CLAIMS:

1. A method of preparing a thermoplastic composition, comprising oxidatively copolymerizing a monohydric phenol and a hydroxyaryl-terminated polysiloxane;

wherein said oxidatively polymerizing the monohydric phenol and the hydroxyaryl-terminated polysiloxane comprises a monohydric phenol addition period characterized by a first temperature, a build period following the addition period and characterized by a second temperature greater than the first temperature, and a temperature ramp period between the addition period and the build period; and

wherein the temperature ramp period comprises increasing the temperature at an average rate of 0.01 to 0.35°C per minute.

2. The method of claim 1, wherein the first temperature is 20 to 60°C, and the second temperature is 30 to 70°C.

3. The method of claim 1 or 2, wherein the oxidative copolymerization is conducted with a reaction time of 110 to 300 minutes,

wherein the reaction time comprises a build time of 30 to 240 minutes.

4. The method of any of claims 1-3, wherein the thermoplastic composition incorporates greater than 80 weight percent of the hydroxyaryl-terminated polysiloxane into the poly(arylene ether)-polysiloxane block copolymer.

5. The method of any of claims 1-4, wherein the thermoplastic composition has a weight average molecular weight of 35,000 to 150,000 atomic mass units.

6. The method of any of claims 1-5, wherein the thermoplastic composition comprises greater than 8 to 30 weight percent siloxane repeating units and 70 to less than 92 weight percent arylene ether repeating units.

7. The method of claim 1,

wherein the monohydric phenol is 2,6-dimethylphenol;

wherein the hydroxyaryl-terminated polysiloxane is a eugenol-capped polydimethylsiloxane comprising 20 to 60 dimethylsiloxane units;

wherein the oxidative copolymerization is conducted with a reaction time of 170 to 220 minutes;

wherein the temperature ramp period comprises increasing the temperature at an average rate of 0.1 to 0.3°C per minute;

wherein the hydroxyaryl-terminated polysiloxane constitutes 10 to 28 weight percent of the combined weight of the monohydric phenol and the hydroxyaryl-terminated polysiloxane;

wherein the thermoplastic composition incorporates greater than 85 weight percent of the hydroxyaryl-terminated polysiloxane into the poly(arylene ether)-polysiloxane block copolymer;

wherein the thermoplastic composition comprises 15 to 25 weight percent siloxane repeating units and 75 to 85 weight percent arylene ether repeating units; and

wherein the thermoplastic composition has a weight average molecular weight of 35,000 to 150,000 atomic mass units.

8. A thermoplastic composition prepared by the method of claim 1, wherein the thermoplastic composition comprises greater than 8 to 30 weight percent siloxane repeating units and 70 to less than 92 weight percent arylene ether repeating units, and has a weight average molecular weight of 35,000 to 150,000 atomic mass units.

9. The thermoplastic composition of claim 8,

wherein the monohydric phenol is 2,6-dimethylphenol;

wherein the hydroxyaryl-terminated polysiloxane is a eugenol-capped polydimethylsiloxane comprising 35 to 60 dimethylsiloxane units; and

wherein the thermoplastic composition comprises 15 to 25 weight percent siloxane repeating units and 75 to 85 weight percent arylene ether repeating units.

10. A thermoplastic composition, comprising:

a poly(arylene ether); and

a poly(arylene ether)-polysiloxane block copolymer comprising

a poly(arylene ether) block, and

a polysiloxane block comprising, on average, 20 to 80 siloxane repeating units;

wherein the thermoplastic composition comprises greater than 8 to 30 weight percent siloxane repeating units and 70 to less than 92 weight percent arylene ether repeating units, based on the total weight of the poly(arylene ether) and the poly(arylene ether)-polysiloxane block copolymer;

wherein the thermoplastic composition is the product of a process comprising oxidatively copolymerizing a monomer mixture comprising a monohydric phenol and a hydroxyaryl-terminated polysiloxane; and

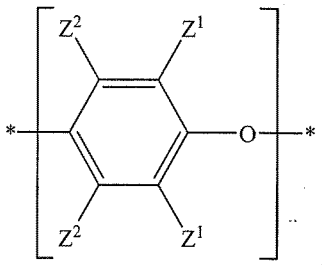
wherein the thermoplastic composition has a weight average molecular weight of 35,000 to 150,000 atomic mass units.

11. The thermoplastic composition of claim 10, wherein the thermoplastic composition comprises 15 to 25 weight percent siloxane repeating units and 75 to 85 weight percent arylene ether repeating units.

12. The thermoplastic composition of claim 10 or 11, wherein the thermoplastic composition comprises less than 20 weight percent of molecules having a molecular weight less than 10,000 atomic mass units.

