Claims:

1. Two-component or multi-component fixing mortar, based on a free-radical-hardening unsaturated reactive resin, for embedding anchoring means in mortar in holes or crevices, *characterised in that* it includes silanes which may or may not have reactive groups capable of participating in the polymerisation with a synthetic resin based on free-radical-hardening unsaturated reactive resins but do in any case have Si-bonded hydrolysable groups, and, physically separate therefrom (see above), a hardener.

2. Fixing mortar according to claim 1, *characterised in that* it includes partly or solely as silanes one or more silanes that carry no or at least one amino, sec-amino, mercapto, epoxy, isocyanato, alkenyl, (meth)acryloyl and/or anhydrido group(s) and include at least one Si-bonded hydrolysable group.

3. Fixing mortar according to claim 1, *characterised in that* it includes as silanes partly or solely those of formula I

$$[R_1\text{-}X\text{-}(CH_2)_n\text{-}]_p\text{-}Si(R^B)_q(L)_t \qquad (I)$$

wherein
X denotes S or NH or O or NCO or nothing; with X being nothing (= absent) when R_1 denotes anhydrido;
R_1 denotes nothing, hydrogen, cycloalkyl, alkyl, aminoalkyl, epoxyalkyl, (meth)acryloyl, aryl, aralkyl, acyl, heterocyclyl (especially anhydrido) or a radical of formula $-[(CH_2)_{n^*}]_{p^*}\text{-}Si(R^{B^*})_{3-t^*}(L^*)_{t^*}$, wherein, in each case independently of the other radical, R^{B*} is as defined below for R^B, L* is as defined below for L and n*, p* and t* are in each case as defined below; with R_1 being hydrogen when X denotes S; with X being O when R_1 is epoxyalkyl or (meth)acryloyl; with R_1 being nothing when X denotes NCO (= isocyanato);

R^B, independently of any other, denotes an alkyl, alkenyl, arylalkyl or aryl group, preferably alkyl or alkenyl,
L denotes a hydrolysable radical, especially alkoxy,

n and, if present, n* independently of one another denote a positive integer, especially from 1 to 10;

p denotes from 0 to 3 and, if present, p* independently denotes from 1 to 3;
q denotes from 0 to 2; and
t denotes from 1 to 4 and, if present, t* independently denotes from 1 to 3,
with the proviso that p + q + t = 4 and, if present, p* + (3-t*) + t* = 4.

4. Fixing mortar according to any one of claims 1 to 3, *characterised in that* the silanes are at least partly also those exhibiting the alpha effect.

5. Fixing mortar according to any one of claims 1 to 4, *characterised in that* the silanes have partly or solely reactive groups capable of participating in the polymerisation with a synthetic resin based on free-radical-hardening unsaturated reactive resins.

6. Fixing mortar according to any one of claims 1 to 5, *characterised in that* it includes as silanes partly or solely those of formula III

$$Si(R^B)_{4-t}(L)_t \qquad (III)$$

wherein R^B denotes, independently of any other(s), an alkyl, alkenyl, arylalkyl or aryl group, preferably alkyl or alkenyl,
L denotes a hydrolysable radical, especially alkoxy,
and
t denotes from 1 to 4.

7. Fixing mortar according to any one of claims 1 to 6, *characterised in that* as Si-bonded hydrolysable groups in the silanes there are present one or more selected from halogen, ketoximate groups, amino, aminoxy, mercapto, acyloxy, aryloxy, aralkyloxy and especially alkoxy.

