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Description

The present invention relates to a composition based on alkylalkoxysilanes and/or alkylalkoxysiloxanes for hydrophobizing porous mineral substrates and for providing porous mineral substrates with water repellent properties, the preparation thereof and the use thereof for protecting buildings. Alkylalkoxysilanes and alkylalkoxysiloxanes are also designated below for short as hydrophobizing active substance or as silane systems, oligomeric silane systems or silane oligomers.

It has long been known that silane compounds carrying alkyl chains can produce hydrophobizing properties on porous mineral substances. Thus, in particular monomeric, relatively short-chain alkylalkoxysilanes are distinguished by good deep impregnation (EP 0 101 816).

Oligomeric silane systems, such as alkylalkoxysiloxanes, have advantages with regard to their use as water repellents since they release less volatile organic compounds (VOC) than monomeric silane systems during use.

Furthermore, it is known that building protection compositions can be used in the form of a solution or of a liquid or pasty or creamy, i.e. high-viscosity, emulsion (inter alia EP 0 814 110, EP 1 205 481, EP 1 205 505, WO 06/081891).

A quality feature of hydrophobizations which is frequently desired by users is the repulsion of water drops on the surface of a hydrophobized substrate (referred to as water repellent effect for short). Such water repellent effects can additionally help to reduce the growth of microorganisms, such as algae, mosses or fungi.

Unfortunately, abovementioned building protection compositions, after application to a porous mineral substrate, prevent the penetration of water (hydrophobization) but in general no water repellent properties or only very weak water repellent

properties are achieved.

US 4,846,886, US 5,674,967, JP 2006-335969 and EP 0 826 650 disclose in each case silane- or siloxane-containing formulations which can produce such water repellent effects on porous, mineral surfaces. However, sufficiently pronounced water repellent effects are achieved only by the use of fluorine-containing compounds. Fluorinated organic compounds are expensive and there is increased ecological interest in replacing them (J. M. Conder et al. *Environmental Science Technology*, 2008, 42(4), 995-1003. K. S. Kumar *Research Journal of Chemistry and Environment*, 2005, 9(3), 50-79.).

Furthermore, it is known from the literature that pronounced water repellent effects can be achieved by the use of silicic acids or more generally by the use of oxidic nanoparticles for the surface modification. Corresponding coatings are described, for example, in JP 2002-338943 or WO 2008/106494.

JP 2008-031275 describes aqueous emulsions of silane systems to which hydrophilic metal oxides are added in order to improve the water repellent behaviour. The disadvantage in the use of such hydrophilic metal oxides is that the water repellency of a surface can be adversely affected by the hydrophilicity introduced.

JP 2008-291225 relates to water repelling preparations comprising organic bentonites and alkylalkoxysilanes or condensates thereof.

The preparation and properties of hydrophobic metal oxides and in particular silicic acids are described, for example, in JP 2007-161510, DE 10 2004 010 756 or DE 10 2004 055 585.

It was the object of the present invention to provide a fluorine-free formulation with which porous mineral surfaces or substrates can be treated to impart water repellency and can be provided with an improved water repellent effect. Thus, both the

reduction of the water absorption of hydrophobizing active substances is to be retained and the water repellent effect ("Teflon effect") otherwise achievable in particular by fluorine groups is to be achieved.

5

The object is achieved, according to the invention, according to the statements in the patent claims.

Surprisingly, it has now been found that the desired properties
10 are achieved by introducing a hydrophobic or hydrophobized silica into a hydrophobizing active substance. The measure is surprisingly simple, economical and nevertheless effective, excellent hydrophobizing and at the same time outstanding water repellent effect substantially improved compared with other
15 fluorine-free hydrophobizing systems being achievable in an advantageous manner on application of a composition according to the invention, which is based on at least one hydrophobizing active substance and at least one hydrophobized metal oxide introduced therein, to a porous mineral surface or substrate.
20 In addition, water repellent effects which are at least equivalent to or even surpass the quality of known fluorine-containing treatment systems are achieved by the teaching according to the invention.

