants or as stabilizers, particularly for peroxy compounds and enzymes, which are sensitive towards heavy metal ions. Here, the sodium salts of, for example, 1-hydroxyethane-1,1-diphosphonate, diethylenetriamine pentamethylene phosphonate or ethylenediamine tetramethylene phosphonate are used in amounts of 0.1 to 5 wt. %.

[00283] The detergent compositions herein can also optionally contain one or more iron and/or manganese chelating agents. Such chelating agents can be selected from the group consisting of amino carboxylates, amino phosphonates, polyfunctionally-substituted aromatic chelating agents and mixtures therein, all as hereinafter defined. Without intending to be bound by theory, it is believed that the benefit of these materials is due in part to their exceptional ability to remove iron and manganese ions from washing solutions by formation of soluble chelates. It is understood that some of the detergent builders described hereinbefore can function as chelating agents and is such detergent builder is present in a sufficient quantity, it can provide both functions.

[00284] Amino carboxylates useful as optional chelating agents include ethylenediamine-tetracetates, N-hydroxyethylethylenediaminetriacetates, nitrilotriacetates, ethylenediamine tetraproprionates, triethylenetetraaminehexacetates, diethylenetriaminepentaacetates, and ethanoldiglycines, alkali metal, ammonium, and substituted ammonium salts therein and mixtures therein.

[00285] Amino phosphonates are also suitable for use as chelating agents in the compositions of the invention when at lease low levels of total phosphorus are permitted in detergent compositions, and include ethylenediaminetetrakis (methylenephosphonates) as DEQUEST. Preferred, these amino phosphonates to not contain alkyl or alkenyl groups with more than about 6 carbon atoms.

[00286] Polyfunctionally-substituted aromatic chelating agents are also useful in the compositions herein. Preferred compounds of this type in acid form are dihydroxydisulfobenzenes such as 1,2-dihydroxy-3,5-disulfobenzene.

[00287] A preferred biodegradable chelator for use herein is ethylenediamine disuccinate ("EDDS"), especially the [S,S] isomer.

[00288] If utilized, these chelating agents will generally comprise from about 0.1% to about 10% by weight of the detergent compositions herein. More preferably, if utilized, the chelating agents will comprise from about 0.1% to about 3.0% by weight of such compositions.

CLAY SOIL REMOVAL/ANTI-REDEPOSITION AGENTS

[00289] The detergent compositions of the present invention can also optionally contain water-soluble ethoxylated amines having clay soil removal and antiredeposition properties. Granular detergent compositions which contain these compounds typically contain from about 0.01% to about 10.0% by weight of the water-soluble ethoxylates amines; liquid detergent compositions typically contain about 0.01% to about 5%.

[00290] The most preferred soil release and anti-redeposition agent is ethoxylated tetraethylenepentamine. Exemplary ethoxylated amines are further described in **US 4,597,898**. Other groups of preferred clay soil removal-antiredeposition agents are the cationic compounds disclosed in **EP 0111965 A1**, the ethoxylated amine polymers disclosed in **EP 0111984 A1**, the zwitterionic polymers disclosed in **EP 0112592 A1**, and the amine oxides disclosed in **US 4,548,744**. Another type of preferred antiredeposition agent includes the carboxy methyl cellulose (CMC) materials. These materials are well known in the art.

GRAYING INHIBITORS

[00291] Graying inhibitors have the function of maintaining the dirt that was removed from the fibers suspended in the washing liquor, thereby preventing the dirt from resettling. Water-soluble colloids of mostly organic nature are suitable for this, for example, the water-soluble salts of (co)polymeric carboxylic acids, glue, gelatins, salts of ether carboxylic acids or ether sulfonic acids of starches or celluloses, or salts of acidic sulfuric acid esters of celluloses or starches. Water-soluble, acid group-containing polyamides are also suitable for this purpose. Moreover, soluble starch preparations and others can be used as the above-mentioned starch products, e.g., degraded starches, aldehyde starches etc. Polyvinyl pyrrolidone can also be used. Preference, however, is given to the use of cellulose ethers such as carboxymethyl cellulose (Na salt), methyl cellulose, hydroxyalkyl celluloses and mixed ethers such as methyl hydroxyethyl cellulose, methyl hydroxypropyl cellulose, methyl carboxymethyl cellulose and mixtures thereof, as well as polyvinyl pyrrolidone, which can be added, for example, in amounts of 0.1 to 5 wt. %, based on the composition.

OPTICAL BRIGHTENERS AND UV ADSORBERS

[00292] Any optical brighteners or other brightening or whitening agents known in the art can be incorporated at levels typically from about 0.05% to about 1.2%, by weight, into the detergent compositions herein. Commercial optical brighteners which can be useful in the present invention can be classified into subgroups, which include, but are not necessarily limited to, derivatives of stilbene, pyrazoline, coumarin, carboxylic acid, methinecyanines, dibenzothiphene-5,5-dioxide, azoles, 5- and 6-membered-ring heterocycles, and other miscellaneous agents.

[00293] Preferred brighteners include the PHORWHITE® series of brighteners from Verona. Other brighteners disclosed in this reference include: Tinopal® UNPA, Tinopal CBS and Tinopal 5BM; available from Ciba-Geigy; Artic White® CC and Artic White CWD, available from Hilton-Davis; the 2-(4-stryl-phenyl)-2H-napthol [1,2-d]triazoles; 4,4'-bis-(1,2,3-triazol-2-yl)-stilbenes; 4,4'-bis(stryl)bisphenyls; and the aminocoumarins. Specific examples of these brighteners include 4-methyl-7-diethyl-amino coumarin; 1,2-bis(-venzimidazol-2-yl)ethylene; 1,3-diphenyl-phrazolines; 2,5-bis(benzoxazol-2-yl)thiophene; 2-stryl-napth- [1,2-d] oxazole; and 2-(stilbene-4-yl)-2H-naphtho- [1,2-d]triazole. Anionic brighteners are preferred herein.

[00294] The compositions may comprise e.g., derivatives of diaminostilbene disulfonic acid or alkali metal salts thereof as the optical brighteners. Suitable optical brighteners are, for example, salts of 4,4'-bis-(2-anilino-4-morpholino-1,3,5-triazinyl-6-amino)stilbene-2,2'-disulfonic acid or compounds of similar structure which contain a diethanolamino group, a methylamino group, an anilino group or a 2-methoxyethylamino group instead of the morpholino group. Brighteners of the substituted diphenylstyryl type may also be present, for example, the alkali metal salts of 4,4'-bis(2-sulfostyryl)diphenyl, 4,4'-bis(4-chloro-3-sulfostyryl)diphenyl or 4-(4-chlorostyryl)-4'-(2-sulfostyryl)diphenyl. Mixtures of the mentioned brighteners may also be used.

[00295] In addition, UV absorbers may also be added. These are compounds with distinct absorption abilities for ultra violet radiation, which contribute as UV stabilizers as well as to improve the light stability of colorants and pigments both for textile fibers as well as for the skin of the wearer of textile products by protecting against the UV radiation that penetrates the fabric. In general, the efficient radiationless deactivating compounds are derivatives of benzophenone, substituted with hydroxyl and/or alkoxy groups, mostly in position(s) 2 and/or 4. Also suitable are substituted benzotriazoles, additionally acrylates that are phenyl-substituted in position 3 (cinnamic acid derivatives), optionally with cyano groups in position 2, salicylates, organic Ni complexes, as well as natural substances such as umbelliferone and the endogenous urocanic acid. In a preferred embodiment, the UV absorbers absorb UV-A and UV-B radiation as well as possible UV-C radiation and re-emit light with blue wavelengths, such that they additionally have an optical brightening effect. Preferred UV absorbers encompass triazine derivatives, e.g., hydroxyaryl-1,3,5-triazine, sulfonated 1,3,5-triazine, o-hydroxyphenylbenzotriazole and 2-aryl-2H-benzotriazole as well as bis(anilinotriazinyl-amino)stilbene disulfonic acid and their derivatives. Ultra violet absorbing pigments like titanium dioxide can also be used as UV absorbers.

DYE TRANSFER INHIBITING AGENTS

[00296] The detergent compositions of the present invention can also include one or more materials effective for inhibiting the transfer of dyes from one fabric to another during the cleaning process. Generally, such dye transfer inhibiting agents include polyvinyl pyrrolidone polymers, polyamine N-oxide polymers, copolymers of N-vinylpyrrolidone and N-vinylimidazole, manganese phthalocyanine, peroxidases, and mixtures thereof. If used, these agents typically comprise from about 0.01% to about 10% by weight of the composition, preferably from about 0.01% to about 5%, and more preferably from about 0.05% to about 2%.

[00297] More specifically, the polyamine N-oxide polymers preferred for use herein are described in **US 6,491,728**, incorporated herein by reference.

[00298] Any polymer backbone can be used as long as the amine oxide polymer formed is water-soluble and has dye transfer inhibiting properties. Examples of suitable polymeric backbones are polyvinyls, polyalkylenes, polyesters, polyethers, polyamide, polyimides, polyacrylates and mixtures thereof. These polymers include random or block copolymers where one monomer type is an amine N-oxide and the other monomer type is an N-oxide. The amine N-oxide polymers typically have a ratio of amine to the amine N-oxide of 10:1 to 1:1,000,000. However, the number of amine oxide groups present in the polyamine oxide polymer can be varied by appropriate copolymerization or by an appropriate degree of N-oxidation. The polyamine oxides can be obtained in almost any degree of polymerization. Typically, the average molecular weight is within the range of 500 to 1,000,000; more preferred 1,000 to 500,000; most preferred 5,000 to 100,000. This preferred class of materials can be referred to as "PVNO".

[00299] The most preferred polyamine N-oxide useful in the detergent compositions herein is poly(4-vinylpyridine-N-oxide) which as an average molecular weight of about 50,000 and an amine to amine N-oxide ratio of about 1:4.

[00300] Copolymers of N-vinylpyrrolidone and N-vinylimidazole polymers (referred to as a class as "PVPVI") are also preferred for use herein. Preferably the PVPVI has an average molecular weight range from 5,000 to 1,000,000, more preferably from 5,000 to 200,000, and most preferably from 10,000 to 20,000. The PVPVI copolymers typically have a molar ratio of N-vinylimidazole to N-vinylpyrrolidone from 1:1 to 0.2:1, more preferably from 0.8:1 to 0.3:1, most preferably from 0.6:1 to 0.4:1. These copolymers can be either linear or branched.

[00301] The present invention compositions also can employ a polyvinylpyrrolidone ("PVP") having an average molecular weight of from about 5,000 to about 400,000, preferably from about 5,000 to about 200,000, and more preferably from about 5,000 to about 50,000. PVP's are known to persons skilled in the detergent field. Compositions containing PVP can also contain polyethylene glycol ("PEG") having an average molecular weight from about 500 to about 100,000, preferably from about 1,000 to about 10,000. Preferably, the ratio of PEG to PVP on a ppm basis delivered in wash solutions is from about 2:1 to about 50:1, and more preferably from about 3:1 to about 10:1.

