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5 Triamino- and fluoroalkyl-functional organosiloxanes

The present invention relates to novel triamino- and fluoroalkyl-functional organosiloxanes. The present invention furthermore relates to their preparation, compositions comprising the corresponding organosiloxanes, and their use.

The present invention particularly relates to a composition which comprises at least one aminoalkyl- and fluoroalkyl-functional organosiloxane containing hydroxyl groups and/or alkoxy groups, water, if appropriate a content of alcohol and if appropriate a content of acid. In the present patent application, organosiloxanes which contain hydroxyl groups and/or alkoxy groups and are contained in aqueous compositions are to be understood as those compounds which, according to chemical understanding, are completely or partly hydrolyzed, that is to say can contain hydroxyl and/or alkoxy groups in the context of equilibrium being established.

It has been known for a long time to prepare fluoroalkylalkoxysilanes or corresponding polycondensates and to use them as hydrophobicizing and oleophobicizing agents (for example DE-C 834 002, US 3 013 066, GB 935 380, DE-A 31 00 555, EP 0 382 557 A1, EP 0 493 747 B1, EP 0 587 667 B1 and DE-A 195 44 763).

Fluoroalkylalkoxysilanes are usually not used in concentrated form, since they are extremely expensive products. Furthermore, fluoroalkylalkoxysilanes are not soluble in water.

To obtain sufficiently stable solutions or formulations of fluoroalkyl-functional silanes and corresponding cocondensates, organic solvents or else emulsifiers have been employed (for example DE-A 34 47 636, DE-C 36 13 384, WO 95/23830, WO 95/23804, WO 96/06895, WO 97/23432 and EP 0 846 716 A1).

A disadvantage of solvent- and emulsifier-containing formulations and of organosiloxanes with a high content of alkoxy groups is the fact that such systems are undesirable on ecological and work safety grounds. Efforts are therefore increasingly being made to provide water-based systems with the lowest possible content of volatile organic compounds (abbreviation: "VOC").

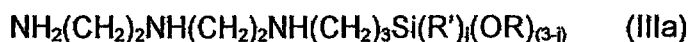
Nitrogen-containing and aminoalkyl- and fluoroalkyl-functional organosiloxanes which are substantially free from alkoxy groups are known as water-soluble constituents in otherwise emulsifier- and surfactant-free compositions for rendering surfaces water-, oil- and dirt-repellent (DE-A 15 18 551, EP 0 738 771 A1 and EP 0 846 717 A1).

A relatively high content of aminoalkyl groups must always be used in the water-based systems mentioned in order to ensure a good solubility in water. On the other hand, a high content of aminoalkyl groups is counterproductive, since these have hydrophilic properties and therefore counteract the efforts to provide a system which as far as possible has the effect of hydrophobic properties.

The invention was based on the object of providing further water-soluble aminoalkyl- and fluoroalkyl-functional organosiloxanes. A particular concern of the present invention was to provide organosiloxanes which have the highest possible number of fluoroalkyl groups in relation to the number of aminoalkyl groups.

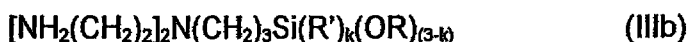
The object described is achieved according to the invention in accordance with the statement of the patent claims.

It has now been found, surprisingly, that a low-viscosity, that is to say preferably of < 100 mPas, as a rule clear to slightly opalescent composition which is also outstandingly stable to storage for several months on dilution with water and comprises at least one water-soluble, triamino- and fluoroalkyl-functional organosiloxane containing hydroxyl groups and/or alkoxy groups or a mixture of corresponding organosiloxanes, water, if appropriate a content of alcohol and if appropriate a content of acid is obtainable by i) mixing at least one aminoalkylalkoxysilane of the general formula IIIa



in which R and R' are identical or different and are a linear or branched
5 alkyl group having 1 to 4 C atoms and j is 0 or 1,

and/or of the general formula IIIb



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in which R and R' are identical or different and are a linear or branched
alkyl group having 1 to 4 C atoms and k is 0 or 1,

and/or a "bis-product" or a mixture of "bis-products" of the general formula
15 IIIc



