Claims:

1. Siloxane (A) of the formula (I)

$M^1_{a1}M^2_{a2}M^3_{a3}M^4_{a4}D^1_{b1}D^2_{b2}D^3_{b3}T^1_{c1}T^4_{c4}Q_d$ Formula (I)

with

M^1 = $[R^1_3SiO_{1/2}]$;
M^2 = $[R^2R^1_2SiO_{1/2}]$;
M^3 = $[R^3R^1_2SiO_{1/2}]$;
M^4 = $[R^4R^1_2SiO_{1/2}]$;
D^1 = $[R^1_2SiO_{2/2}]$;
D^2 = $[R^1R^2SiO_{2/2}]$;
D^3 = $[R^1R^3SiO_{2/2}]$;
T^1 = $[R^1SiO_{3/2}]$;
T^4 = $[R^4SiO_{3/2}]$;
Q = $[SiO_{4/2}]$;

a1 = 0 to 32, preferably 0 to 19, especially 0 to 12;
a2 = 0 to 32, preferably 1 to 10, especially 1 to 3;
a3 = 0 to 32, preferably 1 to 10, especially 1 to 2;
a4 = 0 to 6, preferably 0 to 1, especially 0;
b1 = 1 to 1000, preferably 5 to 500, especially 10 to 400;
b2 = 0 to 10, preferably 0 to 5, especially 0;
b3 = 0 to 10, preferably 0 to 5, especially 0;
c1 = 0 to 10, preferably 0 to 5, especially 0 to 4;
c4 = 0 to 5, preferably 0 to 2, especially 0;
d = 0 to 10, preferably 0 to 5, especially 0 to 4;

R^1 = each independently identical or different hydrocarbon radicals~~, preferably~~ having 1 to 30 carbon atoms,
further preferably alkyl radicals having 1 to 30 carbon atoms or aromatic hydrocarbon radicals having 6 to 30 carbon atoms,
even further preferably alkyl radicals having 1 to 14 carbon atoms or monocyclic aromatic hydrocarbon radicals,
where the alkyl radicals are preferably linear or branched, saturated or unsaturated, even further preferably methyl, ethyl, propyl or phenyl, especially methyl;

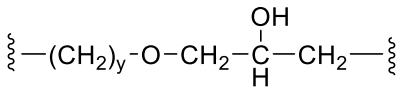
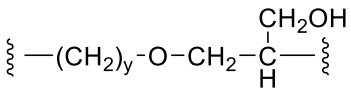
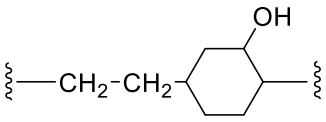
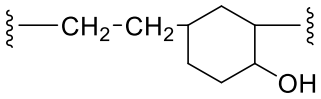
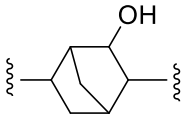
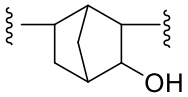
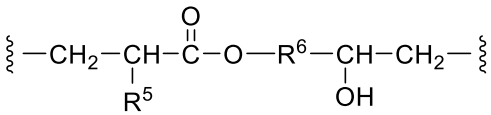
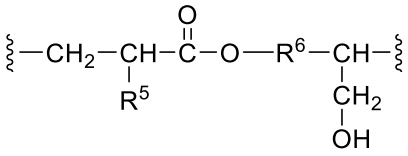
R^2 = R^{21}-R^{22};

R^{21} = each independently identical or different divalent hydrocarbon radicals having at least one hydroxyl group and optionally further oxygen atoms and ~~preferably~~ 2 to 30 carbon atoms,

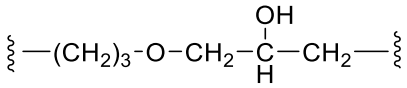
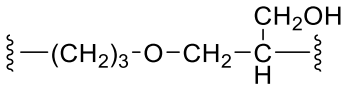
further preferably additionally containing 1 to 2 further oxygen atoms,

even further preferably containing functional groups selected from ether, carbonyl and ester groups,

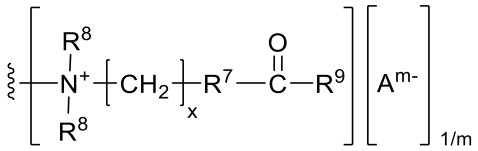
even further preferably each independently identical or different divalent radicals selected from the group consisting of