25 In the context of the present application, hydrophobizing active substances or hydrophobizing reagents are substances which, on application to a mineral substrate, produce hydrophobizing of the substrate or hydrophobizing on the surfaces thereof.

30 The present invention therefore relates to a fluorine-free composition for hydrophobizing porous mineral substrates and for producing a water repellent effect on the surface of the substrate, the composition being based on
- at least one hydrophobizing active substance and
35 - at least one hydrophobic metal oxide.

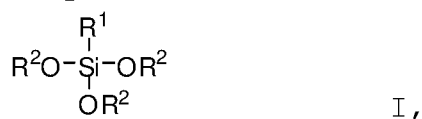
As further constituents, a composition according to the invention may contain

- optionally at least one organic solvent,
- optionally water,
- optionally at least one emulsifier and/or
- optionally further auxiliaries.

5

A composition according to the invention is preferably a solvent-free composition.

10 A composition according to the invention may advantageously contain, as a hydrophobizing active substance, one or more alkyl-substituted silanes of the general formula I



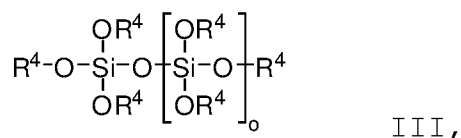
15 in which R^1 represents a C_1 - C_{18} -alkyl group, groups R^2 are identical or different and R^2 represents a hydrogen atom or an alkyl radical having 1 to 6 carbon atoms, preferably methyl or ethyl. Preferred examples are those having radicals:

$\text{R}^1 = \text{CH}_3-$, C_2H_5- , C_3H_7- , C_4H_9- , $i\text{-C}_4\text{H}_9-$, $\text{C}_6\text{H}_{13}-$, $i\text{-C}_6\text{H}_{13}$, $\text{C}_8\text{H}_{16}-$, $i\text{-C}_8\text{H}_{16}-$ and

20 $\text{R}^2 = \text{H}$, methyl or ethyl.

Finally, a hydrophobizing active substance can be selected from the series consisting of the alkyl silicates of the general, idealized formula III

25



30 in which R^4 , independently of one another, represents a hydrogen atom or an alkyl radical having 1 to 6 carbon atoms, preferably having 1 or 2 carbon atoms, i.e. methyl or ethyl, and o is a number from 0 to 50 (including all numbers in between), preferably from 1 to 10.

35 In addition, mixtures of abovementioned hydrophobizing active substances of the general formulae I and III can be used. Each of the hydrophobizing active substances I and III, independently

of one another, may account for from 0 to 100% (including all numbers in between) of the total amount of hydrophobizing active substance.

5 A composition according to the invention contains one or more hydrophobic metal oxides. In the context of the present invention, metal oxides may be oxides, hydroxides or hydrated oxides of the elements aluminium, silicon and titanium. Silicas, such as flame silicas, precipitated silicas, crystalline silicas
10 or zeolites, are preferably used. Hydrophobic metal oxides used according to the invention are in particular pulverulent solids; use in liquid form, for example as a sol, such as silica sol, is excluded. Suitable hydrophobic metal oxides are obtained if said metal oxides are treated with a hydrophobizing reagent. The
15 treatment can be effected, for example, by wetting (mixing, kneading, milling, immersion, flooding) of said metal oxides with the hydrophobizing reagent and a subsequent thermal aftertreatment, for example in a drying oven. However, the treatment can also be carried out by spraying the metal oxides
20 with a hydrophobizing reagent, optionally under the influence of a relatively high temperature and optionally in the vapour form. Milling and/or classification of the powders can also be carried out beforehand or subsequently. Alkylalkoxysilanes, such as methyltrimethoxysilane, ethyltrimethoxysilane,
25 propyltrimethoxysilane, butyltrimethoxysilane, octyltrimethoxysilane, hexadecyltrimethoxysilane, methyltriethoxysilane, ethyltriethoxysilane, propyltriethoxysilane, butyltriethoxysilane, octyltriethoxysilane, hexadecyltriethoxysilane - to mention but
30 a few - alkylalkoxysiloxanes, for example propyl- or octyl-functional methoxy- or ethoxysiloxanes, as described, inter alia, in EP 0 814 110, EP 1 205 481 and EP 1 205 505, or silicones, waxes or oils are used as hydrophobizing reagents. Metal oxides treated in this manner are designated as hydrophobized metal
35 oxides in the context of the present invention.