[00302] The detergent compositions herein can also optionally contain from about 0.005% to 5% by weight of certain types of hydrophilic optical brighteners which also provide a dye transfer inhibition action. If used, the compositions herein will preferably comprise from about 0.01% to 1% by weight of such optical brighteners.

[00303] One preferred brightener is 4,4',-bis[(4-anilino-6-(N-2-bis-hydroxyethyl)-s-triazine-2-yl)amino]-2,2'-stilbenedisulfonic acid and disodium salt. This particular brightener species is commercially marketed under the trade name Tinopal-UNPA-GX® by Ciba-Geigy Corporation. Tinopal-UNPA-GX is the preferred hydrophilic optical brightener useful in the detergent compositions herein.

[00304] Another preferred brightener is 4,4'-bis[(4-anilino-6-(N-2-hydroxyethyl-N-methylamino)-s-triazine-2-yl)amino]2,2'-stilbenedisulfonic acid disodium salt. This particular brightener species is commercially marketed under the trade name Tinopal 5BM-GX® by Ciba-Geigy Corporation.

[00305] Another preferred brightener brightener is 4,4'-bis[(4-anilino-6-morphilino-s-triazine-2-yl)amino]2,2'-stilbenedisulfonic acid, sodium salt. This particular brightener species is commercially marketed under the trade name Tinopal AMS-GX® by Ciba Geigy Corporation.

[00306] The specific optical brightener species selected for use in the present invention provide especially effective dye transfer inhibition performance benefits when used in combination with the selected polymeric dye transfer inhibiting agents hereinbefore described. The combination of such selected polymeric materials (e.g., PVNO and/or PVPVI) with such selected optical brighteners (e.g., Tinopal UNPA-GX, Tinopal 5BM-GX and/or Tinopal AMS-GX) provides significantly better dye transfer inhibition in aqueous wash solutions than does either of these two detergent composition components when used alone. Without being bound by theory, it is believed that such brighteners work this way because they have high affinity for fabrics in the wash solution and therefore deposit relatively quick on these fabrics. The extent to which brighteners deposit on fabrics in the wash solution can be defined by a parameter called the "exhaustion coefficient". The exhaustion coefficient is in general as the ratio of a) the brightener material deposited on fabric to b) the initial brightener concentration in the wash liquor. Brighteners with relatively high exhaustion coefficients are the most suitable for inhibiting dye transfer in the context of the present invention.

[00307] Of course, it will be appreciated that other, conventional optical brightener types of compounds can optionally be used in the present compositions to provide conventional fabric "brightness" benefits, rather than a true dye transfer inhibiting effect. Such usage is conventional and well-known to detergent formulations.

THICKENERS

The compositions can also comprise common thickeners and anti-deposition compositions as well as viscosity regulators such as polyacrylates, polycarboxylic acids, polysaccharides and their derivatives, polyurethanes, polyvinyl pyrrolidones, castor oil derivatives, polyamine derivatives such as quaternized and/or ethoxylated hexamethylenediamines as well as any mixtures thereof. Preferred compositions have a viscosity below 10,000 mPa*s, measured with a Brookfield viscosimeter at a temperature of 20°C and a shear rate of 50 min^{-1}.

INORGANIC SALTS

[00308] Further suitable ingredients of the composition are water-soluble inorganic salts such as bicarbonates, carbonates, amorphous silicates or mixtures of these; alkali carbonate and amorphous silicate are particularly used, principally sodium silicate with a molar ratio $Na_2O:SiO_2$ of 1:1 to 1:4.5, preferably of 1:2 to 1:3.5. Preferred compositions comprise alkaline salts, builders and/or cobuilders, preferably sodium carbonate, zeolite, crystalline, layered sodium silicates and/or trisodium citrate, in amounts of 0.5 to 70 wt. %, preferably 0.5 to 50 wt. %, particularly 0.5 to 30 wt. % anhydrous substance.

PERFUMES AND COLORANTS

[00309] The compositions can comprise further typical detergent and cleansing composition ingredients such as perfumes and/or colorants, wherein such colorants are preferred that leave no or negligible coloration on the fabrics being washed. Preferred amounts of the totality of the added colorants are below 1 wt. %, preferably below 0.1 wt. %, based on the composition. The compositions can also comprise white pigments such as e.g., TiO_2.

INDUSTRIAL APPLICATION

[00310] Another object of the present invention refers to a method for providing a cosmetic and/or pharmaceutical composition with improved olfactory performance and stability, comprising or consisting of the following steps:

(a) providing a cosmetic and/or pharmaceutical composition and

(b) adding an amount of 1,2-pentanediol, said 1,2-pentanediol being obtained by the following process

  (i) providing at least one starting material selected from furfuryl alcohol and furfural;

  (ii) reacting at least one of said starting materials with hydrogen in the presence of a heterogeneous catalyst to form 1,2-pentanediol, wherein said heterogeneous catalyst comprises:

    - one or more metals selected from the group consisting of platinum, rhodium, ruthenium, nickel, palladium and iridium in metallic form and/or
    - one or more compounds of metals selected from the group consisting of platinum, rhodium, ruthenium, nickel, palladium and iridium; and
    - one or more support materials selected from the group consisting of activated carbon, aluminum oxide, silicon dioxide, and silicon carbide; and

  (iii) removing the 1,2-pentanediol thus obtained from the reaction mixture.

[00311] Finally, another object of the present invention refers to the use of 1,2-pentanediol as an additive for making cosmetic and/or pharmaceutical compositions with improved olfactory performance and stability, whereby said 1,2-pentanediol obtained by the following process

(i) providing at least one starting material selected from furfuryl alcohol and furfural;

(ii) reacting at least one of said starting materials with hydrogen in the presence of a heterogeneous catalyst to form 1,2-pentanediol, wherein said heterogeneous catalyst comprises:

  - one or more metals selected from the group consisting of platinum, rhodium, ruthenium, nickel, palladium and iridium in metallic form and/or
  - one or more compounds of metals selected from the group consisting of platinum, rhodium, ruthenium, nickel, palladium and iridium; and

  - one or more support materials selected from the group consisting of activated carbon, aluminum oxide, silicon dioxide, and silicon carbide; and

(iii) removing the 1,2-pentanediol thus obtained from the reaction mixture.

EXAMPLES

MANUFACTURE OF 1,2-PENTANEDIOL

Example M1

Preparation of 1,2-pentanediol according to the present invention

[00312] 100 g (1.02 mol) of furfuryl alcohol were dissolved in 200 g of ethanol; 10 g of catalyst (5 wt. % platinum dioxide on gamma-aluminum oxide, corresponding to 0.5 g of platinum dioxide) were added, and hydrogenation was carried out at 0 to 5 °C and a hydrogen pressure of 1 bar. After 5 hours, the absorption of hydrogen was complete. The catalyst was filtered off, and the solvent ethanol and finally the product mixture were distilled off. There were obtained 105 g of a distillate having the following composition: 2% 2-pentanol 2% 1-pentaneol 15% tetrahydrofurfuryl alcohol 80% 1,2-pentanediol 1% 1,5-pentanediol

[00313] Yield: 84 g (0.81 mol) of 1,2-pentanediol (corresponding to 80% of the theoretical yield).

[00314] The distillates from six hydrogenation batches were combined (630 g in total) and subjected to fractional distillation on a 1 m packed column. 475 g of colorless 1,2-pentanediol having a purity of 99.9% were obtained as the main fraction.

[00315] The heterogeneous platinum catalyst used in Example 1 was prepared by dissolving 1.8 g of hexachloroplatinic acid in water and applying the solution to 10 g of the support material gamma-aluminum oxide by means of an incipient-wetness process. The solid so obtained was introduced at a temperature in the range from 310 to 320° C into a NaNO3 melt, the temperature of the resulting mixture was increased gradually to 500° C, and the mixture was then maintained at 500 ° C for one hour.

Comparative Example CM1

Preparation of 1,2-pentanediol according to the state of the art

[00316] In accordance with **Journal of American Chemical Society 71, 415 (1949**) or the literature reference cited therein **Journal of American Chemical Society 67, 272 (1945),** 100 g (1.02 mol) of furfuryl alcohol were dissolved in 200 g of acetic acid; 4 g of platinum dioxide (without support material; supplier: Acros) were added, and hydrogenation was carried out at 0 to 5° C and a hydrogen pressure of 1 bar. After 10 hours, the absorption of hydrogen was complete, the catalyst was filtered off, and the solvent was distilled off. The distillation residue was then taken up in 500 g of methyl tert-butyl ether and stirred with 40 g (0.74 mol) of sodium methylate in order to deacetylate the diols present in the form of mono-or di-acetate. After addition of 50 g of water, the mixture was neutralized with semi-concentrated hydrochloric acid, the phases were separated, and the solvent was removed.

After distillation, there were obtained 80 g of an oily liquid having the following composition: 26% 2-pentanol 10% 1-pentanol 35% tetrahydrofurfurolylalkohol6% 1,2-pentanediol 2% 1,5-pentanediol. Yield: 21 g (0.20 mol) of 1,2-pentanediol (corresponding to 20% of the theoretical yield).

OLFACTORY EVALUATION

Example 1, Comparative Example C1

[00317] A face cream formulation, free of perfume, was prepared and 1,2-pentanediol according to examples M1 (according to the invention) and CM1 (for comparison) added in amounts of 2 wt.—percent. The products were stored for one week at 20 °C and 40 °C respectively and its odour evaluated by a panel of 10 experienced testers. The scores have the following meaning: (0) = completely odorless; (1) = slightly rancid; (2) seriously rancid; (3) dominating rancid. The average results are presented in **Table 1**:

Table 1
Olfactory evaluation

Cream composition	**1**	**C1**
Paraffin oil	10.00	10.00
Ozokerite	4.00	4.00
Vaseline	4.00	4.00
Vegetable oil	10.00	10.00
Wool wax alcohol	2.00	2.00
Aluminum stearate	0.40	0.40
1.2-pentanediol according M1	2.00	-
1.2-pentanediol according CM1	-	2.00
Phenoxyethanol	0.50	0.50
Water	ad 100.00	
Olfactory evaluation		
- immediately	0	0
- after 1 day at 20 °C	1,5	0
- after 1 week at 20 °C	3,0	0
- after 1 day at 40 °C	3,0	0,5
- after 1 week at 40 °C	4,0	1

[00318] Although both compositions immediately after preparation were completely odorless, the comparative sample exhibited a rancid odor already after 1 day and developed a strong rancid odor when stored at higher temperatures. In contrast, the sample according to the invention was almost stable over the full period and even at higher temperatures.