in which R and R' are identical or different and are a linear or branched
20 alkyl group having 1 to 4 C atoms, a is an integer from 1 to 6, b is 1, 2,
3, 4, 5 or 6, c is 1, 2, 3 or 4, d is 0 or 1, e is 1, 2, 3, 4 or 5, x is 0 or 1 or
2, y is 0 or 1, z is 0 or 1 or 2, and with the proviso that $(x+y+z) \leq 4$,
where e in the case where $(x+y+z) = 0$ assumes the numerical value 5,
for $(x+y+z) = 1$ e = 4, for $(x+y+z) = 2$ e = 3, for $(x+y+z) = 3$ e = 2, and in
25 the case where $(x+y+z) = 4$ e = 1,

and ii) at least one fluoroalkylalkoxysilane of the general formula IV



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in which r is an integer from 0 to 18, s is 0 or 2 and t is 0 or 1, and R
and R'' are identical or different and are a linear or branched alkyl group
having 1 to 4 C atoms,

35 if appropriate adding alcohol, water and/or a water/alcohol mixture and if
appropriate adding a catalyst, allowing the components to react or reacting
the components, that is to say if appropriate pre-hydrolyzing them,
hydrolyzing them and subjecting them to cocondensation, removing the

alcohol completely or partly, that is to say suitably down to residual amounts of less than 5% by weight, and if appropriate adjusting the resulting product mixture to a pH of < 12 by addition of an inorganic or organic acid. The composition suitably has a pH of < 11.

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The composition according to the invention moreover has the effect of further improved liquid-repellent properties of a correspondingly treated mineral surface - using both hydrophilic and hydrophobic standard test liquids (tests according to the "Teflon® specification test kit" from DuPont).

10 Reference is made to the examples here.

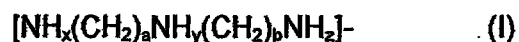
In particular, by a molar ratio of starting substances in respect of an N-[N'-(2-aminoethyl)-2-aminoethyl]-3-aminopropyltrialkoxysilane or an aminoalkylalkoxysilane according to formula IIIb or formula IIIc, to a
15 fluoroalkylalkoxysilane according to formula IV of 1 : ≤ 3.5 preferably 1 : 3 to 1 : 0.5, particularly preferably 1 : 3 to 1 : 1, especially preferably 1 : 3 to 1 : 2, a particularly high fluoroalkyl group content can be achieved in the water-soluble cocondensates according to the invention.

20 The composition according to the invention can suitably be diluted with water in all proportions. In the case of completely hydrolyzed systems, as a rule no additional hydrolysis alcohol is formed here. In general, compositions according to the invention and dilute systems are outstandingly stable to storage for more than 6 months.

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The invention thus relates to a composition which comprises at least one organosiloxane containing hydroxyl groups and/or alkoxy groups and water, wherein the organosiloxane carries at least one triamino group of the formula I

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in which the triamino group is bonded to at least one silicon atom via at least one further N-bonded alkylene group having 1 to 4 C atoms, a and
35 b are identical or different and are an integer from 1 to 6, x is 0 or 1 or 2, y is 0 or 1, z is 0 or 1 or 2, and with the proviso that $(x+y+z) \leq 4$,

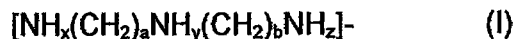
and at least one Si-C-bonded fluoroalkyl group of the formula II



in which r is an integer from 0 to 18 and s is 0 or 2.

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The invention also relates to organosiloxanes which contain at least one triamino group of the formula I

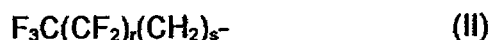


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in which the triamino group is bonded to at least one silicon atom via at least one further N-bonded alkylene group having 1 to 4 C atoms, a and b are identical or different and are an integer from 1 to 6, x is 0 or 1 or 2, y is 0 or 1, z is 0 or 1 or 2, and with the proviso that $(x+y+z) \leq 4$,

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and at least one Si-C-bonded fluoroalkyl group of the formula II



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in which r is an integer from 0 to 18 and s is 0 or 2.

Organosiloxanes according to the invention are in general based on so-called [M], [D] and [T] structural units such as are familiar to the expert, it also being possible for the oligomeric and polymeric organosiloxane units to form aggregates.