The average particle size of hydrophobic metal oxides used according to the invention is advantageously 1 to 300 nm

(including all numbers in between), preferably 2 to 150 nm, particularly preferably 3 to 100 nm, very particularly preferably 4 to 70 nm, in particular 5 to 50 nm. The average particle size can be determined, for example, by means of
5 transmission electron microscopy (TEM).

The specific surface areas of hydrophobic metal oxides used according to the invention are advantageously 20 to 800 g/m² (including all numbers in between), preferably 25 to 600 g/m²,
10 particularly preferably 50 to 500 g/m², very particularly preferably 60 to 400 g/m², in particular 70 to 300 g/m². The specific surface area (BET) can be determined, for example, on the basis of DIN 66131.

15 Compositions according to the invention advantageously have a content of 0.01 to 10% by weight (including all numbers in between) of hydrophobic metal oxide, preferably 0.01 to 5% by weight, particularly preferably 0.05 to 4% by weight, in particular 0.1 to 2% by weight, based on the total mass of the
20 composition.

The compositions according to the invention may be present and may be used as such, as a solution in an organic solvent, as an aqueous emulsion or as an aqueous solution. The formulations
25 which can be used advantageously have a content of hydrophobizing active substance or hydrophobizing active substance mixture of 0.5 to 99.99% by weight (including all numbers in between), preferably 5 to 99.95% by weight, particularly preferably 8 to 99.9% by weight, very particularly
30 preferably 10 to 75% by weight, based on the composition.

According to the invention, in particular alcohols, such as methanol, ethanol or isopropanol, polar aprotic solvents, such as acetone, DMSO or NMP, aliphatic or aromatic solvents, such
35 as n-hexane, toluene or xylenes, or mineral oils, such as mineral spirit, may be used as organic solvents.

Thus, according to the invention, compositions can

advantageously have a content of at least one organic solvent or diluent from the series consisting of the aliphatic and aromatic hydrocarbons having a boiling point above room temperature, preferably of the C₆- to C₁₂-alkanes, benzene, petroleum ether, diesel, kerosene, toluene, xylene, the alcohols or polyols, preferably methanol, ethanol, isopropanol, tert-butanol, pentanol, hexanol, octanol, nonanol, isononanol, glycerol, the ketones, preferably acetone, or a mixture of at least two of the abovementioned organic solvents or diluents.

If the composition according to the invention is present in the form of an aqueous emulsion, this may have a content of at least one emulsifier; the emulsifier can advantageously be selected from the series consisting of the alkylsulphates having C₈-C₁₈-alkyl, alkyl and alkaryl ether sulphates having C₈-C₁₈-alkyl in the hydrophobic radical and having 1 to 40 ethylene oxide (EO) or propylene oxide (PO) units, alkylsulphonates having C₈-C₁₈-alkyl, alkarylsulphonates having C₈-C₁₈-alkyl, monoesters of sulphosuccinic acid with monohydric alcohols or alkylphenols having 5 to 15 carbon atoms, alkali metal and ammonium salts of carboxylic acids having 8 to 20 carbon atoms in the alkyl, aryl, alkaryl or aralkyl radical, alkyl and alkaryl phosphates having 8 to 20 carbon atoms in the organic radical, alkyl ether or alkaryl ether phosphates having 8 to 20 carbon atoms in the alkyl or alkaryl radical and 1 to 40 EO units, alkylpolyglycol ethers and alkarylpolyglycol ethers having 8 to 40 EO units and C₈-C₂₀ carbon atoms in the alkyl or aryl radicals, ethylene oxide/propylene oxide (EO/PO) block copolymer having 8 to 40 EO and PO units, adducts of alkylamines having C₈-C₂₂-alkyl radicals with ethylene oxide or propylene oxide, alkylpolyglycosides having linear or branched saturated or unsaturated C₈-C₂₄-alkyl radicals and oligoglycoside radicals having 1 to 10 hexose or pentose units, silicon-functional surfactants or mixtures of these emulsifiers.