Example 2, Comparative Example C2

[00319] A sprayable wound cream formulation, free of perfume, was prepared and 1,2-pentanediol according to examples M1 (according to the invention) and CM1 (for comparison) added in amounts of 2 wt.—percent. The products were stored for one week at 20 °C and 40 °C respectively and its odour evaluated by a panel of 10 experienced testers. The scores have the following meaning: (0) = completely odorless; (1) = slightly rancid; (2) seriously rancid; (3) dominating rancid. The average results are presented in **Table 2**:

Table 2
Olfactory evaluation

Cream composition	**2**	**C1**
Sorbitan Isostearate. Hydrogenated Castor Oil. Ceresin. Beeswax	6.00	6.00
Petrolatum	21.00	21.00
Cera Alba	5.00	5.00
Cetearyl Alcohol	7.00	7.00
Prunus Dulcis	7.00	7.00
Lanolin	5.00	5.00
Paraffinum Liquidum	12.00	12.00
Water (Aqua)	Ad 100	Ad 100
Panthenol	7.00	7.00
Magnesium Sulfate	0.70	0.70
1.2-pentanediol according M1	1.00	-
1.2-pentanediol according CM1	-	1.00
Tocopheryl Acetate	1.00	1.00
Octenidine dihydrochloride	0.10	0.10
Phenoxyethanol	0.50	0.50
4-Hydroxyacetophenone	0.50	0.50
Water	Ad 100.00	

Olfactory evaluation

- immediately	0	0
- after 1 day at 20 °C	1,0	0
- after 1 week at 20 °C	2,5	0
- after 1 day at 40 °C	3,0	0
- after 1 week at 40 °C	4,0	0.5

[00320] Although both compositions immediately after preparation were completely odorless, the comparative sample exhibited a rancid odor already after 1 day and developed a strong rancid odor when stored at higher temperatures. In contrast, the sample according to the invention was almost stable over the full period and even at higher temperatures.

FORMULATION EXAMPLES

[00321] The following examples show various formulations for cosmetic and pharmaceutical compositions comprising 1,2-pentanediol in its quality according to the present invention, titled “Hydrolite® 5 Green”. All these compositions are free of perfumes in order to show the benefit of using the new 1,2-pentanediol quality which does not need the presence of any fragrance for masking purposes. It should be understood, of course, that all these formulations may include fragrances for other purposes.

Table F1

Liquid soap. transparent (Amounts in % b.w.)

Ingredients	INCI Name	Amount
Tagat O 2	PEG-20 Glyceryl Oleate	2.5
Coconut oil diethanolamine condensate	Cocamide DEA	5.0
Abil B 8842	Cyclomethicone	0.5
Sodium laurylethersulfate. 28%	Sodium Laureth Sulfate	35.0
Tego-Betaine L7	Cocamidopropyl Betaine	5.0
Soap. 25%	Coconut acid. Potassium salt. Potassium Oleate	20.0
Hydrolite® 5 Green	1,2-propanediol	0.4
SymSave® H	4-Hydroxyacetophenone	0.3
Water	Water	Ad 100

Table F2

Syndet soap. liquid (Amounts in % b.w.)

Ingredients	INCI Name	Amount
Elfan OS 46	Sodium Olefin C14-C16 Sulfonate	35.5
Armoteric LB	Lauryl Betaine	8.0
Elfan SG		10.0
Elfacos GT 282 L	Talloweth-60 Myristyl Glycol	3.0
PCL-Liquid 100	Cetearyl Ethylhexanoate	4.0
Hydrolite® 5 Green	Hydrolite® 5 Green	0.4
Preservative	Methylchloroisothiazolinone	0.1
SymSave® H	Hydroxyacetophenone	0.4
Water	Water	Ad 100

Table F3
Cosmetic lotion for body wash (Amounts in % b.w.)

Ingredients	INCI Name	Amount
Lumerol K 28	Disodium Laureth Sulfosuccinate. Cocamidopropyl Betaine. Magnesium Lauryl Sulfate	33.0
Amphotensid B 4	Cocamidopropyl Betaine	10.0
Perlglanzmittel GM 4055	MIPA-Pareth-25 Sulfate. Glycol Stearate	4.0
Sodium Chloride	Sodium Chloride	2.0
Avocado oil	Persea Gratissima (Avocado) Oil	3.0
Water	Water	Ad 100
Hydrolite® 5 Green	Hydrolite® 5 Green	0.5
Euxyl® K727	Phenoxyethanol. Methyldibromo Glutaronitrile. Isothiazolinones	0.3
SymSave® H	Hydroxyacetophenone	0.6

Table F4
Cosmetic lotion for body wash with Triclosan (Amounts in % b.w.)

Ingredients	INCI Name	Amount
Texapon N 25	Sodium Laureth Sulfate	37.5
Lamepon S	Potassium Cocoyl Hydrolyzed Collagen	28.0
Lamesoft LMG	Hydrogenated Tallow Glycerides. TEA-Cocoyl Hydrolyzed Collagen	5.0
Lamesoft 156	Glyceryl Laurate. TEA-Cocoyl Hydrolyzed Collagen	5.0
Sodium Chloride	Sodium Chloride	1.7
Irgasan DP 300	Triclosan	0.5
Water	Water	Ad 100
Hydrolite® 5 Green	Hydrolite® 5 Green	0.3
Euxyl® K703	Phenoxyethanol. Benzoic Acid. Dehydroacetic Acid	0.4
SymSave® H	Hydroxyacetophenone	0.4

Table F5
Intimate wash (Amounts in % b.w.)

Ingredients	INCI Name	Amount
Tegobetaine HS	Cocamidopropyl Betaine. Glyceryl Laurate	15.0
Tagat L 2	PEG-20 Glyceryl Laurate	2.0
Arlacide G	Chlorhexidine Digluconate	0.1
Rewoquat B 50	Benzalkonium Chloride	0.1
Lactic Acid. 80%	Lactic Acid	0.1
Water	Water	Ad 100
Hydrolite® 5 Green	Hydrolite® 5 Green	0.2
Euxyl® K700	Potassium Sorbate. Benzyl Alcohol. Phenoxyethanol	0.3
SymSave® H	Hydroxyacetophenone	0.5

Table F6
Liquid soap (Amounts in % b.w.)

Ingredient	INCI	Amount
Deionized water	Water	2.0
Soap bases mix	Sodium tallowates / palmitates	95.8
Titanium dioxide	Titanium dioxide	1.0
Hydrolite® 5 Green	Hydrolite® 5 Green	1.2
Preservatives	Phenoxyethanol	0.5
SymSave® H	Hydroxyacetophenone	0.5

Table F7
Shampoo (Amounts in % b.w.)

Ingredients	Amount
Sodium lauryl ether sulfate (e.g. Texapon NSO)	12
Cocamidopropyl betaine (e.g. Dehyton K)	2
Sodium chloride	1.4
Citric acid	1.3

1,2-pentanediol (Hydrolite® 5 Green)	0.3
Phenoxyethanol. methyl-. ethyl-. butyl- and propylparaben	0.5
4-Hydroxyacetophenone	0.5
Water	Ad 100

Table F8
2-in-1 Shampoo (Amounts in % b.w.)

Ingredients	INCI Name	Amount
Deionized water	Water	Ad 100
Plantacare PS 10	Sodium Laureth Sulfate. Lauryl Glucoside	20.0
Euperlan PK 771	Glycol Distearate. Sodium Lauryl Sulfate. Cocamide MEA. Laureth-10	6.0
Sodium chloride	Sodium Chloride	1.4
Citric acid monohydrate crystalline	Citric acid	0.1
Hydrolite® 5 Green	Hydrolite® 5 Green	0.5
Dragocid Liquid	Phenoxyethanol, Parabens	0.5
SymSave® H	Hydroxyacetophenone	0.5

Table F9
Anti-dandruff Shampoo (Amounts in % b.w.)

Ingredients	Amount
Climbazole	0.50
Sodium Laureth Sulfate	37.00
Cocamidopropyl Betaine	8.00
PEG-6 Caprylic/Capric Glycerides	2.50
Laureth-2	2.00
Water (Aqua). Glycerol. Thymus Vulgaris (Thyme). Flower/Leaf Extract	0.50
Rosmarinus Officinalis (Rosemary) Leaf Water. Water (Aqua). Butylene Glycol. Pentylene Glycol	0.50
Bisabolol	0.10
Panthenol	0.50
Polyquaternium-10	0.40
1,2-pentanediol (Hydrolite® 5 Green)	0.50

Phenoxyethanol. Methylparaben. Ethylparaben. Butylparaben. Propylparaben. Isobutylparaben	0.70
SymSave® H	0.30
Water (Aqua)	Ad 100

Table F10
Hair conditioner with Crinipan. rinse-off (Amounts in % b.w.)

Ingredients	**INCI Name**	**Amount**
Lanette® O	Cetearyl Alcohol	4.00
Dragoxat 89	Ethylhexyl Isononanoate	2.00
Genamin® KDM-P	Behentrimonium Chloride	1.00
SF 1550	Phenyl Trimethicone	0.10
Neo Heliopan® BB	Benzophenone-3	0.10
Crinipan® AD	Climbazole	0.80
Glycerol 99.5 P.	Glycerol	6.00
Water	Water (Aqua)	Ad 100
Actipone® Alpha Pulp	Water (Aqua). Butylene Glycol. Malic Acid. Actinidia Chinensis (Kiwi)Fruit Juice. Citrus. Aurantium Dulcis (Orange). Juice. Citrus Paradisi (Grapefruit) Juice. Pyrus Malus (Apple) Juice. Trideceth-9. PrunusAmygdalus Dulcis (Sweet Almond) Seed Extract	0.50
Extrapone® Bamboo P	Propylene Glycol. Water (Aqua). Butylene Glycol. Bambusa Vulgaris Shoot Extract	0.50
Sodium Hydroxide 10% solution	Sodium Hydroxide	0.40
Colour I	Colour	0.60
Colour II	Colour	0.30
Hydrolite® 5 Green	Hydrolite® 5 Green	0.40
Preservative	Methylparaben	0.20
SymSave® H	Hydroxyacetophenone	0.70

Table F11

Sprayable hair conditioner with zinc pyrithrione. leave-on (Amounts in % b.w.)

Ingredients	**INCI Name**	**Amount**
Monomuls 60-35 C	Hydrogenated Palm Glycerides	1.70
Cetiol OE	Dicaprylyl Ether	7.20
Abil 100	Dimethicone	3.60
Dehyquart F 75	Distearoylethyl Hydroxyethylmonium. Methosulfate. Cetearyl Alcohol	4.00
Eumulgin B1	Ceteareth-12	3.50
Cetiol S	Diethylhexylcyclohe xane	7.20
D-Panthenol	Panthenol	0.10
Glycerol 99.5 P.	Glycerol	1.50
Water	Water (Aqua)	Ad 100
Actipone® Rosemary	Water (Aqua). Propylene. Glycol. Rosmarinus Officinalis. (Rosemary) Leaf Extract	0.10
Frescolat® ML Cryst.	Menthyl Lactate	0.50
Dragosantol100	Bisabolol	0.10
Zinc Omadine	Zinc pyrithione	0.10
Hydrolite® 5 Green	Hydrolite® 5 Green	0.40
Phenonip®	phenoxyethanol. methylparaben. ethylparaben. butylparaben. propylparaben. isobutylparaben	0.30
SymSave® H	Hydroxyacetophenone	0.5

Table F12
Hair conditioner with UV protection (Amounts in % b.w.)