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Such organosiloxanes usually carry hydroxyl groups and/or alkoxy groups as further functionalities, in addition to the functional groups according to the invention. The presence of hydroxyl and alkoxy groups can as a rule be controlled via the amount of water added during the preparation and the completeness of the removal of alcohol. Furthermore, the organosiloxanes according to the invention can also contain, that is to say carry, alkyl groups having 1 to 16 C atoms as additional functionalities.

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In particular, organosiloxanes according to the invention can be diluted with water in an outstanding manner. Low-viscosity, slightly opalescent liquids are in general obtained in this case. However, the organosiloxanes

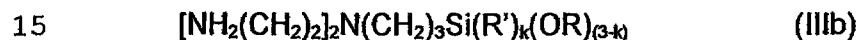
according to the invention can also be dissolved in alcohol or incorporated into water-soluble emulsions.

The invention furthermore relates to a process for the preparation of an
5 organosiloxane-containing composition, which comprises i) mixing at least one aminoalkylalkoxysilane of the general formula IIIa



10 in which R and R' are identical or different and are a linear or branched alkyl group having 1 to 4 C atoms and j is 0 or 1,

and/or of the general formula IIIb



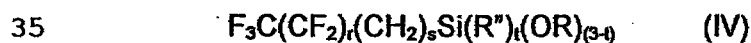
in which R and R' are identical or different and are a linear or branched alkyl group having 1 to 4 C atoms and k is 0 or 1,

20 and/or a "bis-product" or a mixture of "bis-products" of the general formula IIIc



25 in which R and R' are identical or different and are a linear or branched alkyl group having 1 to 4 C atoms, a is an integer from 1 to 6, b is 1, 2, 3, 4, 5 or 6, c is 1, 2, 3 or 4, d is 0 or 1, e is 1, 2, 3, 4 or 5, x is 0 or 1 or 2, y is 0 or 1, z is 0 or 1 or 2, and with the proviso that $(x+y+z) \leq 4$, where e in the case where $(x+y+z) = 0$ assumes the numerical value 5,
30 for $(x+y+z) = 1$ e = 4, for $(x+y+z) = 2$ e = 3, for $(x+y+z) = 3$ e = 2, and in the case where $(x+y+z) = 4$ e = 1,

and ii) at least one fluoroalkylalkoxysilane of the general formula IV



in which r is an integer from 0 to 18, s is 0 or 2 and t is 0 or 1, and R and R' are identical or different and are a linear or branched alkyl group having 1 to 4 C atoms,

- 5 adding water or a water/alcohol mixture and, if appropriate a catalyst, allowing the components to react and completely or partly removing the alcohol. The product mixture thus obtained is preferably brought to a pH of < 12 by addition of an inorganic or organic acid. The pH is preferably brought to 4 to 7 here.

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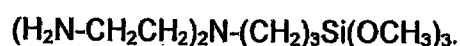
The invention moreover relates to a composition which is obtainable by the process according to the invention. The invention also relates to triamino- and fluoroalkyl-functional organosiloxanes according to the invention, in particular mixtures thereof, which are obtainable by the process according to the invention.

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N-[N'-(2-Aminoethyl)-2-aminoethyl]-3-aminopropyltrimethoxysilane (DYNASYLAN® TRIAMO) is preferably employed as component i) according to formula IIIa in the process according to the invention.

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An example which may be mentioned of a component according to formula IIIb is



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"Bis-product" in the context of the present invention here are understood as meaning those compounds such as can be seen from the general formula IIIc, thus, for example, the formula

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However, a mixture of triaminoalkyl-functional alkoxysilanes can also be employed in the process according to the invention.

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Tridecafluoro-1,1,2,2-tetrahydrooctyltrimethoxysilane or tridecafluoro-1,1,2,2-tetrahydrooctyltriethoxy-silane (DYNASYLAN® F8261) is preferably employed as the fluoroalkylalkoxysilane of the general formula IV in the

process according to the invention. However, mixtures of several fluoroalkylalkoxysilanes can also be employed.

5 The alkoxysilanes which are employed here in the process according to the invention are preferably methoxy- or ethoxysilanes. If an alcohol is added during the process, methanol or ethanol can accordingly be used.

10 A protonic acid or a mixture of protonic acids is particularly suitable as the catalyst. Thus, for example, formic acid, acetic acid and hydrogen chloride can be employed in the process according to the invention. The said acids can furthermore also be used for establishing the pH of the composition according to the invention.