The content of emulsifier in a composition according to the invention is preferably 0.01 to 5% by weight, particularly preferably 0.05 to 4% by weight (including all numbers in

between), based on the total weight of the emulsion.

Furthermore, compositions according to the invention have a content of at least one hydrolysis or condensation catalyst from the series consisting of the complex compounds, such as halides, oxides, hydroxides, imides, alcoholates, amides, thiolates, carboxylates and/or combinations of these substituents, of elements of the 3rd and 4th main group of the Periodic Table of the Elements (PTE) and of subgroups II, III, IV, V, VI, VII and VIIId, VIIIf and VIIIf of the PTE, in particular titanates or zirconates, such as, for example, tetra-*n*-butyl orthotitanate or tetra-*n*-propyl orthozirconate. In addition, oxides, hydroxides, hydrogen phosphates, hydrogen sulphates, sulphides, hydrogen sulphides, carbonates or bicarbonates of the 1st and 2nd main group of the PTE and/or alcoholates, preferably sodium methanolate or sodium ethanolate and/or aminoalcohols, preferably 2-aminoethanol or 2-(*N,N*-dimethyl)aminoethanol, may be present as the catalyst. In addition, carboxylic acids, such as formic acid, acetic acid or propionic acid, and mineral acids, such as hydrochloric acid or phosphoric acid, or a mixture of at least two of said catalysts may advantageously be used as the hydrolysis or condensation catalyst.

The hydrolysis or condensation catalysts mentioned can advantageously be used in an amount of 0.05 to 5% by weight (including all numbers in between), preferably 0.1 to 2% by weight, very particularly preferably 0.2 to 1.8% by weight, based on the amount of hydrophobizing active substance used.

In addition, a composition according to the invention can advantageously have a content of at least one further auxiliary, selected from the series consisting of inorganic or organic acids, buffer substances, fungicides, bactericides, algicides, microbicides, odorous substances, corrosion inhibitors, preservatives, rheology auxiliaries.

In addition, one or more non-hydrophobized metal oxides may also be added to compositions according to the invention as further

auxiliary, in addition to one or more of the hydrolysis or condensation catalysts described, with the result that an even greater abrasion resistance of the water repellent effect can advantageously be achieved.

5

The preparation of compositions according to the invention can advantageously be effected by simple mixing of the individual components in a container with a suitable mixing unit. This mixing can be effected continuously, for example by using a
10 mixing tube, or batchwise.

The preparation of an aqueous emulsion is described in detail from the technical point of view, for example in WO 06/081892 and WO 06/081891. Advantageously, a composition according to the
15 invention comprising at least one hydrophobizing active substance and at least one hydrophobic metal oxide can be used as the oil phase.

Thus, the compositions according to the invention can
20 advantageously be prepared by metering said constituents in succession into a suitable container and homogenizing them by mixing.

The present invention therefore relates to a process for the
25 preparation of a composition according to the invention by combining

- the at least one hydrophobizing active substance and
- the at least one hydrophobic metal oxide in a mixing unit and mixing them batchwise or continuously
- 30 - with the at least one hydrolysis or condensation catalyst,
- optionally water,
- optionally at least one organic solvent,
- optionally at least one emulsifier and
- optionally with at least one further auxiliary.

35

The present invention furthermore relates to a fluorine-free composition which is obtainable by the process according to the invention.