8. Fixing mortar according to any one of claims 1 to 7, *characterised in that* it includes water in the hardener.

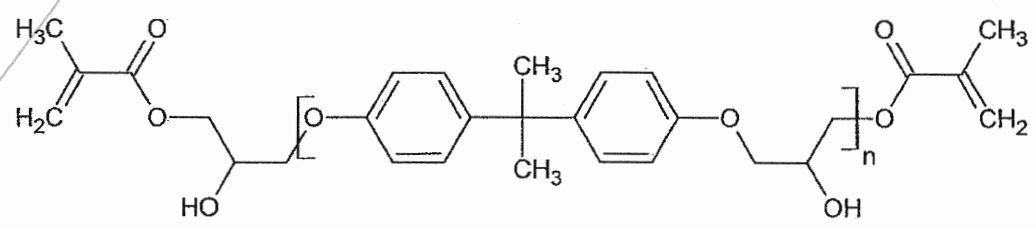
9. Fixing mortar according to any one of claims 1 to 8, *characterised in that* it includes cements (for example Portland cements or alumina cements) in the component that includes the free-radical-hardening unsaturated reactive resins and the silanes.

10. Fixing mortar according to any one of claims 1 to 9, *characterised in that* as silane there are included 3-aminopropyl-trialkoxysilane, 3-glycidyloxypropyl-trialkoxysilane, bis(3-trialkoxysilylpropyl)amine, N-(alkyl)-3-aminopropyl-trialkoxysilane, 3-mercapto-propyl-trialkoxysilane, or especially 3-(meth)acryloyl-oxypropyl-trialkoxysilane, alkenyl-trialkoxysilane or tetraalkoxysilane, or alkoxy polysilicate or mixtures of two or more thereof.

11. Fixing mortar according to any one of claims 1 to 10, *characterised in that* as silane there are included partly or only 3-(meth)acryloyloxypropyl-trimethoxysilane, 3-(meth)acryloyloxypropyl-triethoxysilane, 3-(meth)acryloyloxymethyl-trimethoxysilane, 3-(meth)acryloyloxymethyl-triethoxysilane, vinyltrimethoxysilane, vinyltriethoxysilane, or tetraethoxysilane, tetramethoxysilane, tetrapropoxysilane, or ethyl or propyl poly-silicate, or mixtures of two or more thereof.

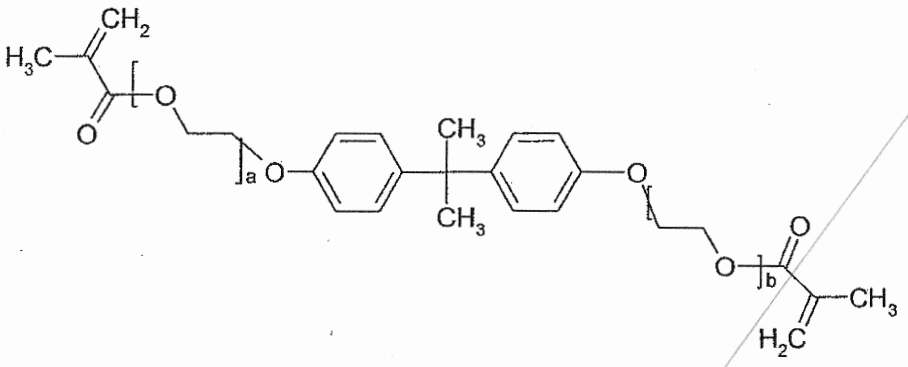
12. Fixing mortar according to any one of claims 1 to 11, *characterised in that* as free-radical-hardening unsaturated reactive resins there are included partly or solely one or more selected from acrylic acid, methacrylic acid, mono-, di-, tri- or poly-(meth)-acrylates or -methacrylates, epoxy(meth)acrylates, urethane- or urea-(meth)acrylates and unsaturated polyester resins having an unsaturated carboxylic acid component, with or without the presence of reactive diluents.