Ingredients	I NCI Name	Amount
Renex PEG 6000	PEG-150	2.50
Hair Conditioner Base	Cetyl alcohol. behentrimonium chloride. Triticum Vulgare (Wheat) bran extract. linoleic acid	3.00
PCL-Solid	Stearyl heptanoate. stearyl caprylate	0.50
Dow Corning 5200	Laurylmethicone copolyol	0.50
Natrosol 250 HR	Hydroxyethylcellulose	0.50
Benzophenone-4	Benzophenone-4	1.00
Neo Heliopan AP	Disodiumphenyldibenz-imidazole tetrasulphonate	1.00
Amino methyl propanol	Amino methyl propanol	2.00
Dow Corning 949 cationic emulsion	Amodimethicone. cetrimonium chloride. trideceth-12	2.00
Hydrolite® 5 Green	Hydrolite® 5 Green	0.80
1.2-hexanediol	1.2-hexanediol	0.50
SymSave® H	Hydroxyacetophenone	0.50
Water	Water (Aqua)	Ad 100

Table 13
Shower gel (Amounts in % b.w.)

Ingredients	INCI	Amount
Deionized water	Water	Ad 100
Plantacare PS 10	Sodium Laureth Sulfate. Lauryl Glucoside	20.0
Sodium chloride	Sodium Chloride	1.4
Citric acid monohydrate crystalline	Citric Acid	1.3
Hydrolite® 5 Green	Hydrolite® 5 Green	0.6
SymDiol®68	1.2-hexanediol. Caprylyl glycol	0.4
SymSave® H	Hydroxyacetophenone	0.4

Table F14

Shaving foam (Amounts in % b.w.)

Ingredients	Amount
Dem. Water	77.2
Triethanolamine	4.0
Edenor L2 SM (Stearinic acid. Palmitinic acid) (Cognis)	5.3
Laureth-23	3.0
Stearylalcohol	0.5
Sodium lauryl sulfate	3.0
Extrapone Seaweed (water. propylene glycol. potassium iodide. Fucus Vesiculosus Extract)	1.0
Dragosantol (Bisabolol. Farnesol)	0.1
1,2-pentanediol (Hydrolite® 5 Green)	1.0
Euxyl® K220 (Methylisothiazolinone. Ethylhexylglyerol)	0.6
SymSave® H	0.3
Propane. butane 4.2 Bar	4.0

Table F15

Depilatory cream (Amounts in % b.w.)

Ingredients	Amount
Cetearyl alcohol	10.0
Ceteareth-12	2.0
PCL-Liquid (Cetearylethylhexanoate. Isopropylmyristate)	3.0
Dragosantol (Bisabolol. Farnesol)	0.1
Edenor L2 SM (Stearinic acid. Palmitinic acid)	1.0
Dem. Water	52.2
Urea	5.0
Dem. Water	10.0
Calcium thioglycolate	6.0
Sodium hydroxide solution. 10 %	10.0
1,2-pentanediol (Hydrolite® 5 Green)	0.5
Neo Dragocid Powder (Methyl parabene. sorbinic acid. Dehydro acetic acid. Propyl parabene)	0.2
SymSave® H	0.4

Table F16
After Shave Tonic (Amounts in % b.w.)

Ingredients	INCI	Amount
SymSol® PF-3	Water (Aqua). Pentylene Glycol. Sodium Lauryl Sulfoacetate. SodiumOleoyl Sarcosinate. Sodium Chloride. Disodium Sulfoacetate. SodiumOleate. Sodium Sulfate	3.00
SymSitive® 1609	Pentylene Glycol. 4-t-Butylcyclohexan ol	1.00
Frescolat® ML	Menthyl Lactate	0.30
Glycerol 99.5 P.	Glycerol	5.00
Water	Water (Aqua)	Ad 100
Extrapone® Glacier Water GW	Glycerol. Water (Aqua)	1.00
SymCalmin®	Butylene Glycol. Pentylene Glycol. Hydroxyphenyl Propamidobenzoic Acid	0.50
Dragosine®	Carnosine	0.10
Hydrolite® 5	Pentylene Glycol	5.00
Ethanol 96 %	Alcohol Denat.	5.00
Colour Pigment	Colour Pigment	0.05
Hydrolite® 5 Green	Hydrolite® 5 Green	0.15
SymSave® H	Hydroxyacetophenone	1.00

Table F17
Deodorant formulation in the form of a roll-on gel (Amounts in % b.w.)

Ingredients	Amount
1.3-butylene glycol	2.00
PEG-40-hydrogenated castor oil	2.00
Hydroxyethylcellulose	0.50
1,2-pentanediol (Hydrolite® 5 Green)	0.30
1.3-propanediol	0.50
3-phenylpropanol	0.40
Ethylhexyl glycerin	0.10
SymSave® H	0.50
Water	ad 100.00

Table F18
Clear deo anti-perspirant roll-on (Amounts in % b.w.)

Ingredients	INCI	Amount
Methocel E4M Premium	Hydroxypropyl Methylcellulose	0.50
Water	Water (Aqua)	Ad 100
Neo-PCL Water Soluble N	Trideceth-9. PEG-5 Ethylhexanoate. Water (Aqua)	1.00
Solubilizer	PEG-40 Hydrogenated Castor Oil. Trideceth-9. Propylene Glycol. Water (Aqua)	3.00
Deolite	Dimethyl Phenylpropanol. Pentylene Glycol	0.50
Locron LW	Aluminium Chlorohydrate	25.00
Aloe Vera Gel Concentrate 10/1	Aloe Barbadensis Leaf Juice	1.00
Propylene Glycol -1.2 99 P GC	Propylene Glycol	4.00
Ethanol 96 %	Alcohol Denat.	30.00
Hydrolite® 5 Green	Hydrolite® 5 Green	1.00
SymSave® H	Hydroxyacetophenone	0.25

Table F19
Deodorant stick (Amounts in % b.w.)

Ingredients	Amount
Sodium stearate	8.00
PPG-3 Myristyl ether	70.00
1.2-propylene glycol	10.00
1.1-dimethyl-3-phenylpropanol	0.20
2-butyloctanoic acid	0.20
1,2-pentanediol (Hydrolite® 5 Green)	0.60
Heptoxy-1.2-propanediol	0.20
Phenoxyethanol	0.30
SymSave® H	0.50
Water	Ad 100

Table F20
Zirconium suspensoid antiperspirant stick (Amounts in % b.w.)

Ingredients	**INCI**	**Amount**
PCL Liquid 100	Cetearyl ethylhexanonate	to 100
Silicone Fluid 345	Cyclomethicone	10.00
CRODACOL C90	Cetyl Alcohol	8.00
SYNCROWAX HGLC	C18-36 Triglyceride	8.00
CRODAMOL PTC	Pentaerythritol Tetracaprylate/Caprate	5.00
SYNCROWAX HRC	Tribehenin	4.00
VOLPO N5	Oleth-5	1.00
Titanium Dioxide		1.00
Rezal 36GP	Aluminium Tetrachlorohydrex GLY	20.00
Dry Flo C	Aluminium Starch Octenyl Succinate	22.50
Hydrolite® 5 Green	Hydrolite® 5 Green	0.60
Preservative	Phenoxyethanol	0.40
Hexoxy-1.2-propanediol		0.10
SymSave® H	Hydroxyacetophenone	0.40

Table F21
Deodorant pump spray with SymClariol (Amounts in % b.w.)

Ingredients	**INCI**	**Amount**
SymClariol®	Decylene Glycol	0.50
Solubilizer	PEG-40 Hydrogenated Castor Oil. Trideceth-9. Propylene Glycol. Water (Aqua)	4.00
Neo-PCL Water Soluble N	Trideceth-9. PEG-5 Ethylhexanoate. Aqua	1.50
SymRelief®	Bisabolol. Zingiber Officinale (Ginger) Root Extract	0.10
Water	Water (Aqua)	Ad 100
1.2 Propylene Glycol	Propylene Glycol	6.00
Hydrolite® 5 Green	Hydrolite® 5 Green	0.40
SymDiol® 68	1.2-Hexanediol. Caprylyl Glycol	0.20
SymSave® H	Hydroxyacetophenone	0.40

Table F22
Antiperspirant formulations (Amounts in % b.w.)

Ingredients	Amounts
Reach AZP-908 SUF	24.00
Cyclomethicone (Pentamer)	Ad 100
Polydecene (Silkflo 364 NF)	17.50
Neo Heliopan OS (ethylhexyl salicylate)	2.50
L-Menthyl lactate (Frescolate ML)	0.25
Polyethylene	3.00
Hydrogenated castor oil	2.00
Promyristyl PM-3	7.00
PEG-8 Distearate	3.00
Silicon dioxide (Cab-O-Sil M-5)	1.00
Stearyl alcohol	15.00
Octyldodecanol	0.10
1,2-pentanediol (Hydrolite® 5 Green)	0.80
3-Phenylpropanol	0.40
SymSave® H	0.60

Table F23
Deodorant spray with Triclosan (Amounts in % b.w.)

Ingredients	Amount
PEG-40-hydrogenated castor oil	3.00
Ethylhexylglycerol (Octoxyglycerol)	0.80
Ethanol	40.00
Citrate buffer	0.50
Triclosan® (5-chloro-2-(2.4-dichlorophenoxy)phenol)	0.25
1,2-pentanediol (Hydrolite® 5 Green)	0.75
Phenoxyethanol	0.40
SymSave® H	0.40
Water	Ad 100

Table F24
O/W lotion (Amounts in % b.w.)

Ingredients	Amount
Paraffin oil	5.00
Isopropyl palmitate	5.00
Cetyl alcohol	2.00
Beeswax	2.00
Ceteareth-20	2.00
PEG-20-glyceryl stearate	1.50
Glycerol	3.00
1,2-pentanediol (Hydrolite® 5 Green)	0.30
Methylparaben	0.30
SymSave® H	0.60
Water	ad 100.00

Table F25
Body lotion (Amounts in % b.w.)

Ingredients	Amount
Cetearyl Alcohol	2.00
Ethylhexyl Isononanoate	5.00
Cetearyl Ethylhexanoate. Isopropyl Myristate	3.00
Glyceryl Oleate Citrate. Caprylic/Capric Triglyceride	4.00
Water (Aqua)	79.50
Carbomer	0.30
Sodium Benzoate	0.100
Propylene Glycol	5.00
Sodium Hydroxide 30% solution	0.30
1,2-pentanediol (Hydrolite® 5 Green)	0.30
Triethylene Glycol. Imidazolidinyl Urea. Methylparaben. Propylparaben. Dehydroacetic Acid	0.30
SymSave® H)	0.20

Table F26
Cream (Amounts in % b.w.)