Finally, the present invention relates to the use of a fluorine-free composition according to the invention or of a composition prepared by the process according to the invention for hydrophobizing porous mineral substrates and for producing a water repellent effect on the substrate surface, in particular of building materials, such as concrete, fibre cement, clay, loam, brick, marble, plaster, substrates based on plaster or plaster-containing substrates, granite, sandstone or lime sandstone, one or more water drops which remain on the treated substrate surface over a time of 1 minute practically not wetting the surface, thus advantageously leaving behind no spots due to wetting which are detectable with the naked eye.

In particular, mineral substrates which have low nucleophilicity, i.e. as a rule those having a low content of free OH groups, cannot be made sufficiently water repellent by means customary to date. Such mineral substrates are, for example, calcium carbonate and magnesium carbonate or substrates based on calcium carbonate or magnesium carbonate, such as limestone, or calcium sulphate or magnesium sulphate or substrates based on calcium sulphate or magnesium sulphate, such as plaster, and are frequently used in the building industry. Surprisingly, compositions according to the invention are also particularly advantageous for producing hydrophobizing properties and water repellent effects on such substrates or corresponding materials, products, articles or components.

Another subject therefore comprises products which are treated with a composition according to the invention, in particular those based on concrete, plaster, lime sandstone, limestone.

The invention is illustrated in more detail with reference to the following examples, but without limiting the subject matter of the invention.

Examples

All data below in % by weight are based on the total mass of the prepared formulation.

Example 1 (Comparative example)

5

At room temperature, an alkyltrialkoxysilane (Protectosil® BHN from Evonik Degussa GmbH) was initially introduced into a clean, dry glass vessel and 0.5% by weight of the hydrophobic silica AEROSIL® R 202 (obtainable from Evonik Degussa GmbH) was added.

10 The mixture formed was stirred for a further 5 minutes and could then be used directly.

Example 2

15 At room temperature, ethanol was initially introduced into a clean, dry glass vessel and 20% by weight of an alkyltrialkoxysilane (Protectosil® BHN from Evonik Degussa GmbH), 20% of an ethyl polysilicate (Dynasylan A from Evonik Degussa GmbH), 1.5% by weight of a catalyst (Tyzor TnBT from DuPont) and
20 0.5% by weight of the hydrophobic silica AEROSIL® R 202 (obtainable from Evonik Degussa GmbH) were added in succession. The mixture formed was stirred for a further 5 minutes and could then be used directly.

25 **Example 3 (Comparative example)**

At room temperature, Shellsol D 60 (obtainable from Shell Chemicals) was initially introduced into a clean, dry glass vessel and 10% by weight of an alkylsiloxane (Protectosil® 266
30 from Evonik Degussa GmbH) and 1% by weight of the hydrophobic silica AEROSIL® R 972 (obtainable from Evonik Degussa GmbH) were added in succession. The mixture formed was stirred for a further 5 minutes and could then be used directly.

35 **Example 4 (Comparative example)**

A pure alkyltrialkoxysilane (Protectosil® BHN from Evonik Degussa GmbH) was used.

Example 5 (Comparative example)

At room temperature, 0.5% by weight of the hydrophobic silica
5 AEROSIL® R 202 (obtainable from Evonik Degussa GmbH) was
suspended in ethanol in a dry, clean glass vessel.

Example 6 (Comparative Example)

10 Analogous to Example 2, but without the addition of the
hydrophobic silica AEROSIL® R 202.

Example 7 (Comparative Example)

15 At room temperature, an aqueous emulsion of an alkylsiloxane
(Protectosil® WS 600 from Evonik Degussa GmbH) was initially
introduced into a clean, dry glass vessel and 1% by weight of
the hydrophilic silica AEROSIL® 200 (obtainable from Evonik
Degussa GmbH) was added. The mixture formed was stirred for a
20 further 5 minutes and could then be used directly.

