CLAIMS

1. A condensation reaction curable composition comprises:

(A) a phosphonate catalyst, and

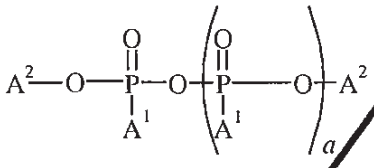
(B) a polyorganosiloxane polyoxyalkylene block copolymer having one or more polyorganosiloxane blocks and one or more polyoxyalkylene blocks linked to each other via divalent radicals which comprises at least two silicon-bonded alkoxy groups,

with the proviso that when ingredient (B) contains only two silicon-bonded alkoxy groups, then the composition further comprises a cross-linking agent.

2. The composition of claim 1, where ingredient (A) is selected from the group consisting of a monomeric phosphonate, a polymeric phosphonate, and a combination thereof.

3. The composition of claim 1 or claim 2, where ingredient (A) is selected from the group consisting of an organic phosphonate, a silyl phosphonate, or a combination thereof.

4. The composition of claim 1, where ingredient (A) has average general formula (i):



, where

each A^1 is independently a monovalent hydrocarbon group;

each A^2 is independently selected from a hydrogen atom, a monovalent organic group, a silyl group of formula $-SiA^3_3$, or a siloxane group;

each A^3 is independently a monovalent hydrocarbon group; and

subscript a has a value of 0 or greater.

5. The composition of claim 4, where each A^1 is independently an alkyl group or an alkenyl group; each A^2 is independently a hydrogen atom, a monovalent hydrocarbon group, or a silyl group; and subscript *a* has a value ranging from 0 to 50.

6. The composition of claim 4, where each A^1 is independently an alkyl group of 1 to 8 carbon atoms or an alkenyl group of 1 to 8 carbon atoms; and each A^2 is independently a hydrogen atom, an alkyl group of 1 to 4 carbon atoms, or a silyl group in which each A^3 is independently an alkyl group of 1 to 4 carbon atoms.

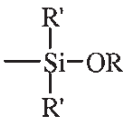
7. The composition of claim 1, where ingredient (A) comprises diethenyl-diphosphonic acid, vinylphosphonic acid, bis(trimethylsilyl) vinylphosphonate, trimethylsilyl vinylphosphonic acid, bis(dimethylvinylsilyl) vinylphosphonate, dimethylvinylsilyl vinylphosphonic acid, dimethyl methylphosphonate, bis(trimethylsilyl) octylphosphonate, trimethylsilyl octylphosphonate, and octylphosphonic acid, or a combination thereof.

8. The composition of claim 7, where ingredient (A) comprises a mixture of bis(trimethylsilyl) octylphosphonate, trimethylsilyl octylphosphonate, and octylphosphonic acid.

9. The composition of claim 1, where the polyorganosiloxane polyoxyalkylene block copolymer has formula: $PS - (A - PO)_m - (A - PS)_n$, where PO is a polyoxyalkylene block, PS represents a polyorganosiloxane block, A is a divalent radical, subscripts m and n have independently a value of at least 1, where the copolymer comprises at least one alkoxy-substituted siloxane unit of the formula $(R')_q(OR)\text{-}SiO_{3-q/2}$, wherein R represents an alkyl group having 1 to 4 carbon atoms and each R' represents an alkyl group having 1 to 6 carbon atoms, a phenyl group, or an alkoxy group of the formula –OR and q has a value of 0, 1 or 2, provided at least two silicon-bonded groups OR are present in the block copolymer.

10. The composition of claim 9, where the polyorganosiloxane polyoxyalkylene block copolymer has formula $PS - (A - PO - A - PS)_n$.

11. The composition of claim 10, where the polyorganosiloxane polyoxyalkylene block copolymer has terminal PS blocks, and the terminal PS blocks each have an alkoxy-substituted siloxane unit which is linked via oxygen to another silicon atom of the terminal PS block and which has the formula



12. The composition of claim 9, where the PS blocks are mainly polydimethylsiloxane blocks having from 4 to 40 siloxane units.

13. The composition of claim 9, where the alkoxy groups are selected from methoxy groups and ethoxy groups.

14. The composition of claim 13, where the alkoxy groups are ethoxy groups.

15. The composition of claim 14, where the alkoxy groups are methoxy groups.

16. The composition of claim 9, where the PO block has general formula $-(C_sH_{2s}O)_t-$ where each subscript s independently has a value of from 2 to 6 and each subscript t independently has a value of from 4 to 40.