13. Fixing mortar according to any one of claims 1 to 12, *characterised in that* as free-radical-hardening unsaturated reactive resins there are included partly or solely one or more of formula



wherein n denotes a number greater than or equal to 1, but when mixtures of different molecules having different n values are present and are represented by the formula, non-integer numbers are also possible as a mean value; and/or

of formula



wherein a and b each independently of the other denote a number greater than or equal to 0, with the proviso that preferably at least one of the values is greater than 0, preferably both values being 1 or more, with non-integer numbers also being possible as a mean value when mixtures of different molecules having different a and b values are present and are represented by the formula; preferably, based on the total amount by weight of the free-radical-hardening unsaturated reactive resins, in a proportion of from 10 to 100 % by weight, wherein there may be additionally included one or more reactive diluents selected from mono-, di-, tri- or poly-(meth)acrylates, such as hydroxyalkyl (meth)acrylates, such as hydroxypropyl (meth)acrylate, acetacetoxyalkyl (meth)acrylate, (meth)acrylic acid methyl ester, 1,4-butanediol di(meth)acrylate, 1,2-ethanediol di(meth)acrylate, diethyl glycol di(meth)acrylate, trimethylolpropane tri(meth)acrylate, polyethylene glycol di(meth)acrylate; styrene, α-methyl styrene, vinyl toluene, tert-butyl styrene and divinyl benzene, or mixtures of two or more thereof, in a proportion by weight, based on the total amount by weight of the free-radical-hardening reactive resins, of from 0 to 90 % by weight.

14. Fixing mortar according to any one of claims 1 to 13, *characterised in that* it is a two-component system, especially in the form of a two-chamber cartridge without or with a static mixer or a two-chamber capsule.

15. Use of a fixing mortar according to any one of claims 1 to 14 for embedding anchoring means in mortar in holes or crevices, in which the fixing mortar and an

anchoring means are introduced into a hole or crevice and the fixing mortar is caused to cure.

16. Process or method for embedding anchoring elements in mortar in holes or crevices, in which a fixing mortar according to any one of claims 1 to 14 is used for embedding anchoring means in mortar, the fixing mortar and an anchoring means being introduced into a hole or crevice and the fixing mortar being caused to cure.

17. Use, especially according to claim 15, of a fixing mortar according to any one of claims 1 to 14 for embedding anchoring means in mortar, for example commercially available threaded rods, in the tension zone, that is to say in cracked concrete or, furthermore, concrete at risk of cracking.

Claims:

1. Two-component or multi-component fixing mortar, based on a free-radical-hardening unsaturated reactive resin, for embedding anchoring means in mortar in holes or crevices, *characterised in that* it includes silanes which may or may not have reactive groups capable of participating in the polymerisation with a synthetic resin based on free-radical-hardening unsaturated reactive resins but do in any case have Si-bonded hydrolysable groups, and, physically separate therefrom (see above), a hardener.

2. Fixing mortar according to claim 1, *characterised in that* it includes one or more silanes that carry no or at least one amino, sec-amino, mercapto, epoxy, isocyanato, alkenyl, (meth)acryloyl and/or anhydrido group(s) and include at least one Si-bonded hydrolysable group.

3. Fixing mortar according to claim 1, *characterised in that* it includes silanes those of formula I

$$[R_1\text{-}X\text{-}(CH_2)_n\text{-}]_p\text{-}Si(R^B)_q(L)_t \qquad (I)$$

wherein
X denotes S or NH or O or NCO or nothing; with X being nothing (= absent) when R_1 denotes anhydrido;
R_1 denotes nothing, hydrogen, cycloalkyl, alkyl, aminoalkyl, epoxyalkyl, (meth)acryloyl, aryl, aralkyl, acyl, heterocyclyl (especially anhydrido) or a radical of formula $-[(CH_2)_{n^*}]_{p^*}\text{-}Si(R^{B^*})_{3-t^*}(L^*)_{t^*}$, wherein, in each case independently of the other radical, R^{B*} is as defined below for R^B, L* is as defined below for L and n*, p* and t* are in each case as defined below; with R_1 being hydrogen when X denotes S; with X being O when R_1 is epoxyalkyl or (meth)acryloyl; with R_1 being nothing when X denotes NCO (= isocyanato);

R^B, independently of any other, denotes an alkyl, alkenyl, arylalkyl or aryl group, preferably alkyl or alkenyl,
L denotes a hydrolysable radical, especially alkoxy,

n and, if present, n* independently of one another denote a positive integer, especially from 1 to 10;

p denotes from 0 to 3 and, if present, p* independently denotes from 1 to 3;

q denotes from 0 to 2; and
t denotes from 1 to 4 and, if present, t* independently denotes from 1 to 3,
with the proviso that p + q + t = 4 and, if present, p* + (3-t*) + t* = 4.