,

especially each independently identical or different divalent radicals selected from the group consisting of



;

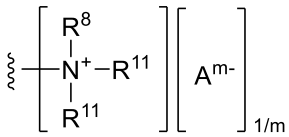
R^{22} = each independently identical or different radicals of the formula (II),


Formula (II);

R^3 = R^{31}-R^{32};

R^{31} = R^{21};

R^{32} = each independently identical or different radicals of the formula (III)


Formula (III)

R^4 = each independently identical or different alkoxy groups or acyloxy groups, ~~preferably~~ having 1 to 6 carbon atoms,

further preferably acetoxy groups and/or methoxy groups, ethoxy groups, n-propoxy groups, isopropoxy groups, n-butoxy groups, tert-butoxy groups and/or alkoxy groups derived from glycol radicals, for example propylene glycol, dipropylene glycol, tripropylene glycol, hexylene glycol, pentylene glycol, butyldiglycol, especially isopropoxy groups;

R^5 = each independently identical or different radicals selected from the group consisting of hydrogen and hydrocarbon radicals~~, preferably~~ having 1 to 6 carbon atoms, further preferably selected from the group consisting of alkyl radicals having 1 to 6 carbon atoms, where the alkyl radicals are preferably linear or branched, saturated or unsaturated, especially methyl;

R^6 = each independently identical or different divalent hydrocarbon radicals optionally containing ether groups~~, preferably~~ having 1 to 6 carbon atoms, further preferably methylene;

R^7 = each independently identical or different divalent radicals selected from the group consisting of -O- and $-NR^{10}-$, preferably $-NR^{10}-$;

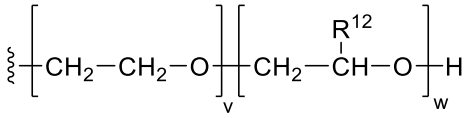
R^8 = each independently identical or different radicals selected from the group consisting of hydrocarbon radicals~~, preferably~~ having 1 to 30 carbon atoms, further preferably selected from the group consisting of linear or branched, saturated or unsaturated alkyl radicals having 1 to 12 carbon atoms, even further preferably each independently identical or different radicals selected from the group consisting of methyl, ethyl, n-propyl, isopropyl, n-butyl, isobutyl, tert-butyl, even further preferably each independently identical or different radicals selected from the group consisting of methyl, ethyl, n-propyl, isopropyl, especially methyl;

R^9 = each independently identical or different radicals selected from the group consisting of hydrogen and hydrocarbon radicals~~, preferably~~ having 1 to 30 carbon atoms, further preferably selected from the group consisting of alkyl radicals having 1 to 30 carbon atoms, even further preferably alkyl radicals having 12 to 24 carbon atoms, especially having 16 to 22 carbon atoms, where the hydrocarbon radicals or alkyl radicals are preferably linear or branched, substituted or unsubstituted, saturated or unsaturated, more preferably linear, unsubstituted and saturated;

R^{10} = each independently identical or different radicals selected from the group consisting of hydrogen, $-C(=O)R^9$ and hydrocarbon radicals~~, preferably~~ having 1 to 6 carbon atoms, further preferably alkyl radicals having 1 to 6 carbon atoms, where the hydrocarbon radicals or alkyl radicals are preferably linear or branched, substituted or unsubstituted, saturated or unsaturated, more preferably linear, unsubstituted and saturated; R^{10} is especially preferably hydrogen;

R^{11} = each independently identical or different radicals selected from the group consisting of hydrocarbon radicals having at least one hydroxyl group and ~~preferably~~ 1 to 6 carbon atoms, preferably alkyl radicals having at least one hydroxyl group and

preferably 1 to 6 carbon atoms, where the alkyl radicals are preferably linear or branched, saturated or unsaturated, and radicals of the formula (IV)



Formula (IV),

preferably 2-hydroxyethyl and/or 2-hydroxypropyl;

R^{12} = each independently identical or different radicals selected from the group consisting of hydrocarbon radicals~~, preferably~~ having 1 to 6 carbon atoms, further preferably alkyl radicals having 1 to 6 carbon atoms, where the alkyl radicals are preferably linear or branched, saturated or unsaturated, preferably methyl and ethyl, especially methyl;

A^{m-} = each independently identical or different anions selected from inorganic or organic anions of the acids H_mA, and derivatives thereof,

m = 1 to 3, preferably 1 to 2, especially 1;

v = 0 to 30, preferably 0 to 10, especially 1 to 3;

w = 0 to 30, preferably 0 to 10;

x = 2 to 18, preferably 3;

y = 2 to 18, preferably 3;

~~characterized in that~~wherein conditions (i) and (ii) are applicable:

(i) a2 + b2 ≥ 1;

(ii) a3 + b3 ≥ 1.