17. The composition of claim 16, where A is a divalent radical, linking the PS and PO blocks together, and A is selected from a divalent alkylene group having from 2 to 10 carbon atoms and a divalent polyorganosiloxane group terminated by diorganosilylalkylene units of the general formula $-C_sH_{2s}-[Si(R^*_2)O]_tSi(R^*_2)C_sH_{2s}-$, where R* is defined as alkyl, aryl, alkaryl or aralkyl having from 1 to 18 carbon.

18. The composition of claim 1, further comprising (C) an organosilicon cross-linking agent having at least two silicon-bonded alkoxy groups reactive with the silicon bonded alkoxy groups of ingredient (B) by condensation reaction, provided that if ingredient (B) has

only two alkoxy groups per molecule, ingredient (C) is present and has on average more than two reactive silicon-bonded alkoxy groups per molecule.

19. The composition of claim 18, where ingredient (C) is a polysiloxane comprising siloxane units selected from Q units of the formula ($SiO_{4/2}$), T units of the formula $R^cSiO_{3/2}$, D units of the formula $R^b{}_2SiO_{2/2}$ and M units of the formula $R^a{}_3SiO_{1/2}$, wherein the R^a, R^b, and R^c substituents are selected from alkyl and alkoxy groups having 1 to 6 carbon atoms, at least three R^a, R^b, and/or R^c substituents being alkoxy units.

20. The composition of claim 19, where the cross-linking agent is a polydiorganosiloxane comprising D units and M units, and the alkoxy groups are bonded to the M units.

21. The composition of claim 9, where on average each of the polyorganosiloxane polyoxyalkylene block copolymers present has more than two reactive silicon bonded alkoxy groups and in which no cross-linking agent is present.

22. The composition of claim 18, which further comprises a polyorganosiloxane containing no polyoxyalkylene moieties but having the one or more reactive silicon-bonded alkoxy groups.

23. The composition of claim 1, which further comprises a filler selected from the group consisting of silica, including fumed silica, fused silica, precipitated silica, barium sulphate, calcium sulphate, calcium carbonate, silicates, including talc, feldspar and china clay, bentonite and other clays and solid silicone resins.

24. A process for forming a cured product comprising: reacting a curable composition according to any one of claims 1 to 23 in the presence of moisture.

25. A water-insoluble hydrophilic polymer network according to claim 24, where a surface of the polymer network becomes more hydrophilic on wetting with water, as shown by the contact angle of a water droplet on a surface of the polymer network decreasing with

time after application of the water droplet to the surface and reversibly becomes more hydrophobic on drying of the polymer network surface.

26. A cured product prepared by the process of claim 24, where the cured product is clear and/or colorless.

CLAIMS

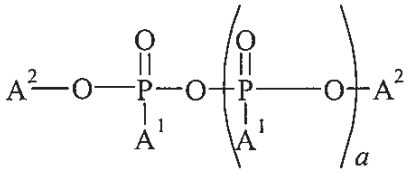
1. A condensation reaction curable composition comprises:

   (A) a phosphonate catalyst, and

   (B) a polyorganosiloxane polyoxyalkylene block copolymer having one or more polyorganosiloxane blocks and one or more polyoxyalkylene blocks linked to each other via divalent radicals which comprises at least two silicon-bonded alkoxy groups,

   with the proviso that when ingredient (B) contains only two silicon-bonded alkoxy groups, then the composition further comprises a cross-linking agent.

2. The composition of claim 1, where ingredient (A) has average general formula (i):



, where

each A^1 is independently a monovalent hydrocarbon group;

each A^2 is independently selected from a hydrogen atom, a monovalent organic group, a silyl group of formula $-SiA^3_3$, or a siloxane group;

each A^3 is independently a monovalent hydrocarbon group; and

subscript *a* has a value of 0 or greater.

3. The composition of claim 2, where each A^1 is independently an alkyl group or an alkenyl group; each A^2 is independently a hydrogen atom, a monovalent hydrocarbon group, or a silyl group; and subscript *a* has a value ranging from 0 to 50.

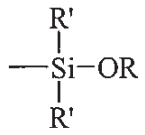
4. The composition of claim 2, where each A^1 is independently an alkyl group of 1 to 8 carbon atoms or an alkenyl group of 1 to 8 carbon atoms; and each A^2 is independently a hydrogen atom, an alkyl group of 1 to 4 carbon atoms, or a silyl group in which each A^3 is independently an alkyl group of 1 to 4 carbon atoms.