Evaluation of the examples

Table 1 below lists the results of the abovementioned examples.
25 For this purpose, the ready-to-use solutions were applied to
concrete panels and lime sandstone panels having the dimensions
15 x 7.5 x 1 cm in the amount stated in each case by immersion
of the panels. For determining the quality of the water repellent
properties, water drops were placed on top and, unless they had
30 been absorbed after a contact time of 1 minute, the so-called
contact angles were determined. (The measurement of the contact
angle was effected according to DIN EN 828.) In addition, the
drops were wiped off after a contact time of 10 minutes and the
remaining surface was assessed (spot formation: 0 = drops
35 repelled, 1 = no wetting, 2 = contact surface half wetted, 3 =
contact surface completely wetted, 4 = dark coloration of the
contact surface, drops somewhat absorbed, 5 = dark coloration
of the contact surface, drops absorbed to an extent of 50%, 6 =

dark coloration of the contact surface, drops completely absorbed).

5 The hydrophobizing properties are expressed by the reduction of the water absorption of the individual mixtures. For this purpose, concrete, lime sandstone or plaster panels measuring 15 x 7.5 cm were treated with the stated amount by immersion. After a setting time of 2 weeks, the treated concrete and lime sandstone panels were stored completely under water for 24 hours.
10 The weight increase was then determined. The reduction of the water absorption is obtained by comparison with an untreated cube.

Plaster test specimens (water/plaster value = 0.5) were stored
15 according to DIN EN 520 under water for 2 hours and the weight increase in % was then determined. The standard envisages a weight increase of < 5% for the highest class.

Table 1

20 Results of Examples 1 to 7.

Mixture from Example	Substrate	Amount applied [g/m ²]	Contact angle after 1 minute (static)	Spot formation after 10 minutes (Henkel test)	Reduction of the water absorption [%]
1	Concrete	153	147°	0	92.5
1	Lime sandstone	213.3	145°	*	96.2
2	Plaster	210.3	145.5°	2	0.54***
3	Concrete	158	130°	1-2	87.0
4	Concrete	160	**	4	89
4	Lime sandstone	220	**	3	90.5
5	Concrete	146	152°	*	24.2
6	Plaster	250	111°	2-3	0.7%***
7	Concrete	237	76°	4	87.4%

*: Drop comes back off the surface, test not possible

**: Complete wetting, not measurable

***: The water absorption for plaster is determined
5 analogously to EN 520 as a weight increase. Untreated plaster
shows a weight increase of > 20%.

n.d.: not determined

Conclusion

10

On plaster, the compositions according to the invention show
outstanding water repellent properties in combination with
outstanding hydrophobizing effect (expressed as reduction of the
water absorption or weight increase on storage under water).

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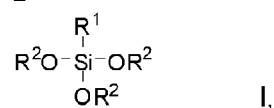
Formulations which lack one of the components according to the
invention show an increased water absorption and/or poorer water
repellent properties.

Patentkrav

1. Fluorfri sammensætning til hydrofobering af porøse mineralske substrater og til frembringelse af en afperlingseffekt på overfladen af substratet, idet sammensætningen baserer på

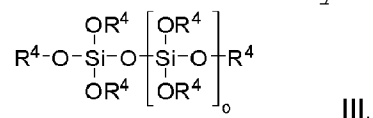
- i det mindste et hydrofoberende aktivstof og
 - i det mindste et hydrofobt metaloxid,
- idet

10 det hydrofoberende aktivstof er udvalgt fra rækken af alkylsubstituerede silaner med den almene formel I



hvor R¹ står for en C₁-C₁₈-alkyl-gruppe, grupperne R² er ens eller forskellige, og R² er et hydrogenatom eller en alkylgruppe med 1 til 6 carbonatomer, og

af rækken af alkylsilicater med den idealiserede formel III,



hvor R⁴ uafhængigt af hinanden står for et hydrogenatom eller en alkylgruppe med 1 til 6 carbonatomer, og o er et tal fra 0 til 50;