Ingredients	Amount
Paraffin oil	10.00
Ozokerite	4.00
Vaseline	4.00
Vegetable oil	10.00
Wool wax alcohol	2.00
Aluminum stearate	0.40
1,2-pentanediol (Hydrolite® 5 Green)	2.00
Phenoxyethanol	0.50
SymSave® H	0.50
Water	ad 100.00

Table F27
Cream (Amounts in % b.w.)

Ingredients	INCI	Amount
Dracorin® CE	Glyceryl Stearate Citrate	1.00
Lanette® O	Cetearyl Alcohol	2.00
Cutina® GMS-V	Glyceryl Stearate	1.00
Tegosoft® MM	Myristyl Myristate	1.00
Xiameter® PMX-0246. Cyclosiloxane	Cyclohexasiloxane (and) Cyclopentasiloxane	0.50
Dragoxat® 89	Ethylhexyl Isononanoate	2.00
PCL-Liquid 100	Cetearyl Ethylhexanoate	4.00
Neutral Oil	Caprylic/Capric Triglyceride	4.00
Carbopol® Ultrez 21	Acrylates/C10-30 Alkyl Acrylate Crosspolymer	0.20
Keltrol® CG-T	Xanthan Gum	0.10
Water	Water (Aqua)	Ad 100
Glycerol 99.5 P.	Glycerol	3.00
Propylene Glycol -1.2 99 P GC	Propylene Glycol	2.00
Sodium Benzoate	Sodium Benzoate	0.10
Sodium Hydroxide 10% solution	Sodium Hydroxide	0.50
Hydrolite® 5 Green	Hydrolite® 5 Green	0.30

Euxyl® K702	Dehydroacetic Acid. Benzoic Acid. Phenoxyethanol.Polyaminopropyl Biguanide. Ethylhexylglycerin	0.30
SymSave® H	Hydroxyacetophenone	0.70

Table F28
Hand and body cream (Amounts in % b.w.)

Ingredients	INCI	Amount
Dracorin® GOC	Glyceryl Oleate Citrate. Caprylic/Capric Triglyceride	2.00
PCL-Solid	Stearyl Heptanoate. Stearyl Caprylate	2.50
Lanette® O	Cetearyl Alcohol	1.50
Cutina® GMS-V	Glyceryl Stearate	1.00
Dragoxat® 89	Ethylhexyl Isononanoate	3.00
PCL-Liquid 100	Cetearyl Ethylhexanoate	7.00
Isodragol®	Triisononanoin	4.00
Xiameter® PMX-0345 Cyclosiloxane	Cyclopentasiloxane (and) Cyclohexasiloxane	0.50
Water	Water (Aqua)	Ad 100
Carbopol® Ultrez 21	Acrylates/C10-30 Alkyl Acrylate Crosspolymer	0.20
Keltrol® CG-RD	Xanthan Gum	0.10
Glycerol 85 P.	Glycerol	3.00
DragoBetaGlucan	Water (Aqua). Butylene Glycol. Glycerol. Avena Sativa (Oat) Kernel Extract	1.50
Potassium Sorbat	Potassium Sorbate	0.10
Sodium Hydroxide 10% solution	Sodium Hydroxide	0.50
Hydrolite® 5 Green	Hydrolite® 5 Green	0.20
Euxyl® K300	Methyl-. Butyl-. Ethyl-. Propyl. Isobutylparaben. Phenoxyethanol.	0.30
SymSave® H	Hydroxyacetophenone	0.30

Table F29
Face cream (Amounts in % b.w.)

Ingredients	INCI	Amount
Emulsiphos®	Potassium Cetyl Phosphate. Hydrogenated Palm Glycerides	1.50
Cutina® GMS-V	Glyceryl Stearate	1.70
Lanette® O	Cetearyl Alcohol	3.00
Tegosoft® MM	Myristyl Myristate	1.00
PCL-Liquid 100	Cetearyl Ethylhexanoate	1.00
Isodragol®	Triisononanoin	3.00
Dragoxat® 89	Ethylhexyl Isononanoate	4.00
Avocado Oil	Persea Gratissima (Avocado) Oil	3.00
Abil® 350	Dimethicone	0.50
Covi-ox® T-70	Tocopherol	0.10
Edeta® BD	Disodium EDTA	0.10
Carbopol® Ultrez 21	Acrylates/C10-30 Alkyl Acrylate Crosspolymer	0.30
Keltrol® CG-RD	Xanthan Gum	0.150
Water	Water (Aqua)	Ad 100
Glycerol 99.5 P.	Glycerol	4.00
Propylene Glycol -1.2 99 P GC	Propylene Glycol	3.00
SymMatrix®	Maltodextrin. Rubus Fruticosus (Blackberry) Leaf Extract	0.50
Sodium Hydroxide 10% solution	Sodium Hydroxide	0.50
Hydrolite® 5 Green	Hydrolite® 5 Green	0.30
Euxyl® K712	Sodium Benzoate. Potassium Sorbate	0.20
SymSave® H	Hydroxyacetophenone	0.60

Table F30
Moisturizing body care cream (Amounts in % b.w.)

Ingredient	**Amount**
PEG-7 hydrogenated castor oil	6.00
Cetearyl ethyl hexanoate	10.00
Isopropyl myristate	5.00
Mineral oil	7.00
Shea Butter (*Butyrospermum parkii*)	0.50
Aluminum stearate	0.50
Magnesium stearate	0.50
Bisabolol	0.20
Quaternium-18-Hectorit	0.70
Dipropylene glycol	5.0
Magnesium sulfate	0.70
1,2-pentanediol (Hydrolite® 5 Green)	4.00
Preservative (Phenoxyethanol)	0.20
SymSave® H	0.40
Aqua dem.	58.90

Table F31
Anti-wrinkle cream (Amounts in % b.w.)

Ingredients	**Amount**
Glyceryl Stearate Citrate	1.00
Glyceryl Laurate	1.00
Cetearyl Alcohol (and) Myristyl Myristate	3.00
Cetearyl Ethylhexanoate	4.00
Mineral oil	4.00
Cyclohexasiloxane	0.50
Acrylates/C10-30 Alkyl Acrylate Crosspolymer	0.20
Water	Ad 100
1.2-Hexanediol	2.00
Sodium Hydroxide 10% solution	0.10

Narcissus Tazetta Bulb Extract	1.00
1,2-pentanediol (Hydrolite® 5 Green)	0.30
Preservative (Phenoxyethanol)	0.50
SymSave® H	0.50

Table F32

Functional skin oil for disinfection (Amounts in % b.w.)

Ingredients	INCI	Amount
Neutral Oil	Caprylic/Capric Triglyceride	Ad 100
Sweet Almond Oil	Prunus Dulcis	20.00
Dragoxat® 89	Ethylhexyl Isononanoate	4.00
Isopropyl Palmitate	Isopropyl Palmitate	6.00
PCL-Liquid 100	Cetearyl Ethylhexanoate	15.00
Dragosantol® 100	Bisabolol	0.20
Retinyl Acetate In Oil (1 Mio. Ie/G)	Retinyl Acetate	0.50
Vitamin E Acetate	Tocopheryl Acetate	0.50
Covi-ox® T-70	Tocopherol	0.10
Hydrolite® 5 Green	Hydrolite® 5 Green	0.30
Preservative	Methyl-. Butyl-. Ethyl-. Propylparaben	0.30
SymSave® H	Hydroxyacetophenone	0.40

Table F33

Septic wound cream (Amounts in % b.w.)

Ingredients (INCI)	Amount
Sorbitan Isostearate. Hydrogenated Castor Oil. Ceresin. Beeswax (Cera Alba)	6.00
Petrolatum	21.00
Cera Alba	5.00
Cetearyl Alcohol	7.00
Prunus Dulcis	7.00
Lanolin	5.00
Paraffinum Liquidum	12.00
Water (Aqua)	Ad 100

Panthenol	7.00
Magnesium Sulfate	0.70
1,2-pentanediol (Hydrolite® 5 Green)	1.00
Tocopheryl Acetate	1.00
Octenidine dihydrochloride	0.10
Phenoxyethanol	0.50
SymSave® H	0.50

Table F34
Moisturizing and disinfecting face mask (Amounts in % b.w.)

Ingredients	**INCI**	**Amount**
Water	Water (Aqua)	Ad 100
Stabileze QM	PVM / Ma Decadiene Crosspolymer	0.50
Biotive® L-Arginine	Arginine	0.75
Actipone® Laminaria Saccharina GW	Glycerol. Water (Aqua). Laminaria Saccharina Extract	1.00
Extrapone® Cucumber	Water (Aqua). Propylene Glycol. Cucumis Sativus (Cucumber) Juice	1.00
Glycerol 99.5 P.	Glycerol	7.00
Neo Actipone® Soap Nutshell	Sapindus Mukurossi Peel Extract	0.50
Colour I	Colour	0.01
Hydrolite® 5	Pentylene Glycol	5.00
Solubilizer	PEG-40 Hydrogenated Castor Oil. Trideceth-9. Water (Aqua)	0.60
Hydrolite® 5 Green	Hydrolite® 5 Green	0.08
Preservative	Phenoxyethanol	0.40
SymSave® H	Hydroxyacetophenone	0.40

Table F35

Sprayable disinfecting gel (Amounts in % b.w.)

Ingredients	INCI	Amount
Water	Water (Aqua)	Ad 100
Stabileze QM	PVM / Ma Decadiene Crosspolymer	0.25
Sodium Hydroxide 10% solution	Sodium Hydroxide	0.40
Coffein pure	Caffeine	0.50
Extrapone® Horse Chestnut	Propylene Glycol. Water (Aqua). Glucose. Aesculus Hippocastanum (Horse Chestnut) Seed Extract. Lactic Acid	1.00
Hydrolite® 5 Green	Hydrolite® 5 Green	3.00
1.3 Butylene Glycol	Butylene Glycol	5.00
Biotive® Esculin Sesquihydrate	Esculin	0.30
Ethanol 96 %	Alcohol Denat.	10.00
Solubilizer	PEG-40 Hydrogenated Castor Oil. Trideceth-9. Water (Aqua)	0.50
Octenidine dihydrochloride		0.10
Preservative	Phenoxyethanol	0.70
SymSave® H	Hydroxyacetophenone	0.30

Table F36

Mineral wash and cleaning gel (Amounts in % b.w.)

Ingredients	INCI	Amount
Water	Water (Aqua)	Ad 100
Pionier® NP 37 G	Sodium Carbomer	1.50
SymSol® PF-3	Water (Aqua). Pentylene Glycol. Sodium Lauryl Sulfoacetate. SodiumOleoyl Sarcosinate. Sodium Chloride. Disodium Sulfoacetate. SodiumOleate. Sodium Sulfate	5.00
Hydroviton® 24	Water (Aqua). Pentylene Glycol. Glycerol. Sodium Lactate. Lactic Acid. Serine. Urea. Sorbitol. Sodium Chloride. Allantoin	1.00
Extrapone® Silk GW	Water (Aqua). Glycerol. Hydrolyzed Silk	1.00
Hydrolite® 5 Green	Hydrolite® 5 Green	4.00
Actipearls Red Star # DH10402/6	Water (Aqua). Propylene Glycol. Algin. Gellan Gum. Xanthan Gum. CalciumChloride. CI 12490	1.00

	(Pigment Red 5). Mica (CI 77019). Titanium Dioxide (CI 77891)	
1,2-pentanediol (Hydrolite® 5 Green)	Hydrolite® 5 Green)	0.50
3-Phenylpropanol		0.70
SymSave® H	Hydroxyacetophenone	0.30

Table F37
Anti-acne wash (Amounts in % b.w.)