5. The composition of claim 1, where ingredient (A) comprises diethenyl-diphosphonic acid, vinylphosphonic acid, bis(trimethylsilyl) vinylphosphonate, trimethylsilyl vinylphosphonic acid, bis(dimethylvinylsilyl) vinylphosphonate, dimethylvinylsilyl vinylphosphonic acid, dimethyl methylphosphonate, bis(trimethylsilyl) octylphosphonate, trimethylsilyl octylphosphonate, and octylphosphonic acid, or a combination thereof preferably ingredient (A) comprises a mixture of

bis(trimethylsilyl) octylphosphonate, trimethylsilyl octylphosphonate, and octylphosphonic acid.

6. The composition of claim 1, where the polyorganosiloxane polyoxyalkylene block copolymer has formula: $PS - (A - PO)_m - (A - PS)_n$, where PO is a polyoxyalkylene block, PS represents a polyorganosiloxane block, A is a divalent radical, subscripts m and n have independently a value of at least 1, where the copolymer comprises at least one alkoxy-substituted siloxane unit of the formula $(R')_q(OR)\text{-}SiO_{3-q/2}$, wherein R represents an alkyl group having 1 to 4 carbon atoms and each R' represents an alkyl group having 1 to 6 carbon atoms, a phenyl group, or an alkoxy group of the formula –OR and q has a value of 0, 1 or 2, provided at least two silicon-bonded groups OR are present in the block copolymer preferably the polyorganosiloxane polyoxyalkylene block copolymer has formula $PS - (A - PO - A - PS)_n$ and/or preferably .

7. The composition of claim 6, where the polyorganosiloxane polyoxyalkylene block copolymer has terminal PS blocks, and the terminal PS blocks each have an alkoxy-substituted siloxane unit which is linked via oxygen to another silicon atom of the terminal PS block and which has the formula



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8. The composition of claim 6, where the PS blocks are mainly polydimethylsiloxane blocks having from 4 to 40 siloxane units.

9. The composition of claim 6 where the alkoxy groups are selected from methoxy groups and ethoxy groups.

10. The composition of claim 6, where the PO block has general formula $-(C_sH_{2s}O)_t-$ where each subscript s independently has a value of from 2 to 6 and each subscript t independently has a value of from 4 to 40.

11. The composition of claim 10, where A is a divalent radical, linking the PS and PO blocks together, and A is selected from a divalent alkylene group having from 2 to 10 carbon atoms and a divalent polyorganosiloxane group terminated by diorganosilylalkylene units of the general formula $-C_sH_{2s}\text{-}[Si(R^*_2)O]_tSi(R^*_2)C_sH_{2s}-$, where R* is defined as alkyl, aryl, alkaryl or aralkyl having from 1 to 18 carbon.

12. The composition of claim 1, further comprising (C) an organosilicon cross-linking agent having at least two silicon-bonded alkoxy groups reactive with the silicon bonded alkoxy groups of ingredient (B) by condensation reaction, provided that if ingredient (B) has only two alkoxy groups per molecule, ingredient (C) is present and has on average more than two reactive silicon-bonded alkoxy groups per molecule.
13. The composition of claim 12, where ingredient (C) is a polysiloxane comprising siloxane units selected from Q units of the formula $(SiO_{4/2})$, T units of the formula $R^cSiO_{3/2}$, D units of the formula $R^b{}_2SiO_{2/2}$ and M units of the formula $R^a{}_3SiO_{1/2}$, wherein the R^a, R^b, and R^c substituents are selected from alkyl and alkoxy groups having 1 to 6 carbon atoms, at least three R^a, R^b, and/or R^c substituents being alkoxy units
14. The composition of claim 13, where the cross-linking agent is a polydiorganosiloxane comprising D units and M units, and the alkoxy groups are bonded to the M units.
15. The composition of claim 6, where on average each of the polyorganosiloxane polyoxyalkylene block copolymers present has more than two reactive silicon bonded alkoxy groups and in which no cross-linking agent is present.
16. The composition of claim 12, which further comprises a polyorganosiloxane containing no polyoxyalkylene moieties but having the one or more reactive silicon-bonded alkoxy groups.
17. The composition of claim 1, which further comprises a filler selected from the group consisting of silica, including fumed silica, fused silica, precipitated silica, barium sulphate, calcium sulphate, calcium carbonate, silicates, including talc, feldspar and china clay, bentonite and other clays and solid silicone resins.
18. A process for forming a cured product comprising: reacting a curable composition according to any one of claims 1 to 17 in the presence of moisture.
19. A water-insoluble hydrophilic polymer network provided by curing the composition according to any one of claims 1 to 17, where a surface of the polymer network becomes more hydrophilic on wetting with water, as shown by the contact angle of a water droplet on a surface of the polymer network decreasing with time after application of the water droplet to the surface and reversibly becomes more hydrophobic on drying of the polymer network surface.

20. A cured product prepared by the process of claim 18, where the cured product is clear and/or colourless.