det hydrofobe metaloxid opnås, hvis man behandler metaloxidet med et hydrofoberende reagensmiddel udvalgt af alkylalkoxysilaner, alkylalkoxysiloxaner, silikoner, voks og olier; og

sammensætningen har et indhold af i det mindste en hydrolyse- eller kondensationskatalysator fra rækken af de komplekse forbindelser af grundstofferne fra den 3. og 4. hovedgruppe i grundstoffernes periodiske system (GPS) samt sidegrupperne II, III, IV, V, VI, VII og VIIIA, VIIIb og VIIIc i GPS, fra rækken af saltene af grundstofferne i den 1. og 2. hovedgruppe i GPS, fra rækken af alkoholaterne, fra rækken af aminoalkoholerne, fra rækken af carboxylsyrerne eller mineralsyrerne eller af en blanding af i det mindste to af de ovenfor nævnte hydrolyse- eller kondensationskatalysatorer.

2. Sammensætning ifølge krav 1,
kendetegnet ved,
at sammensætningen som yderligere bestanddele indeholder
- valgfrit i det mindste et organisk opløsningsmiddel,
5 - valgfrit vand,
- valgfrit i det mindste en emulgator og/eller
- valgfrit yderligere hjælpestoffer.
3. Sammensætning ifølge et af kravene 1 til 2,
10 kendetegnet ved,
at sammensætningen baserer på en blanding af hydrofoberende
aktivstoffer med de idealiserede formler I og/eller III.
4. Sammensætning ifølge et af kravene 1 til 3,
15 kendetegnet ved
et indhold af hydroforberende aktivstof på 0,5 til 99,99 vægt-%,
baseret på sammensætningen.
5. Sammensætning ifølge et af kravene 1 til 4,
20 kendetegnet ved
et indhold af hydrofobt metaloxid fra 0,01 til 10 vægt-%, baseret
på sammensætningen.
6. Sammensætning ifølge et af kravene 1 til 5,
25 kendetegnet ved
et indhold af i det mindste et organisk opløsnings- eller
fortyndingsmiddel fra rækken af de alifatiske eller aromatiske
opløsningsmidler, de alifatiske samt aromatiske carbonhydrider
med et kogepunkt over stuetemperatur, de polare aprotiske
30 opløsningsmidler, alkoholerne eller polyolerne, ketonerne eller
en blanding af i det mindste to af de ovenfor nævnte organiske
opløsnings- eller fortyndingsmidler.
7. Sammensætning ifølge et af kravene 1 til 6,
35 kendetegnet ved, at
den i det mindste ene hydrolyse- eller kondensationskatalysator
er udvalgt fra rækken af titanaterne eller zirkonaterne.

8. Sammensætning ifølge et af kravene 1 til 7, kendetegnet ved et indhold af katalysator fra 0,05 til 5 vægt-%, baseret på mængden af anvendt hydrofoberende aktivstof.

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9. Sammensætning ifølge et af kravene 1 til 8, kendetegnet ved et indhold af i det mindste en emulgator udvalgt af alkylsulfater med C₈-C₁₈-alkyl, alkyl- og alkarylethersulfater med C₈-C₁₈-alkyl i den hydrofobe gruppe og med 1 til 40 ethylenoxid (EO)- eller propylenoxid (PO)-enheder, alkylsulfonater med C₈-C₁₈-alkyl, alkarylsulfonater med C₈-C₁₈-alkyl, halvestere af sulforavsyre med monovalente alkoholer eller alkylphenoler med 5 til 15 carbonatomer, alkali- og ammoniumsalte af carboxylsyrer med 8 til 20 carbonatomer i alkyl-, aryl-, alkaryl- eller aralkylgruppen, alkyl- og alkarylphosphater med 8 til 20 carbonatomer i den organiske gruppe, alkylether- eller alkaryletherphosphater med 8 til 20 carbonatomer i alkyl- eller alkarylgruppen og 1 til 40 EO-enheder, alkylpolyglykolether og alkarylpolyglykolether med 8 til 40 EO-enheder og C₈-C₂₀-carbonatomer i alkyl- eller arylgrupperne, ethylenoxid/propylenoxid (EO/PO)-blokcopolymer med 8 til 40 EO- eller PO-enheder, additionsprodukter af alkylaminer med C₈-C₂₂-alkylgrupper med ethylenoxid eller propylenoxid, alkylpolyglykosider med lineære eller forgrenede mættede eller umættede C₈-C₂₄-alkylgrupper og oligoglykosidgrupper med 1 til 10 hexose- eller pentoseenheder, siliciumfunktionelle tensider eller en blanding af i det mindste to af de ovenfor nævnte emulgatorer.