15 In the process according to the invention, i) at least one triaminosilane according to the general formulae IIIa to IIIc and ii) at least one fluoroalkylsilane of the general formula IV are employed in a molar ratio of $i/ii \geq 0.29$, preferably 0.3 to 2, particularly preferably 0.33 to 0.5.

20 The concentration of the organosiloxanes in the aqueous solution according to the invention is furthermore suitably adjusted to an active compound content of < 50% by weight. An active compound content above 50% by weight can lead to gel formation or severe clouding.

25 In particular, the content of organosiloxane in the composition according to the invention is 0.005 to 40% by weight, preferably 0.01 to 20% by weight, particularly preferably 0.05 to 15% by weight, especially preferably 0.1 to 5% by weight.

30 The process according to the invention is in general carried out such that aminoalkylalkoxysilanes of the general formulae IIIa to IIIc and fluoroalkyl-alkoxysilanes of the general formula IV are mixed - alcohol is added if appropriate - and the components are hydrolyzed together and subjected to cocondensation, and the alcohol, including the hydrolysis alcohol, is removed by distillation. Mixing of the alkoxysilanes can take place in a
35 temperature range between the solidification point and boiling point of the silanes employed. As a rule, water is added in excess to the silane mixture to carry out the hydrolysis. Hydroxyl-functional organosiloxanes are as a rule obtained by this procedure. However, the hydrolysis or

cocondensation can also be carried out with a stoichiometric amount or a stoichiometrically deficient amount of water. If the amount of water added during the reaction is limited to less than 3 mol of water per mol of Si compound employed, substantially alkoxy-containing organosiloxanes
5 according to the invention can be prepared. The organosiloxanes according to the invention are usually obtained as a mixture in the reaction.

The reaction according to the invention is in general carried out at a
10 temperature in the range from 0 to 100°C. The reaction according to the invention is suitably carried out at a pH of 4 to 12. The hydrolysis preferably takes place at a temperature of < 100°C, particularly preferably at < 90°C, and especially preferably at < 60°C. A good thorough mixing, for example by stirring, is as a rule ensured here. The reaction described here
15 can furthermore be carried out in the presence of a catalyst.

As a rule, in the process according to the invention the alcohol or hydrolysis alcohol is removed by distillation, the distillation preferably being carried out at a temperature of < 90°C, particularly preferably at <
20 60°C, and suitably under reduced pressure - since this protects the product. The content of alcohol in the composition is suitably lowered here to less than 5% by weight, preferably to less than 1% by weight, particularly preferably to less than 0.5% by weight.

25 The distillation can advantageously be carried out over a distillation column and can be continued until no further alcohol can be detected at the top of the column, where the desired product is obtained in the bottom and can be further worked up, if appropriate. If suspended matter occurs, this can be removed from the product by means of filtration, sedimentation,
30 centrifugation or similar standard processes.

The composition according to the invention can be applied from a 50% strength solution or a dilute solution. Water, for example, can be used as the diluent. In principle, however, the composition according to the
35 invention can also be diluted with a corresponding alcohol.

The present invention also relates to compositions which comprise the organosiloxanes according to the invention, for example - but not

exclusively - those which are employed for hydrophobicizing and/or oleophobicizing surfaces, for "anti-graffiti" applications, for "easy-to-clean" applications - to name only a few.

- 5 Compositions according to the invention can thus be used in an outstanding manner as compositions for hydrophobicizing and/or oleophobicizing surfaces, as building protection compositions, as compositions for treatment of concrete, naturally occurring mineral substances and glazed and non-glazed ceramic products, as an additive in
10 formulations for surface treatment, for "anti-graffiti" applications and in compositions for "anti-graffiti" applications, for "easy-to-clean" applications and in compositions for "easy-to-clean" applications, as water-soluble adhesion promoters, as a constituent in coating systems and in anticorrosion compositions, for biocidal treatment of surfaces, for treatment
15 of wood, for treatment of leather, leather products and furs, for treatment of glass surfaces, for treatment of plateglass, for treatment of surfaces of plastics, for the preparation of pharmaceutical and cosmetic products, for modification of glass and mineral surfaces and glass and mineral fiber surfaces, for production of artificial stones, for wastewater treatment, for
20 surface modification and treatment of pigments and as a constituent in paints and coatings.

The present invention is illustrated in more detail by the following examples.