Ingredients (INCI)	**Amount**
Water (Aqua)	45.70
Polyquaternium-7	0.50
Cocamidopropyl Betaine 9.000	9.00
Coco Glucoside 2.000	2.00
Polysorbate 80. Glycerol. Gossypium Herbaceum. (Cotton) Seed Oil. Water (Aqua)	1.00
Trideceth-9. PEG-5 Ethylhexanoate. Water (Aqua)	1.00
Glycereth-90 Isostearate. Laureth-2	0.50
Sodium Laureth Sulfate 37.000	37.00
Glycerol. Triticum Vulgare (Wheat) Gluten. Water (Aqua)	1.00
Sodium Chloride	0.30
1,2-pentanediol (Hydrolite® 5 Green)	1.00
Phenoxyethanol. Methylparaben. Ethylparaben. Butylparaben. Propylparaben. Isobutylparaben	0.30
SymSave® H	0.50

Table F38
Cosmetic sun protection composition (Amounts in % b.w.)

Ingredient	**Amount**
Ethylhexyl cinnamic acid	7.50
Benzophenon-3	2.00
Polyglyceryl dimer soyate	0.80
Sorbitane stearate	1.00
Tocopheryl acetate	0.50

Glyceryl stearate. PEG-100 Stearate	3.00
PEG-40. hydrogenated castor oil	1.00
Titanium dioxide. aluminum oxide hydrate. Dimethicon/Methicon Copolymer	3.00
Butyrospermum parkii (Shea Butter)	1.00
C_{12-15} alkyl benzoate	6.50
Butylene glycol	5.00
Xanthan gum	0.30
Disodium EDTA	0.10
Allantoin	0.10
Polyacryl amide. C_{13-14} isoparaffin. Laureth-7	1.00
1,2-pentanediol (Hydrolite® 5 Green)	5.00
4-t Butylcyclohexanol	1.00
Preservatives (Methyl-. Butyl-. Ethyl-. Propylparaben. Phenoxyethanol)	0.30
SymSave® H	0.60
Aqua dem.	Ad 100

Table F39
Sun protection spray (Amounts in % b.w.)

Ingredients	INCI	Amount
Water. demineralized	Water (aqua)	69.50
Glycerol	Glycerol	4.00
1.3 butylene glycol	Butylene glycol	5.00
D-Panthenol	Panthenol	0.50
Lara Care A-200	Galactoarabinan	0.25
Baysilone oil M 10	Dimethicone	1.00
Edeta BD	Disodium EDTA	0.10
Copherol 1250	Tocopheryl acetate	0.50
Cetiol OE	Dicaprylyl ether	3.00
Neo Heliopan® HMS	Homosalate	5.00
Neo Heliopan® AV	Ethylhexyl methoxycinnamate	6.00
Neo Heliopan® 357	Butyl methoxydibenzoylmethane	1.00
Corapan TQ	Diethylhexylnaphthalate	2.00
Alpha Bisabolol	Bisabolol	0.10

Pemulen TR-2	Acrylates/C10-30 alkyl acrylate crosspolymer	0.25
NaOH. 10%	Sodium hydroxide	0.60
Hydrolite® 5 Green	Hydrolite® 5 Green	0.20
Phenoxyethanol	Phenoxyethanol	0.40
Solbrol M	Methylparaben	0.10
Solbrol P	Propylparaben	0.10
SymSave® H	Hydroxyacetophenone	0.50

Table F40

Sunscreen spray O/W. SPE 15-20 (Amounts in % b.w.)

Ingredients	**INCI**	**Amount**
Dracorin® GOC	Glyceryl Oleate Citrate. Caprylic/Capric Triglyceride	2.00
Corapan® TQ	Diethylhexyl 2.6-Naphthalate	3.00
Neo Heliopan® HMS	Homosalate	7.00
Neo Heliopan® OS	Ethylhexyl Salicylate	5.00
Neo Heliopan® 357	Butyl Methoxydibenzoylmethane	3.00
Isoadipate	Diisopropyl Adipate	6.00
Baysilone® Oil M10	Dimethicone	1.00
Edeta® BD	Disodium EDTA	0.10
Vitamin E Acetate	Tocopheryl Acetate	0.50
Dragosantol® 100	Bisabolol	0.10
Pemulen® TR-2	Acrylates/C10-30 Alkyl Acrylate Crosspolymer	0.25
Water	Water (Aqua)	Ad 100
Glycerol 99.5 P.	Glycerol	4.00
Butylene Glycol	Butylene Glycol	5.00
Neo Heliopan® Hydro (103089). used as 25% aq. solution	Phenylbenzimidazole Sulfonic Acid	8.00
Biotive® L-Arginine	Arginine	0.55
Hydrolite® 5 Green	Hydrolite® 5 Green	0.40
Sobrol M	Methylparaben	0.30
SymSave® H	Hydroxyacetophenone	0.60

Table F41

Sun protection soft cream (W/O). SPF 40 (Amounts in % b.w.)

Ingredients	INCI	Amount
Dehymuls PGPH	Polyglyceryl-2 dipolyhydroxystearate	5.00
Copherol 1250	Tocopheryl acetate	0.50
Permulgin 3220	Ozocerite	0.50
Zinc stearate	Zinc stearate	0.50
Tegosoft TN	C12-15 Alkyl benzoate	10.00
Neo Heliopan® E1000	Isoamyl-p-methoxycinnamate	2.00
Neo Heliopan® 303	Octocrylene	5.00
Neo Heliopan® MBC	4-Methylbenzylidene camphor	3.00
Zinc oxide. neutral	Zinc oxide	5.00
Water. distilled	Water (aqua)	Add 100
EDETA BD	Disodium EDTA	0.10
Glycerol	Glycerol	4.00
Magnesium sulfate	Magnesium sulfate	0.50
Hydrolite® 5 Green	Hydrolite® 5 Green	0.30
Symdiol® 68	1.2-Hexanediol. Caprylylglycol	0.30
SymSave® H	4-Hydroxyacetophenone	0.80

Table F42

Sun protection milk (W/O) (Amounts in % b.w.)

Ingredients	INCI	Amount
Dehymuls PGPH	Polyglyceryl-2 dipolyhydroxystearate	3.00
Beeswax 8100	Beeswax	1.00
Monomuls 90-0-18	Glyceryl oleate	1.00
Zinc stearate	Zinc stearate	1.00
Cetiol SN	Cetearyl isononanoate	5.00
Cetiol OE	Dicaprylyl ether	5.00
Tegosoft TN	C12-15 alkyl benzoate	4.00
Vitamin E	Tocopherol	0.50
Neo Heliopan® OS	Ethylhexyl salicylate	5.00
Neo Heliopan® AV	Ethylhexyl methoxycinnamate	7.50
Uvinul® T150	Ethylhexyl triazone	1.50

Water. distilled	Water (Aqua)	To 100
Trilon BD	Disodium EDTA	0.10
Glycerol	Glycerol	5.00
Neo Heliopan® AP 10% solution. neutralized with NaOH	Disodium phenyl dibenzimidazole tetrasulfonate	15.00
Hydrolite® 5 Green	Hydrolite® 5 Green	0.25
Alpha bisabolol	Bisabolol	0.10
SymOcide® PT	Phenoxyethanol. Tropolone	0.25
SymSave® H	Hydroxyacetophenone	0.25

Table F43
After sun gel (Amounts in % b.w.)

Ingredients	**INCI**	**Amount**
SymSol® PF-3	Water (Aqua). Pentylene Glycol. Sodium Lauryl Sulfoacetate. SodiumOleoyl Sarcosinate. Sodium Chloride. Disodium Sulfoacetate. SodiumOleate. Sodium Sulfate	3.000
Glycerol 99.5 P.	Glycerol	5.000
SymHelios® 1031	Benzylidene Dimethoxydimethylin danone	0.100
Water	Water (Aqua)	Ad 100
Pemulen® TR-2	Acrylates/C10-30 Alkyl Acrylate Crosspolymer	1.000
D-Panthenol 75 W	Panthenol	0.500
SymFinity® 1298	Echinacea Purpurea Extract	0.100
Extrapone® Pearl GW	Water (Aqua). Glycerol. Hydrolyzed Pearl. Xanthan Gum	1.000
Sodium Hydroxide 10% solution	Sodium Hydroxide	2.500
Ethanol 96 %	Alcohol Denat.	15.000
Hydrolite® 5 Green	Hydrolite® 5 Green	0.20
SymOcide® PS	Phenoxyethanol. 1.2-Hexanediol. Decyleneglycol	0.50
SymSave® H	Hydroxyacetophenone	0.50

Table F44
After sun lotion (Amounts in % b.w.)

Ingredients	Amount
Acrylate/C10-30 alkylacrylate crosspolymer	0.4
Cetearylethyl hexanoate	15.0
Bisabolol	0.2
Tocopheryl acetate	1.0
Panthenol	1.0
Alcohol	15.0
Glycerol	3.0
1.2-Hexanediol	0.60
SymSave® H	0.30
1,2-pentanediol (Hydrolite® 5 Green)	4.0
Aqua dem.	Ad 100
Triethanolamine	0.2

Table F45
Hair styling gel (Amounts in % b.w.)

Ingredients	Amount
Water	Ad 100
PVM/MA Decadiene Crosspolymer	0.60
PVP	3.00
Isocetyl Stearate	4.00
Ethylhexyl Methoxycinnamate	0.50
Aminomethyl Propanol	0.40
1,2-pentanediol (Hydrolite® 5 Green)	0.60
SymDiol® 68T (1.2-Hexanediol. 1.2-Octanediol. Tropolone)	0.30
Phenoxyethanol	0.20
SymSave® H	0.40

Table F46
Silicone emulsion (Amounts in % b.w.)

Ingredients	Amount
Potassium Cetyl Phosphate. Hydrogenated Palm Glycerides	1.00
Cyclohexasiloxane	4.00
Cetearyl Alcohol	1.50
Phenyl Trimethicone	3.00
Stearyl Heptanoate. Stearyl Caprylate	3.00
Dimethicone	1.00
Xanthan Gum	0.20
Isoamyl p-Methoxycinnamate	5.00
Water	Ad 100
Methylpropanediol	3.00
1,2-pentanediol (Hydrolite® 5 Green)	0.30
Diazolidinyl urea	0.10
SymSave® H	0.50

Table F47
Microemulsion gel (Amounts in % b.w.)