4. Fixing mortar according to any one of claims 1 to 3, *characterised in that* the silanes are at least partly also those exhibiting the alpha effect.

5. Fixing mortar according to any one of claims 1 to 4, *characterised in that* the silanes have reactive groups capable of participating in the polymerisation with a synthetic resin based on free-radical-hardening unsaturated reactive resins.

6. Fixing mortar according to any one of claims 1 to 5, *characterised in that* it includes silanes those of formula III

$$Si(R^B)_{4-t}(L)_t \qquad (III)$$

wherein R^B denotes, independently of any other(s), an alkyl, alkenyl, arylalkyl or aryl group, preferably alkyl or alkenyl,
L denotes a hydrolysable radical, especially alkoxy,
and
t denotes from 1 to 4.

7. Fixing mortar according to any one of claims 1 to 6, *characterised in that* as Si-bonded hydrolysable groups in the silanes there are present one or more selected from halogen, ketoximate groups, amino, aminoxy, mercapto, acyloxy, aryloxy, aralkyloxy and especially alkoxy.

8. Fixing mortar according to any one of claims 1 to 7, *characterised in that* it includes water in the hardener.

9. Fixing mortar according to any one of claims 1 to 8, *characterised in that* it includes cements (for example Portland cements or alumina cements) in the component that includes the free-radical-hardening unsaturated reactive resins and the silanes.

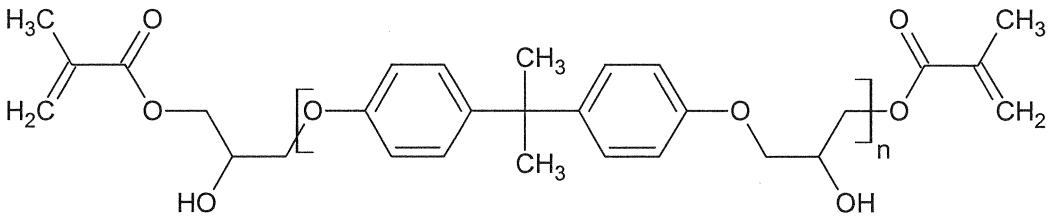
10. Fixing mortar according to any one of claims 1 to 9, *characterised in that* as silane there are included 3-aminopropyl-trialkoxysilane, 3-glycidyloxypropyl-trialkoxysilane, bis(3-trialkoxysilylpropyl)amine, N-(alkyl)-3-aminopropyl-trialkoxysilane, 3-mercaptopropyl-

trialkoxysilane, or especially 3-(meth)acryloyl-oxypropyl-trialkoxysilane, alkenyl-trialkoxysilane or tetraalkoxysilane, or alkoxy polysilicate or mixtures of two or more thereof.

11. Fixing mortar according to any one of claims 1 to 10, *characterised in that* as silane there are included 3-(meth)acryloyloxypropyl-trimethoxysilane, 3-(meth)acryloyloxypropyl-triethoxysilane, 3-(meth)acryloyloxymethyl-trimethoxysilane, 3-(meth)acryloyloxymethyl-triethoxysilane, vinyltrimethoxysilane, vinyltriethoxysilane, or tetraethoxysilane, tetramethoxysilane, tetrapropoxysilane, or ethyl or propyl polysilicate, or mixtures of two or more thereof.