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Example 1

Preparation of a water-soluble condensate of DYNASYLAN® TRIAMO and DYNASYLAN® F 8261 in a molar ratio of 1 : 3

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Apparatus:

Heatable stirred reactor with a distillation device, internal thermometer and metering device

Statement of amounts:

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Starting substances

w(DYNASYLAN® TRIAMO)	= 26.5 g	0.1 mol
w(DYNASYLAN® F 8261)	= 153.0 g	0.3 mol

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w(ethanol)	= 60.0 g	
w(water)	= 10.9 g	1.5 mol/mol Si(pre-hydrolysis)
w(formic acid)	= 16.3 g	0.3 mol
		(Biesterfeld, 85%)
w(water)	= 860.0 g	

Final weights

w(distillate)	= 113.0 g
w(product)	= 1020.0 g

Procedure:

26.5 g of TRIAMO, 153.0 g of F 8261 and 60 g of ethanol are initially introduced into the reaction vessel and are stirred under reflux (about 80°C) for 2 hours. The water for the pre-hydrolysis is then metered in at about 50°C. The reaction mixture is hydrolyzed under reflux (about 78°C) for 8 hours. Thereafter, 16.3 g of formic acid (85%) are metered in at about 50°C and 860 g of water are added. Thereafter, the product is slightly cloudy.

The hydrolysis alcohol formed and the 60 g of ethanol are distilled off in vacuo.

Pressure: 160 - 130 mbar

Internal temperature: 48 - 50°C

Analysis of the product by means of 29-Si-NMR analysis gave:

12.9 mol% of Si - monomeric silane (triamino-functional) and M structures (triamino-functional)

9.2 mol% of Si - M structures (fluoroalkyl-functional) and D structures (triamino-functional),

68.1 mol% of Si - D structures (fluoroalkyl-functional) and T structures (triamino-functional).

An average particle size D_{50} of 0.0374 μm (laser light scattering) was furthermore determined.

Example 2

The product from Example 1 is diluted with water to a concentration of the fluoropalkyltrialkoxysilane originally employed of

- a) 1%,
- b) 0.1%,
- c) 0.05%.

5

For comparison, a cocondensate described in EP 0 846 716 A2 is prepared from aminopropyltriethoxysilane and DYNASYLAN® F 8261, cf. Example 2 in EP 0 846 716 A2, and is diluted with water to the same fluorosilane content: solutions d), e), f).

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Testing on a porous mineral substrate:

Lime sandstone test specimens with an edge length of about 10 cm are immersed in the abovementioned solutions for in each case 10 seconds. After drying in air for about 1 hour, the test specimens are tested comparatively for their liquid-repellent properties with respect to water and a mineral oil (Kaydol, CAS 8012-95-1).

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The liquid-repellent properties with respect to water are excellent in all cases (a-f). However, the roll-off angle (= inclination necessary to cause a drop of water of defined size to roll off - visual test: the lower the roll-off angle the better the liquid-repellent properties) is significantly lower (that is to say better) with a), b) and c) than with the corresponding comparison solutions d), e) and f). The differences become particularly clear on regarding the oleophobic properties. A drop of a mineral oil (Kaydol) applied to the surface of the test specimen leaves behind no stain after an action time of 30 seconds in the case of a) and b), and a slight formation of a stain is observed in the case of c), which indicates the start of penetration of the oil into the porous mineral test specimen. In the case of d), a slight formation of a stain is observed with the same procedure, and in the case of e) and f) a severe formation of a stain and, respectively, almost complete absorption of the oil drop is observed.

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Result: The formulations according to the invention produce better hydrophobic and oleophobic properties on porous, mineral substrates than comparable products according to the prior art.

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Testing on glass:

Microscope slides of glass (about 76 x 26 mm, cleaned ready to use, Menzel-Gläser, Article No. 01 1101) are in each case immersed for 1 minute in solution a) or d). After drying, the static contact angle with respect to water is determined in accordance with DIN EN 828.

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The glass plate treated with solution a) shows a contact angle of 104°, and the glass plate treated with solution d) shows a contact angle of only 87°. Non-treated glass plates show a contact angle of < 30°.

- 10 The product from Example 1 according to the invention accordingly also has better liquid-repellent properties on smooth surfaces (glass) compared with a comparable product according to the prior art.