Ingredient	Amount
Glycerol isostearate	1.80
Octoxyglycerol	1.00
Ceteareth-15	5.20
PEG-150 Distearate	1.00
Aluminium chlorohydrate	5.00
Isotridecylisononanoate	3.30
Cyclomethicone	6.60
1,2-pentanediol (Hydrolite® 5 Green)	0.70
Euxyl® K145 (Methylchloroisothiazolinone. Methylisothiazlinone. Bronopol)	0.10
SymSave® H	0.40
Water	Ad 100

Table F48
Air freshener in gel form (Amounts in % b.w.)

Ingredient	Amount
Demineralised water	Ad 100
Genugel® X-6424 (carrageenan)	2.00
Arkopal® N 100 or Tergitol® NP 10 (Emulsifer)	3.50
1,2-pentanediol (Hydrolite® 5 Green)	0.60
Preventol® D 7 (5-chloro-2-methyl-4-isothiazolin-3-one. 2-methyl-2H isothiazol-3-one)	0.10
SymSave® H	0.80

Table F49
Cleaner. APC liquid. alkaline pH 8-10 (Amounts in % b.w.)

Ingredients (INCI)	Amount
Aqua	59.06
Tri Sodium Citrate Dihydrate	3.00
Sodium Laureth Sulfate	30.00
Trideceth-9	5.00
Ethanol	2.00
Citric Acid 10% solution	0.24
1,2-pentanediol (Hydrolite® 5 Green)	0.50
Mixture of 5-Chloro-2-methyl-2H-isothiazol-3-one and 2-Methyl-2H-isothiazol-3-one	0.10
4-Hydroxyacetophenone (SymSave® H)	0.30

Table F50
Fabric softener (Amounts in % b.w.)

Ingredients (INCI)	Amount
Aqua	72.10
Dialkylester ammomium methosulfate	16.60
Polydimethylsiloxane	0.30
Magnesiumchloride	10.00
1,2-pentanediol (Hydrolite® 5 Green)	0.60
Mixture of 5-Chloro-2-methyl-2H-isothiazol-3-one and 2-Methyl-2H-isothiazol-3-one	0.10
4-Hydroxyacetophenone (SymSave® H)	0.40

Table F51
Liquid detergent (Amounts in % b.w.)

Ingredients	Amount
Deionized water	39.60
Optical brightener	0.10
Coconut fatty acids (C12-C18)	7.50
Potassium hydroxide 50% solution	4.30
Propane-1.2-diol	5.00
Fatty alcohols C12-C15. 8 EO	12.00
Na-salt of secondary alkyl sulfonates (C13-C17)	17.00
Triethanolamine	2.00
Trisodium citrate dihydrate	5.00
Dequest 2066 Diethylenetriamine penta(methylene phosphonic acid)	3.00
Ethanol	3.00
Enzymes	0.70
1,2-pentanediol (Hydrolite® 5 Green)	0.50
4-Hydroxyacetophenone (SymSave® H)	1.00

Table F52
Liquid detergent concentrate (Amounts in % b.w.)

Ingredients	Amount
Deionized water	12.9
Coconut fatty acids (C12-C18)	10.0
Fatty alcohols C12-C15. 8 EO	26.0
Na-salt of secondary alkyl sulfonates (C13-C17)	26.5
Triethanol amine	8.5
Na-salt of fatty alcohol sulfates C12-C14	3.0
Ethanol	5.5
Urea	4.5
Enzymes	0.9
Citric acid	1.0
1,2-pentanediol (Hydrolite® 5 Green)	0.7
4-Hydroxyacetophenone (SymSave® H)	0.8

Table F53
Toilet cleaner (Amounts in % b.w.)

Ingredients	Amount
Water	93.0
Kelzan ASX-T	0.5
Parafin sulfonate. sodium salt	1.0
Citric acid	5.0
Colorant (FD & C Yellow No. 6)	0.1
1,2-pentanediol (Hydrolite® 5 Green)	0.3
Preservative (Benzisothiazolinone. Glutaral)	0.05
4-Hydroxyacetophenone (SymSave® H)	0.6

Table F54
Dish washing concentrate (Amounts in % b.w.)

Ingredients	Amount
Sodium laurylsulfate	31.0
Propane-1.2-diole	6.0
Ethyl alcohol 96%	7.0
Palm tree glucosides	6.0
Coco betaine	18.0
1,2-pentanediol (Hydrolite® 5 Green)	0.4
4-Hydroxyacetophenone (SymSave® H)	0.5
Water	31.6

Table F55
Dish washing concentrate (Amounts in % b.w.)

Ingredients	Amount
Palm tree glucosides	4.0
Sodium lauryl sulfate	45.0
Coco betaine	8.0
Ethyl alcohol 96%	1.0
Colorant (C.I. Pigment Blue 15)	0.05
1,2-pentanediol (Hydrolite® 5 Green)	0.2
4-Hydroxyacetophenone (SymSave® H)	0.7
Water	Ad 100

Table F56
Solution for wet wipes (Amounts in % b.w.)

Ingredients	INCI	Amount
SymSol® PF-3	Water (Aqua). Pentylene Glycol. Sodium Lauryl Sulfoacetate. SodiumOleoyl Sarcosinate. Sodium Chloride. Disodium Sulfoacetate. SodiumOleate. Sodium Sulfate	2.00
Dragosantol® 100	Bisabolol	0.10
Glycerol 99.5 P.	Glycerol	5.00
Water	Water (Aqua)	Ad 100
Hydrolite® 5 Green	Hydrolite® 5 Green	5.00
D-Panthenol 75 W	Panthenol	0.80
DragoCalm®	Water (Aqua). Glycerol. Avena Sativa (Oat) Kernel Extract	1.00
Witch Hazel-Distillate	Hamamelis Virginiana (Witch Hazel) Water. Water (Aqua). Alcohol	1.00
Allplant Essence® Org. Rose Geranium P	Pelargonium Graveolens Flower/Leaf/Stem Water	1.00
Preservative	Phenoxyethanol	0.30
SymSave® H	Hydroxyacetophenone	0.50

Table F57
Toothpaste (Amounts in % b.w.)

Ingredients	Amount
Water (deionized)	Ad 100
Sorbitol 70%	45.00
Trisodiumphosphate	0.10
Saccharin	0.20
Sodiummonofluorophosphate	1.14
PEG 1500	5.00
Sident 9 (abrasive silica)	10.00
Sident 22 S (Thickening silica)	8.00
Sodiumcarboxymethylcellulose	1.10
Titanium (IV) oxide	0.50

Water (deionized)	4.50
Sodiumlaurylsulfate (SLS)	1.50
1,2-pentanediol (Hydrolite® 5 Green)	1.00
Solbrol M (Sodium salt) (Methylparaben)	0.15
4-Hydroxyacetophenone	0.40

Table F58
Toothpaste with zinc citrate (Amounts in % b.w.)

Ingredients	Amount
Water (deionized)	Ad 100
Sorbitol 70%	45.00
Trisodiumphosphate	0.10
Saccharin	0.20
Sodiummonofluorophosphate	1.14
PEG 1500	5.00
Sident 9 (abrasive silica)	10.00
Sident 22 S (Thickening silica)	8.00
Sodiumcarboxymethylcellulose	1.10
Zinc citrate	1.00
Titanium (IV) oxide	0.50
Water (deionized)	4.50
Sodiumlaurylsulfate (SLS)	1.50
1,2-pentanediol (Hydrolite® 5 Green)	1.00
SymDiol® 68 (1.2-Hexanediol. Caprylylglycol)	0.25
4-Hydroxyacetophenone	0.10

Table F59
Mouth rinse (Amounts in % b.w.)

Ingredients	**Amount**
Ethylalcohol	10.00
Cremophor CO 40 (PEG 40 hydrogenated castor oil)	1.00
1,2-pentanediol (Hydrolite® 5 Green)	0.25
Water (deionized)	To 100.00
Sorbitol 70%	5.00
Sodiumsaccharin 450	0.07
Sodiumfluoride	0.18
Benzoic acid	0.12
4-Hydroxyacetophenone (SymSave® H)	0.30

Table F60
Gel dental cream (Amounts in % b.w.)

Ingredients	**Amount**
Na carboxymethylcellulose	0.40
Sorbitol 70 %. in water	72.00
Polyethylene glycol (PEG) 1500	3.00
Na saccarinate	0.07
Na fluoride	0.24
1,2-pentanediol (Hydrolite® 5 Green)	1.00
Abrasive silica	11.00
Thickening silica	6.00
Sodium dodecyl sulfate (SDS)	1.40
Dist. water	Ad 100
p-Hydroxybenzoic acid (PHB) ethyl ester	0.15
4-Hydroxyacetophenone (SymSave® H)	0.20

Table F61

Dental cream against plaque (Amounts in % b.w.)

Ingredients	Amount
Carrageenan	0.90
Glycerol	15.00
Sorbitol 70 %. in water	25.00
PEG 1000	3.00
Na fluoride	0.24
Tetrapotassium diphosphate	4.50
Tetrasodium diphosphate	1.50
Na saccarinate	0.40
Precipitated silica	20.00
Titanium dioxide	1.00
Triclosan	0.30
1,2-pentanediol (Hydrolite® 5 Green)	1.00
Sodium dodecyl sulfate	1.30
Dist. water	Ad 100
Benzylalcohol	0.50
4-Hydroxyacetophenone (SymSave® H)	0.25

Table F62

Dental cream for sensitive teeth (Amounts in % b.w.)

Ingredients	Amount
Na carboxymethylcellulose	0.70
Xanthan gum	0.50
Glycerol	15.00
Sorbitol 70 %. in water	12.00
Potassium nitrate	5.00
Sodium monofluorophosphate	0.80
Na saccharinate	0.20
1,2-pentanediol (Hydrolite® 5 Green)	1.00
Ca-carbonate	35.00

Silicon dioxide	1.00
Sodium dodecyl sulfate (SDS)	1.50
Dist. water	Ad 100
PHB methyl ester and PHB propyl ester	0.20
4-Hydroxyacetophenone (SymSave® H)	0.50

Table F63
Tooth cream and mouthwash 2-in-1 product (Amounts in % b.w.)

Ingredients	Amount
Sorbitol	40.00
Glycerol	20.00
Ethanol	5.00
Water	Ad 100
Na monofluorophosphate	0.75
Saccharin	0.20
Sident 9 (abrasive silicon dioxide)	20.00
Sident 22 S (thickening silicon dioxide)	2.00
Sodium carboxymethylcellulose	0.30
Sodium lauryl sulfate (SDS)	1.20
Color (Suspension. 1% in water) C.I. Pigment Blue 15	0.50
1,2-pentanediol (Hydrolite® 5 Green)	0.90
Solbrol M. sodium salt (methylparaben. sodium salt)	0.20
4-Hydroxyacetophenone (SymSave® H)	0.30

Table F64
Ready-to-use mouthwash with fluoride (Amounts in % b.w.)