30

10. Sammensætning ifølge krav 9, kendetegnet ved et indhold af emulgator fra 0,01 til 5 vægt-%, baseret på den samlede vægt af sammensætningen.

35

11. Sammensætning ifølge et af kravene 1 til 10, kendetegnet ved et indhold af i det mindste et hjælpestof udvalgt fra rækken af

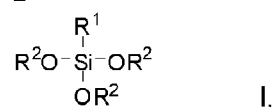
uorganiske eller organiske syrer, buffersubstanser, fungicider, baktericider, algicider, mikrobiocider, lugtstoffer, korrosionsinhibitorer, konserveringsmidler, rheologihjælpemidler.

5

12. Fremgangsmåde til fremstilling af en fluorfri sammensætning ifølge et af kravene 1 til 11, idet man kommer

- i det mindste et hydrofoberende aktivstof, idet det hydrofoberende aktivstof er udvalgt

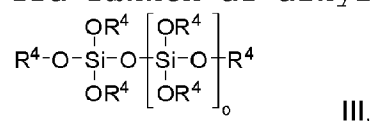
10 fra rækken af alkylsubstituerede silaner med den almene formel I



hvor R¹ står for en C₁-C₁₈-alkyl-gruppe, grupperne R² er ens eller forskellige, og R² er et hydrogenatom eller en alkylgruppe med

15 1 til 6 carbonatomer; og

fra rækken af alkylsilicaterne med den idealiserede formel III,



hvor R⁴ uafhængigt af hinanden står for et hydrogenatom eller en alkylgruppe med 1 til 6 carbonatomer, og o er et tal fra 0 til

20 50; og

- i det mindste et hydrofobt metaloxid, idet det hydrofobe metaloxid opnås, hvis man behandler metaloxidet med et hydrofoberende reagensmiddel udvalgt af alkylalkoxysilaner, alkylalkoxysiloxaner, silikoner, voks og olier;

25 i et blandeaggregat og blander

- med i det mindste en hydrolyse- eller kondensationskatalysator fra rækken af de komplekse forbindelser af grundstoffer fra den 3. og 4. hovedgruppe af grundstoffernes periodiske system (GPS) samt af sidegrupperne II, III, IV, V, VI, VII og VIIa, Vlllb og Vlllc i GPS, fra rækken af saltene af grundstofferne i den 1. og 2. hovedgruppe i GPS, fra rækken af alkoholaterne, fra rækken af aminoalkoholerne, fra rækken af carboxylsyrerne eller mineralsyrerne eller en blanding af i det mindste to af de ovenfor nævnte hydrolyse- eller kondensationskatalysatorer,

35 - valgfrit vand,

- valgfrit i det mindste et organisk opløsningsmiddel,

- valgfrit i det mindste en emulgator og
 - valgfrit i det mindste et yderligere hjælpestof
- diskontinuerlig eller kontinuert.

- 5 13. Anvendelse af en sammensætning ifølge et af kravene 1 til
11 eller en ifølge fremgangsmåden ifølge krav 12 fremstillet
sammensætning til hydrofobering af porøse mineralske substrater
og til frembringelse af en afperlingseffekt på den behandlede
substratoverflade, idet en eller flere vanddråber, som over en
10 periode på 1 minut forbliver på den behandlede substratoverflade,
ikke efterlader fugtpletter.