Example 3

- 15 Preparation of a water-soluble condensate of DYNASYLAN® TRIAMO, DYNASYLAN® F 8261 and hexadecyltrimethoxysilane (DYNASYLAN® 9116) in a molar ratio of 1 : 2 : 1

Apparatus:

- 20 Heatable stirred reactor with a distillation device, internal thermometer, metering device

Statement of amounts:

25 **Starting substances**

w(DYNASYLAN® TRIAMO)	= 5.3 g	0.02 mol
w(DYNASYLAN® F 8261)	= 20.4 g	0.04 mol
w(DYNASYLAN® 9116)	= 3.5 g	0.02 mol
w(ethanol)	= 12.0 g	
30 w(water)	= 2,16 g	
w(formic acid)	= 3.2 g	(Biesterfeld, 85%)
w(water)	= 170.0 g	

Final weights

35 w(distillate)	= 97.9 g
w(product)	= 118.5 g

Procedure:

TRIAMO, F 8261 and ethanol are initially introduced into the reaction vessel and are stirred under reflux (about 80°C) for 2 hours. The water for the pre-hydrolysis is then metered in at about 50°C. The reaction mixture is hydrolyzed under reflux (about 78°C) for about 8 hours. Thereafter, the
5 formic acid (85%) is metered in at about 50°C and the remaining water is added. Thereafter, the product is slightly cloudy.

The hydrolysis alcohol formed and the ethanol additionally added are distilled off in vacuo.

10 Pressure: 160 - 130 mbar
Internal temperature: 48 - 50°C

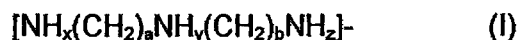
The resulting product is slightly cloudy and miscible with water in all proportions.

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93.33 g of water are added to 6.67 g of the product and the mixture is applied to a lime sandstone surface. After drying, excellent liquid-repellent properties with respect to water can be observed.

Patent Claims:

1. An organosiloxane
which has
5 at least one triamino group of the general formula I



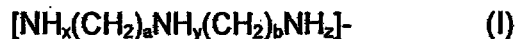
10 where this is bonded to at least one silicon atom via at least one N-bonded alkylene group having 1 to 4 C atoms, a and b are identical or different and are an integer from 1 to 6, x is 0 or 1 or 2, y is 0 or 1, z is 0 or 1 or 2, and with the proviso that $(x+y+z) \leq 4$,

15 and at least one Si-C-bonded fluoroalkyl group of the general formula II



20 in which r is an integer from 0 to 18 and s is 0 or 2.

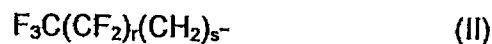
2. A composition which comprises at least one organosiloxane containing hydroxyl groups and/or alkoxy groups and water, wherein
25 the organosiloxane carries at least one triamino group of the general formula I



30 where this is bonded to at least one silicon atom via at least one N-bonded alkylene group having 1 to 4 C atoms, a and b are identical or different and are an integer from 1 to 6, x is 0 or 1 or 2, y is 0 or 1, z is 0 or 1 or 2, and with the proviso that $(x+y+z) \leq 4$,

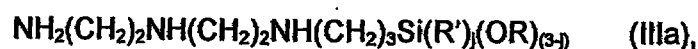
35 and at least one Si-C-bonded fluoroalkyl group of the general formula II





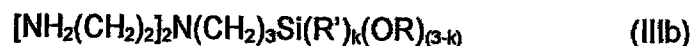
in which r is an integer from 0 to 18 and s is 0 or 2.

- 5 3. A composition as claimed in claim 2,
 wherein
 the molar ratio of the groups according to the formulae I and II in the
 organosiloxane and/or in the organosiloxane mixture is $1 : \leq 3.5$.
- 10 4. A composition as claimed in claim 2 or 3,
 wherein
 the content of organosiloxane is 0.005 to 40% by weight, based on
 the composition.
- 15 5. A composition as claimed in one of claims 2 to 4,
 which has
 a pH of less than 11.
- 20 6. A composition as claimed in one of claims 2 to 5,
 which has
 a content of alcohol of less than 5% by weight.
- 25 7. A process for the preparation of an organosiloxane-containing
 composition as claimed in one of claims 1 to 6,
 which comprises
 i) mixing at least one aminoalkylalkoxysilane of the general
 formula IIIa



in which R and R' are identical or different and are a linear or
branched alkyl group having 1 to 4 C atoms and j is 0 or 1,

and/or of the general formula IIIb



in which R and R' are identical or different and are a linear or branched alkyl group having 1 to 4 C atoms and k is 0 or 1,

