Claims

1. Modified reactive resin which comprises:

   a) at least one cyanate ester;

   b) at least one polyorganosiloxane which is present in the reactive resin in finely divided form.

2. Modified reactive resin according to Claim 1, characterized in that the cyanate ester is selected from the group consisting of bisphenol-based and novolak-based cyanate esters.

3. Modified reactive resin according to Claim 1 or 2, characterized in that the polyorganosiloxane particles are able to react, by means of reactive groups disposed on their surface, with the cyanate ester.

4. Modified reactive resin according to any of Claims 1 to 3, characterized in that it contains 40% - 98% by weight, preferably 50% - 98% by weight of cyanate ester.

5. Modified reactive resin according to any of Claims 1 to 4, characterized in that it contains 2% - 60% by weight, preferably 2% - 50% by weight of polyorganosiloxane.

6. Modified reactive resin according to any of Claims 1 to 5, characterized in that the polyorganosiloxane particles have an average diameter of 0.01 - 50 µm, preferably 0.05 - 20 µm, more preferably 0.1 - 5 µm.

7. Modified reactive resin according to any of Claims 1 to 6, characterized in that the

polyorganosiloxanes derive from siloxane units of the general formula

$$-(R_2SiO)- \qquad (1)$$

in which the two monovalent radicals R, which may be alike or different, are linear or branched alkyl groups having 1 to 18 C atoms, cycloaliphatic groups having 4 to 8 C atoms, linear or branched alkenyl groups having 2 to 4 C atoms, phenyl or alkylphenyl groups having 1 to 12 C atoms in the aliphatic radical, it also being possible for the hydrocarbon radicals to be substituted by halogens or by hydroxyl, carboxyl, carboxylic anhydride, amino, epoxy, alkoxy or alkenyloxy groups, and are additionally polyether or polyolefin groups and also hydrogen, the groups being joined directly or via an oxygen or a nitrogen atom to a silicon atom of the polysiloxane chain.

8. Modified reactive resin according to Claim 7, characterized in that the polyorganosiloxane is a block copolymer in which monovalent radicals R' and R" are disposed along the siloxane main chain in blocks which derive from polymer units of the general formula

$$-(R'_2SiO)_x-(R''_2SiO)_y- \qquad (2)$$

where the radicals R' and R", which have the same definition as R, are different from one another, while the radicals R' and R" may among themselves be alike or different, and x and y are both 1 or integral multiples thereof.

9. Modified reactive resin according to Claim 7 or 8, characterized in that at least 50% of the radicals R, R' and R" are methyl and/or phenyl groups.

10. Modified reactive resin according to any of Claims 1 to 9, characterized in that it further comprises at least one dispersant.

11. Modified reactive resin according to Claim 10, characterized in that the dispersant content is 2% - 20% by weight, preferably 5% - 15% by weight.

12. Modified reactive resin according to Claim 7 or 8, characterized in that the dispersant contains compounds having an amphiphilic structure, some of the groups of such amphiphilic molecules being selected so as to be compatible with the polyorganosiloxanes employed, while other groups are selected so as to be compatible with the cyanate ester.

13. Modified reactive resin according to Claim 12, characterized in that the dispersant comprises a copolymer of polyorganosiloxanes and polyethers.

14. Modified reactive resin according to Claim 13, characterized in that the dispersant comprises a copolymer of polymethylsiloxanes and polyethers.

15. Modified reactive resin according to Claim 14, characterized in that the polyether fractions of the copolymer contain ethoxy and/or propoxy units.

16. Modified reactive resin according to any of Claims 1 to 15, characterized in that it comprises crosslinkers for the polyorganosiloxane.

17. Modified reactive resin according to Claim 16, characterized in that the crosslinker comprises a polyorganohydrosiloxane, preferably a polymethylhydrosiloxane.

~~18. Process for preparing a modified reactive resin~~ according to any of Claims 1 to 17, characterized by the following steps:

a) mixing cyanate ester and polysiloxane;

b) emulsifying the polysiloxane in the cyanate ester;

c) at least partly crosslinking the finely divided polyorganosiloxane.