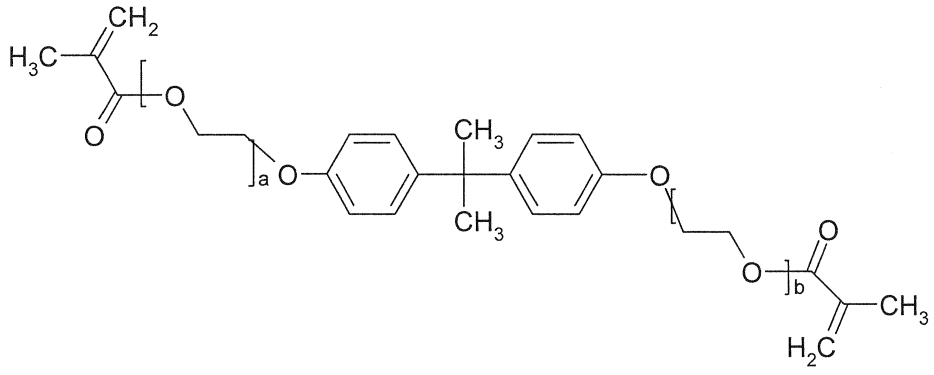
12. Fixing mortar according to any one of claims 1 to 11, *characterised in that* as free-radical-hardening unsaturated reactive resins there are included one or more selected from acrylic acid, methacrylic acid, mono-, di-, tri- or poly-(meth)acrylates or -methacrylates, epoxy(meth)acrylates, urethane- or urea-(meth)acrylates and unsaturated polyester resins having an unsaturated carboxylic acid component, with or without the presence of reactive diluents.

13. Fixing mortar according to any one of claims 1 to 12, *characterised in that* as free-radical-hardening unsaturated reactive resins there are included one or more of formula



wherein n denotes a number greater than or equal to 1, but when mixtures of different molecules having different n values are present and are represented by the formula, non-integer numbers are also possible as a mean value; and/or

of formula



wherein a and b each independently of the other denote a number greater than or equal to 0, with the proviso that preferably at least one of the values is greater than 0, preferably both values being 1 or more, with non-integer numbers also being possible as a mean value when mixtures of different molecules having different a and b values are present and are represented by the formula; preferably, based on the total amount by weight of the free-radical-hardening unsaturated reactive resins, in a proportion of from 10 to 100 % by weight, wherein there may be additionally included one or more reactive diluents selected from mono-, di-, tri- or poly-(meth)acrylates, such as hydroxyalkyl (meth)acrylates, such as hydroxypropyl (meth)acrylate, acetacetoxyalkyl (meth)acrylate, (meth)acrylic acid methyl ester, 1,4-butanediol di(meth)acrylate, 1,2-ethanediol di(meth)acrylate, diethyl glycol di(meth)acrylate, trimethylolpropane tri(meth)acrylate, polyethylene glycol di(meth)acrylate; styrene, α-methyl styrene, vinyl toluene, tert-butyl styrene and divinyl benzene, or mixtures of two or more thereof, in a proportion by weight, based on the total amount by weight of the free-radical-hardening reactive resins, of from 0 to 90 % by weight.

14. Fixing mortar according to any one of claims 1 to 13, *characterised in that* it is a two-component system, especially in the form of a two-chamber cartridge without or with a static mixer or a two-chamber capsule.

15. Use of a fixing mortar according to any one of claims 1 to 14 for embedding anchoring means in mortar in holes or crevices, in which the fixing mortar and an anchoring means are introduced into a hole or crevice and the fixing mortar is caused to cure.

16. Process or method for embedding anchoring elements in mortar in holes or crevices, in which a fixing mortar according to any one of claims 1 to 14 is used for embedding anchoring means in mortar, the fixing mortar and an anchoring means being introduced into a hole or crevice and the fixing mortar being caused to cure.

17. Use, especially according to claim 15, of a fixing mortar according to any one of claims 1 to 14 for embedding anchoring means in mortar, for example commercially available threaded rods, in the tension zone, that is to say in cracked concrete.