5 and/or a "bis-product" or a mixture of "bis-products" of the general formula IIIc



10 in which R and R' are identical or different and are a linear or branched alkyl group having 1 to 4 C atoms, a is an integer from 1 to 6, b is 1, 2, 3, 4, 5 or 6, c is 1, 2, 3 or 4, d is 0 or 1, e is 1, 2, 3, 4 or 5, x is 0 or 1 or 2, y is 0 or 1, z is 0 or 1 or 2, and with the proviso that $(x+y+z) \leq 4$, where e in the case where $(x+y+z) = 0$ assumes the numerical value 5, for $(x+y+z) = 1$ e = 4, for $(x+y+z) = 2$ e = 3, for $(x+y+z) = 3$ e = 2, and in the case where $(x+y+z) = 4$ e = 1,

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and

20 ii) at least one fluoroalkylalkoxysilane of the general formula IV



25 in which r is an integer from 0 to 18, s is 0 or 2 and t is 0 or 1, and R and R'' are identical or different and are a linear or branched alkyl group having 1 to 4 C atoms,

adding water and/or a water/alcohol mixture, allowing the components to react and completely or partly removing the alcohol.

30 8. The process as claimed in claim 7, wherein
i) at least one triaminosilane according to the general formulae IIIa to IIIc and ii) at least one fluoroalkylsilane of the general formula IV are employed in a molar ratio of i/ii ≥ 0.29 .

35 9. The process as claimed in claim 7 or 8, wherein



in addition to components i) and ii), a C₁- to C₁₆-alkylalkoxysilane is employed.

- 5 10. The process as claimed in one of claims 7 to 9,
 wherein
 alcohol is added to the mixture of alkoxysilanes before the reaction.
- 10 11. The process as claimed in one of claims 7 to 10,
 wherein
 the reaction is carried out at a temperature of < 100°C.
- 15 12. The process as claimed in one of claims 7 to 11,
 wherein
 the reaction is carried out in the presence of a protonic acid as a
 catalyst.
- 20 13. The process as claimed in one of claims 7 to 12,
 wherein
 the reaction is carried out at a pH of 4 to 12.
- 25 14. The process as claimed in one of claims 7 to 13,
 wherein
 the alcohol is removed from the product mixture obtained by the
 reaction, down to a content of less than 5% by weight.
- 30 15. The process as claimed in one of claims 7 to 14,
 wherein
 after removal of the alcohol, the product mixture is brought to a pH
 of < 12 by addition of an inorganic or organic acid.
- 35 16. The process as claimed in one of claims 7 to 15,
 wherein
 hydrogen chloride, acetic acid or formic acid is employed as the
 catalyst and/or as the acid for establishing the pH.
17. A composition obtainable as claimed in one of claims 7 to 16.



18. A triamino- or fluoroalkyl-functional organosiloxane and mixtures thereof obtainable as claimed in one of claims 7 to 16.
19. A composition which comprises an organosiloxane as claimed in one of claims 1 to 18.
20. The use of a triamino- or fluoroalkyl-functional organosiloxane as claimed in one of claims 1 to 19 as a composition and in compositions for hydrophobicizing and/or oleophobicizing surfaces, as a building protection composition, as a composition and in compositions for treatment of concrete, naturally occurring mineral substances and glazed or non-glazed ceramic products, as an additive in formulations for surface treatment, for "anti-graffiti" applications and in compositions for "anti-graffiti" applications, for "easy-to-clean" applications and in compositions for "easy-to-clean" applications, as a water-soluble adhesion promoter, as a constituent in coating systems and in anticorrosion compositions, for biocidal treatment of surfaces, for treatment of wood, for treatment of leather, leather products and furs, for treatment of glass surfaces, for treatment of plateglass, for treatment of surfaces of plastics, for the preparation of pharmaceutical and cosmetic products, for modification of glass and mineral surfaces and glass and mineral fiber surfaces, for production of artificial stones, for wastewater treatment, for surface modification and treatment of pigments, and as a constituent in paints and coatings.