19. Process according to Claim 18, characterized in that additionally in step a) and/or b) a dispersant is added.

20. Process according to Claim 18 or 19, characterized in that additionally a crosslinker for the polyorganosiloxane is added.

21. Process according to Claim 20, characterized in that the polyorganosiloxane is first emulsified in the cyanate ester and then a crosslinker for the polyorganosiloxane is added.

22. Use of a modified reactive resin according to any of Claims 1 to 17 for producing thermoset polymers.

Claims

1. A modified reaction resin formed as an emulsion or dispersion with high storage stability, comprising:

a) from 40 – 98 % by weight of at least one cyanate ester with at least two cyanate groups that are cross-linkable with each other or that are polymerizable to form cyanate ester prepolymers that are cross-linkable with each other, without a release of volatile substances, wherein the modified reaction resin contains no other organic monomers or organic prepolymers except for said cyanate ester monomers or said cyanate ester prepolymers;

b) from 2 – 60 % by weight of at least one polyorganosiloxane that is a finely distributed particulate dispersed throughout the modified reaction resin;

c) from 2 - 20% by weight of at least one dispersing agent for forming the storage stable emulsion or dispersion of the at least one polyorganosiloxane or a precatalyzed polyorganosiloxane in the modified reaction resin; and

d) a cross-linker for said polyorganosiloxane, wherein said cross-linker comprises any of the group consisting of polyorganohydrogensiloxane, methyltriacetoxysilane, tetraethoxysilane and methyl-tris-(methylethylketoximino)-silane;

wherein said at least one dispersing agent has an amphiphilic structure, in which a portion of the groups of such amphiphilic molecules is selected such that it is compatible with the polyorganosiloxane that is used, while another portion of the groups is selected such that it is compatible with the cyanate ester;

wherein said at least one dispersing agent is a copolymer of at least one polymethylsiloxane and at least one polyether, and said at least one polyether includes ethoxy units and/or propoxy units; and,

wherein said copolymer of said at least one polymethylsiloxane and said at least one polyether comprises 25 % by weight of a polydimethylsiloxane, wherein said ethoxy units and said propoxy

units are present in a weight ratio of 40 to 60, and wherein said copolymer has a viscosity of 2,000 to 4,000 mPas at 25°C.

2. The modified reaction resin as recited in claim 1, wherein the cyanate ester is selected from the group consisting of bisphenol- and novolac-based cyanate esters.

3. The modified reaction resin as recited in claim 1, wherein the finely distributed polyorganosiloxane consists of polyorganosiloxane particles that may react with the cyanate ester via reactive groups located on their surface.

4. The modified reaction resin as recited in claim 1, containing 50 — 98 % by weight, of the cyanate ester.

5. The modified reaction resin as recited in claim 1, containing 2 — 50 % by weight of the polyorganosiloxane.

6. The modified reaction resin as recited in claim 1, wherein the finely distributed polyorganosiloxane consists of polyorganosiloxane particles that have a mean diameter of 0.01 - 50 µm.

7. The modified reaction resin as recited in claim 1, wherein the polyorganosiloxanes are derived from siloxane units having the general formula

$$-(R_2SiO)- \qquad (1),$$

in which the two monovalent R groups, which may be identical or different, are linear or branched alkyl groups having 1 to 18 C atoms, cycloaliphatic groups having 4 to 8 C atoms, linear or branched alkyl groups having 2 to 4 C atoms, phenyl- or alkylphenyl groups having 1 to 12 C atoms in the aliphatic group - it being possible to also substitute halogens or hydroxyl-, carboxyl-, carbonic acid anhydride, amino-, epoxy-, alkoxy- or alkenyloxy groups for the hydrocarbon groups - and polyether- or polyolefine groups and hydrogen, the groups being bonded together directly or

via an oxygen or nitrogen atom with a silicon atom of the polysiloxane chain.