2. Siloxane (A) according to Claim 1, ~~characterized in that~~wherein, in addition, either condition (iii) or condition (iv) is applicable:

(iii) a1 = a4 = b2 = b3 = c1 = c4 = d = 0
and
a2 = a3 = 1;

(iv) b2 = b3 = 0
and
c1 + c4 + d ≥ 1
and
a2 + a3 + a4 ≥ 3, preferably a2 ≥ 2, a3 ≥ 1 and a4 = 0.

3. Composition, ~~characterized in that~~wherein it comprises at least one siloxane (A) according to at least one of Claims 1 and 2.

4. Composition according to Claim 3, ~~characterized in that~~wherein the composition additionally comprises at least one siloxane selected from the group consisting of siloxanes (B) and siloxanes (C), where:

siloxane (B) is a siloxane that differs from a siloxane according to Claim 1 at least ~~in that~~wherein, preferably precisely in that, conditions (v) and (vi) are applicable rather than conditions (i) to (iv):

(v) $a2 = b2 = 0$,

(vi) $a3 + b3 \geq 2$;

siloxane (C) is a siloxane that differs from a siloxane according to Claim 1 at least ~~in that~~wherein, preferably precisely ~~in that~~wherein, conditions (vii) and (viii) are applicable rather than conditions (i) and (iv):

(vii) $a3 = b3 = 0$,

(viii) $a2 + b2 \geq 2$.

5. Composition according to at least one of Claims 3 and 4, ~~characterized in that~~wherein

a. the proportion by mass of the at least one siloxane (A) based on the total mass of the siloxanes is from 20% to 70%, preferably from 25% to 60%, especially from 30% to 50%;
and/or

b. the proportion by mass of the at least one siloxane (B) based on the total mass of the siloxanes is from 0% to 15%, preferably from 1% to 10%;
and/or

c. the proportion by mass of the at least one siloxane (C) based on the total mass of the siloxanes is from 3% to 80%, preferably from 5% to 60%, especially from 10% to 50%.

6. Composition according to at least one of Claims 3 to 5, ~~characterized in that~~wherein it contains amide amines, where the proportion by mass of amide amines based on the total mass of the siloxanes is less than 1%, preferably less than 0.8%, further preferably less than 0.6%, especially less than 0.4%, or it does not contain any amide amines.

7. Process~~, preferably~~ for preparation of a siloxane (A) according to at least one of Claims 1 and 2 or of a composition according to at least one of Claims 3 to 6, ~~characterized in that~~wherein the process includes at least one process step in which at least one epoxy-functional siloxane having at least two epoxy groups is reacted both with at least one tertiary amine selected from the group consisting of amide amines and ester amines, preferably amide amines, and with at least one tertiary amine selected from the group consisting of dialkanolamines to form quaternary ammonium groups.

8. Process according to Claim 7, ~~characterized in that~~wherein the epoxy-functional siloxane is prepared by hydrosilylation of at least one olefinically unsaturated epoxide, preferably selected from the group consisting of allyl glycidyl ether, vinylcyclohexene monoxide and norbornadiene monoepoxide, especially allyl glycidyl ether, with at least one SiH-functional siloxane of the formula (V)

$M^1_{a1}M^5_{a5}D^1_{b1}D^5_{b5}T^1_{c1}T^4_{c4}Q_d$ (V)

with

M^5 = $[R^1_2SiHO_{1/2}]$,

D^5 = $[R^1SiHO_{2/2}]$,

a5 = 0 to 32, preferably 1 to 10, more preferably 2 to 3, especially 2;

b5 = 0 to 10, preferably 0 to 5, especially 0;

where

M^1, D^1, T^1, T^4, Q, a1, b1, c1, c4, d and R^1 are as defined in formula (I).