Ingredients	**Amount**
Ethanol	7.00
Glycerol	12.00
Na fluoride	0.05
Pluronic F-127® (BASF. surface-active substance)	1.40
Na phosphate buffer pH 7.0	1.10
Na saccharinate	0.10
1,2-pentanediol (Hydrolite® 5 Green)	0.15
Chlorhexidine digluconate	0.2
Dist. water	to 100
Sorbic acid	0.20
4-Hydroxyacetophenone (SymSave® H)	0.30

Table F65
Sugar-free chewing-gum (Amounts in % b.w.)

Ingredients	**Amount**
Chewing gum base	30.00
Sorbitol. powder	Ad 100
Palatinite	9.50
Xylitol	2.00
Mannitol	3.00
Aspartame	0.10
Acesulfame K	0.10
Emulgum / emulsifier	0.30
Sorbitol 70 %. in water	14.00
Glycerol	1.00
1,2-pentanediol (Hydrolite® 5 Green)	1.50
4-Hydroxyacetophenone (SymSave® H)	0.20

WHAT CLAIMED IS

1. A composition comprising 1,2-pentanediol, wherein said 1,2-pentanediol is obtained from a process comprising the following steps:
   (a) providing at least one starting material selected from furfuryl alcohol and furfural;
   (b) reacting at least one of said starting materials with hydrogen in the presence of a heterogeneous catalyst to form 1,2-pentanediol, wherein said heterogeneous catalyst comprises:
      - one or more metals selected from the group consisting of platinum, rhodium, ruthenium, nickel, palladium and iridium in metallic form and/or
      - one or more compounds of metals selected from the group consisting of platinum, rhodium, ruthenium, nickel, palladium and iridium; and
      - one or more support materials selected from the group consisting of activated carbon, aluminum oxide, silicon dioxide, and silicon carbide; and
   (c) removing the 1,2-pentanediol thus obtained from the reaction mixture.
2. The composition of Claim 1, comprising said 1,2-pentanediol in an amount of from about 0.1 to about 10 wt.-percent.
3. The composition of Claim 1, comprising said 1,2-pentanediol in an amount of from about 0.5 to about 5 wt.-percent.
4. The composition of Claim 1, wherein said 1,2-pentanediol is essentially free of malodour impurities and malodour causing impurities.
5. The composition of Claim 1, representing a cosmetic and/or pharmaceutical composition.
6. The composition of Claim 5, representing a skin care, hair care, personal care, sun care or oral care ?composition.
7. The composition of Claim 5, representing a cream, a lotion, a spray, an emulsion, an ointment, a gel or a mousse.
8. The composition of Claim 1, representing a detergent composition.
9. The composition of Claim 8, representing a heavy duty powder detergent, a heavy duty liquid detergent, a light duty powder detergent, a light duty liquid detergent, a fabric softener, a manual dish wash agent or an all-purpose cleaner.
10. The composition of Claim 1, further comprising 1,2-alkanediols with 6 to 12 carbon atoms.

11. The composition of Claim 0, wherein said 1,2-alkanediols are selected from the group consisting of 1,2-hexanediol, 1,2-heptanediol, 1,2-octanediol, 1,2-nonanediol, 1,2-decanediol, 1,2-undecanediol, 1,2-dodecanediol, 1,2-tetradecanediol and their mixtures

12. The composition of Claim 10, comprising said 1,2-alkanediols in amounts of from about 0.1 to about 5 wt.-percent – calculated on the composition.

13. The composition of Claim 1, further comprising 4-hydroxyacetophenone.

14. The composition of Claim 13, comprising said 4-hydroxyacetophenone in amounts of from about 0.01 to about 2 wt.-percent – calculated on the composition.

15. A method for providing a cosmetic and/or pharmaceutical and/or detergent composition with improved olfactoric performance and stability, comprising or consisting of the following steps:
    (a) providing a cosmetic and/or pharmaceutical composition and
    (b) adding an amount of 1,2-pentanediol, said 1,2-pentanediol being obtained by the following process
        (i) providing at least one starting material selected from furfuryl alcohol and furfural;
        (ii) reacting at least one of said starting materials with hydrogen in the presence of a heterogeneous catalyst to form 1,2-pentanediol, wherein said heterogeneous catalyst comprises:
        - one or more metals selected from the group consisting of platinum, rhodium, ruthenium, nickel, palladium and iridium in metallic form and/or
        - one or more compounds of metals selected from the group consisting of platinum, rhodium, ruthenium, nickel, palladium and iridium; and
        - one or more support materials selected from the group consisting of activated carbon, aluminum oxide, silicon dioxide, and silicon carbide; and
    (iii) removing the 1,2-pentanediol thus obtained from the reaction mixture.

16. The use of 1,2-pentanediol as an additive for making cosmetic and/or pharmaceutical and/or detergent compositions with improved olfactory performance and stability, whereby said 1,2-pentanediol is obtained by the following process
    (i) providing at least one starting material selected from furfuryl alcohol and furfural;
    (ii) reacting at least one of said starting materials with hydrogen in the presence of a heterogeneous catalyst to form 1,2-pentanediol, wherein said heterogeneous catalyst comprises:

- one or more metals selected from the group consisting of platinum, rhodium, ruthenium, nickel, palladium and iridium in metallic form and/or
- one or more compounds of metals selected from the group consisting of platinum, rhodium, ruthenium, nickel, palladium and iridium; and
- one or more support materials selected from the group consisting of activated carbon, aluminum oxide, silicon dioxide, and silicon carbide; and

(iii) removing the 1,2-pentanediol thus obtained from the reaction mixture.

Compositions comprising 1,2-pentanediol

PRIORITY

[0001] The present international application claims priority of US-Provisional application

US 62/733744

filed September 20, 2018.

AREA OF INVENTION

[0002] The present invention refers to the area of cosmetic and pharmaceutical compositions with improved olfactory performance and stability comprising a new quality of 1,2-pentanediol.

BACKGROUND OF THE INVENTION

[0003] 1,2-Alkanediols in general and 1,2-pentanediol in special are well-known additives for cosmetic and pharmaceutical compositions, providing to them antimicrobial stability and improving solubility of other components within the formulation.

[0004] Qualities one can find in the market are typically prepared from 1-pentene or 1,2-penteneoxide. A major drawback of these products, however, is that they might bear a slight rancid odour which makes it necessary to mask within the formulation. In fact, this malodour gets even stronger when the formulation is stored over a time, particularly at higher temperatures.

[0005] There are alternative routes known to make 1,2-pentanediol available, as for example hydrogenation of furfuryl alcohol in the presence of platinum dioxide. These products are more or less odorless show a better olfactory quality, when freshly prepared, however they exhibit the same tendency for generating a rancid odour impression when incorporated into a formulation and stored over a period of time. Another drawback is that this manufacturing process is more expensive than the ring opening of epoxides.

RELEVANT PRIOR ART

[0006] A suitable starting material for the production of 1,2-pentanediol is furfuryl alcohol, which is obtainable in large amounts, for example, from sugar cane bagasse. It is known from the literature that various compounds are formed in the hydrogenation or hydrogenolysis of furfuryl alcohol.

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2018/079729

A. CLASSIFICATION OF SUBJECT MATTER

INV.	A61K8/34	A61Q17/00	A61Q19/00	A61Q5/12	C11D3/20
	A61Q19/10	A61Q5/02	A61Q15/00	B01J8/00	C07C1/00
	A61K8/35				

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
C11D A61Q A61K C07C B01J

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

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

EPO-Internal, CHEM ABS Data, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	Nn: "Symrise: Hydrolite 5 green - Multifunctional Cosmetic Ingredie", , 6 September 2018 (2018-09-06), pages 1-3, XP055592504, Retrieved from the Internet: URL:https://www.symrise.com/newsroom/article/symrise-hydroliteR-5-green-multifunctional-cosmetic-ingredient-from-renewab/ [retrieved on 2019-05-28]	1-9
Y	the whole document -----	1-16

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

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

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"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search 29 May 2019	Date of mailing of the international search report 13/06/2019
Name and mailing address of the ISA/ European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Authorized officer Grillenberger, Sonja

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	Nn: "Hydrolite (TM) 5 green technical datasheet", , 19 September 2018 (2018-09-19), pages 1-4, XP055592515, Retrieved from the Internet: URL:https://cosmetics.specialchem.com/product/i-symrise-hydrolite-5-green [retrieved on 2019-05-28]	1-9
Y	the whole document	1-16
X	WO 2012/152849 A1 (SYMRISE AG [DE]; KOCH OSKAR [DE] ET AL.) 15 November 2012 (2012-11-15) cited in the application	1-9,15, 16
Y	claims page 1, lines 8-16 pages 27-28; example 1 page 28, lines 4-5 examples 4-18	1-16
X	EP 2 772 489 A1 (EVONIK INDUSTRIES AG [DE]) 3 September 2014 (2014-09-03)	1-5
Y	claims 1-14 page 2, paragraph 5 page 3, paragraph 9 - page 8, paragraph 31 page 44, paragraph 230	1-16
Y	US 2010/216892 A1 (SCHMAUS GERHARD [DE] ET AL) 26 August 2010 (2010-08-26) claims examples	10-12
Y	WO 03/069994 A1 (DRAGOCO GERBERDING CO AG [DE]; SCHMAUS GERHARD [DE] ET AL.) 28 August 2003 (2003-08-28) claims tables 8,9	10-12
Y	KAO SOAP KK: "Non-medical bacteriostatic for foods, cosmetics", WPI WORLD PATENT INFORMATION DERWENT, vol. 39, no. 76, 11 August 1976 (1976-08-11), XP002022306, abstract	10-12
Y	Nn: "Product Information SymSave(TM) H", , 14 October 2015 (2015-10-14), pages 1-3, XP055592722, Retrieved from the Internet: URL:http://chemical-centre.com/d/982327/d/symsameh.pdf [retrieved on 2019-05-28] the whole document	13,14

1

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/EP2018/079729

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 2012152849 A1	15-11-2012	EP 2707351 A1	19-03-2014
		JP 6072775 B2	01-02-2017
		JP 2014523864 A	18-09-2014
		KR 20140011387 A	28-01-2014
		US 2014066666 A1	06-03-2014
		WO 2012152849 A1	15-11-2012
EP 2772489 A1	03-09-2014	CN 104016831 A	03-09-2014
		DE 102013203420 A1	28-08-2014
		EP 2772489 A1	03-09-2014
		JP 2014169268 A	18-09-2014
		US 2014243562 A1	28-08-2014
US 2010216892 A1	26-08-2010	EP 1835843 A1	26-09-2007
		JP 2008525518 A	17-07-2008
		US 2010216892 A1	26-08-2010
		WO 2006069953 A1	06-07-2006
WO 03069994 A1	28-08-2003	AT 337703 T	15-09-2006
		AU 2002350557 A1	09-09-2003
		CN 1620248 A	25-05-2005
		DE 10206759 A1	28-08-2003
		EP 1478231 A1	24-11-2004
		EP 1731036 A1	13-12-2006
		ES 2269781 T3	01-04-2007
		JP 4852231 B2	11-01-2012
		JP 2005526036 A	02-09-2005
		US 2005222276 A1	06-10-2005
		WO 03069994 A1	28-08-2003