8. The modified reaction resin as recited in claim 7, wherein the polyorganosiloxane is a block copolymer, in which monovalent groups R' and R" are situated along the siloxane backbone in blocks that are derived from polymer units having the general formula

$$- (R'_2SiO)_x - (R"_2SiO)_y- \qquad (2),$$

in which the groups R' and R", which have the same meaning as R, differ from one another, while the groups R' and R" may be identical or different, and x and y are equal to 1, or are whole-number multiples thereof.

9. The modified reaction resin as recited in claim 7, wherein at least 50% of the groups R, R' and R" are methyl-and/or phenyl groups.

10. A method for manufacturing a modified reaction resin formed as an emulsion or dispersion with high storage stability,

wherein said modified reaction resin comprises

a) from 40 — 98 % by weight of at least one cyanate ester with at least two cyanate groups that are cross-linkable with each other or that are polymerizable to form cyanate ester prepolymers that are cross-linkable with each other, without a release of volatile substances, wherein the modified reaction resin contains no other organic monomers or organic prepolymers except for said cyanate ester monomers or said cyanate ester prepolymers;

b) from 2 — 60 % by weight of at least one polyorganosiloxane that is a finely distributed particulate dispersed throughout the modified reaction resin;

c) from 2 - 20% by weight of at least one dispersing agent for forming a storage stable emulsion or dispersion of the at least one polyorganosiloxane or the precatalyzed polyorganosiloxane in the modified reaction resin; and

d) a cross-linker for said polyorganosiloxane, wherein said cross-linker comprises any of the group consisting of

polyorganohydrogensiloxane, methyltriacetoxysilane, tetra-ethoxysilane and methyl-tris-(methylethylketoximino)-silane;

wherein said at least one dispersing agent has an amphiphilic structure, in which a portion of the groups of such amphiphilic molecules is selected such that it is compatible with the polyorganosiloxanes that are used, while another portion of the groups is selected such that it is compatible with the cyanate ester;

wherein said at least one dispersing agent is a copolymer of at least one polymethylsiloxane and at least one polyether, and said at least one polyether includes ethoxy units and/or propoxy units; and

wherein said copolymer of said at least one polymethylsiloxane and said at least one polyether comprises 25 % by weight of a polydimethylsiloxane, wherein said ethoxy units and said propoxy units are present in a weight ratio of 40 to 60, and wherein said copolymer has a viscosity of 2,000 to 4,000 mPas at 25°C;

wherein said method comprises the steps of:

a) mixing the cyanate ester and polyorganosiloxane;

b) emulsifying the polyorganosiloxane in the cyanate ester with the at least one dispersing agent; and

c) at least partially cross-linking the finely distributed polyorganosiloxane with said cross-linker.

11. The method as recited in claim 10, wherein the at least one dispersing agent is added in step a) and/or b).

12. The method as recited in claim 10, wherein said cross-linker for the polyorganosiloxane is added in step a) and/or in step b).

13. The method as recited in claim 12, wherein the polyorganosiloxane is emulsified in the cyanate ester, and then said cross-linker for the polyorganosiloxane is added.

14. A thermosetting plastic made from a modified reaction resin, as recited in claim 1.

15. The modified reaction resin as recited in claim 1, wherein the finely distributed polyorganosiloxane consists of polyorganosiloxane particles that have a mean diameter of 0.1- 5 µm.

16. The modified reaction resin as recited in claim 1, containing 2 — 10 % by weight of the polyorganosiloxane.

17. The modified reaction resin as recited in claim 1, wherein the cross-linker is a polymethylhydrogensiloxane.

18. The modified reaction resin as recited in claim 1, wherein the at least one cyanate ester is selected from the group consisting of bisphenol A cyanate ester, hexafluoro bisphenol A cyanate ester, bisphenol E cyanate ester, tetramethyl bisphenol F cyanate ester, bisphenol M cyanate ester, bisphenol C cyanate ester and cyclopentadienyl bisphenol cyanate ester.

19. The modified reaction resin as recited in claim 1, wherein said at least one polyorganosiloxane is substantially cross-linked to form a rubber-like polyorganosiloxane,
while a cross-linking reaction of said at least one cyanate ester has not taken place in the reaction resin, or only to a small degree.