9. Process according to at least one of Claims 7 and 8, ~~characterized in that~~wherein the epoxy-functional siloxane is a siloxane of the formula (VI)

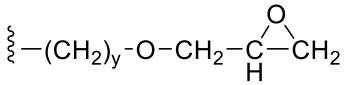
$M^1_{a1}M^6_{a5}D^1_{b1}D^6_{b5}\ T^1_{c1}T^4_{c4}Q_d$ (VI)

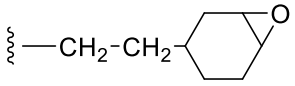
with

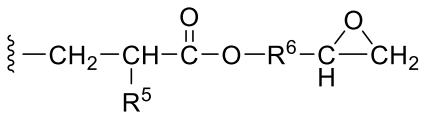
M^6 = $[R^{13}R^1_2SiO_{1/2}]$,

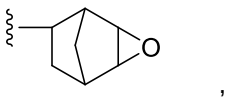
D^6 = $[R^{13}R^1SiO_{2/2}]$,

R^{13} = each independently identical or different organic epoxy radicals, preferably selected from the group consisting of



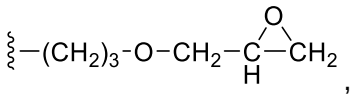






,

especially



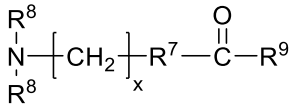
,

where

M^1, D^1, T^1, T^4, Q, a1, a5, b1, b5, c1, c4, d, R^1, R^5, R^6 and y are as defined in formula (I).

10. Process according to at least one of Claims 7 to 9, ~~characterized in that~~wherein the residual content of tertiary amines selected from the group consisting of amide amines and ester amines, preferably amide amines, after the reaction, as a proportion by mass based on the total mass of the composition, is less than 1%, preferably less than 0.8%, further preferably less than 0.6%, especially less than 0.4%.

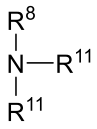
11. Process according to at least one of Claims 7 to 10, ~~characterized in that~~wherein the tertiary amine selected from the group consisting of amide amines and ester amines is a tertiary amine of the formula (VII)



Formula (VII)

where
R^8, R^7, R^9 and x are as defined in formula (II).

12. Process according to at least one of Claims 7 to 11, ~~characterized in that~~wherein the tertiary amine selected from the group consisting of dialkanolamines is a tertiary amine of the formula (VIII)



Formula (VIII)

where R^8 and R^{11} are as defined in formula (III).

~~13. Composition obtainable by a process according to at least one of Claims 7 to 12.~~

~~14.~~13. Composition, preferably an aqueous emulsion, ~~characterized in that~~wherein the composition comprises water and at least one siloxane (A) according to at least one of Claims 1 and 2 or a composition according to at least one of Claims 3 to 6 ~~and/or Claim 13 and/or a process product from a process according to at least one of Claims 7 to 12~~, preferably comprising, reported in parts by mass based on the total mass of the composition, the following components:

a) 20% to 99.5%, preferably 40% to 97%, especially 60% to 95%, water;
b) 0.5% to 80%, preferably 3% to 60%, especially 5% to 40%, of at least one siloxane comprising at least one siloxane (A) and preferably at least one siloxane (B) and/or at least one siloxane (C);
c) preferably 1% to 10% of at least one emulsifier;
d) preferably 5% to 20% of at least one glycol; and
e) preferably 0% to 1% acetic acid.

~~15.~~14. Use of a siloxane (A) according to at least one of Claims 1 and 2 and/or of a composition according to at least one of Claims 3 to 6 ~~and/or at least one of Claims 13 and 14 and/or of a process product from a process according to at least one of Claims 7 to 12~~

a) for treatment, preferably finishing and/or impregnation, of two-dimensional structures;

b) in cleaning and care formulations for the household and for industrial purposes, especially in fabric softeners;

c) in cosmetic, pharmaceutical and dermatological compositions, especially in cosmetic cleansing and care formulations, hair treatment products and hair aftertreatment products; and/or

d) for cleaning and care of hard surfaces, preferably for cleaning and care of motor vehicles, especially as additive in drying aids for carwash facilities.