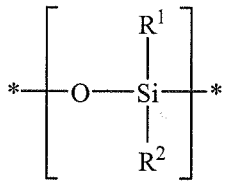
13. The thermoplastic composition of claim 10,

wherein the poly(arylene ether) block comprises arylene ether repeating units having the structure



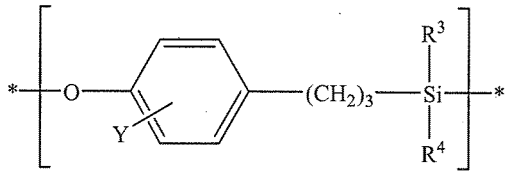
wherein for each repeating unit, each Z^1 is independently halogen, unsubstituted or substituted C_1-C_{12} hydrocarbyl provided that the hydrocarbyl group is not tertiary hydrocarbyl, C_1-C_{12} hydrocarbylthio, C_1-C_{12} hydrocarbyloxy, or C_2-C_{12} halohydrocarbyloxy wherein at least two carbon atoms separate the halogen and oxygen atoms; and each Z^2 is independently hydrogen, halogen, unsubstituted or substituted C_1-C_{12} hydrocarbyl provided that the hydrocarbyl group is not tertiary hydrocarbyl, C_1-C_{12} hydrocarbylthio, C_1-C_{12} hydrocarbyloxy, or C_2-C_{12} halohydrocarbyloxy wherein at least two carbon atoms separate the halogen and oxygen atom;

wherein the polysiloxane block comprises repeating units having the structure



wherein each occurrence of R^1 and R^2 is independently hydrogen, C_1-C_{12} hydrocarbyl or C_1-C_{12} halohydrocarbyl; and

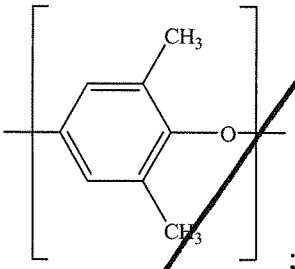
wherein the polysiloxane block further comprises a terminal unit having the structure



wherein Y is hydrogen, C_1-C_{12} hydrocarbyl, C_1-C_{12} hydrocarbyloxy, or halogen, and wherein each occurrence of R^3 and R^4 is independently hydrogen, C_1-C_{12} hydrocarbyl or C_1-C_{12} halohydrocarbyl.

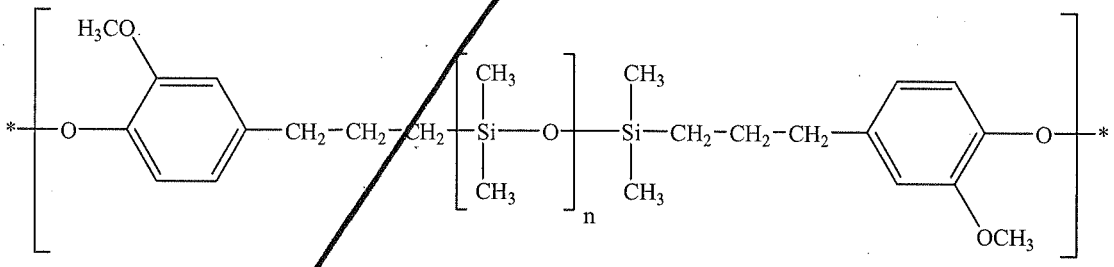
14. The thermoplastic composition of claim 10,

wherein the poly(arylene ether) block comprises arylene ether repeating units having the structure



; and

wherein the polysiloxane block has the structure



wherein n is 35 to 60; and

wherein the thermoplastic composition has a number average molecular weight of 10,000 to 30,000 atomic mass units.

15. A polymer blend, comprising:

about 5 to about 95 weight percent of a polymer selected from the group consisting of polystyrenes, polyamides, polyolefins, polyesters, and combinations thereof; and

5 to 95 weight percent of the thermoplastic composition of claim 10.

CLAIMS:

1. A method of preparing a thermoplastic composition, comprising oxidatively copolymerizing a monohydric phenol and a hydroxyaryl-terminated polysiloxane;

wherein said oxidatively polymerizing the monohydric phenol and the hydroxyaryl-terminated polysiloxane comprises a monohydric phenol addition period characterized by a first temperature, a build period following the addition period and characterized by a second temperature greater than the first temperature, and a temperature ramp period between the addition period and the build period; and

wherein the temperature ramp period comprises increasing the temperature at an average rate of about 0.01 to about 0.35°C per minute.

2. The method of claim 1, wherein the first temperature is about 20 to about 60°C, and the second temperature is about 30 to about 70°C.

3. The method of claim 1, wherein the oxidative copolymerization is conducted with a reaction time greater than or equal to 110 minutes.

4. The method of claim 1, wherein the reaction time comprises a build time of about 30 to about 240 minutes.

5. The method of claim 1, wherein the oxidative copolymerization is initiated in the presence of less than 50 weight percent of the total hydroxyaryl-terminated polysiloxane used.

6. The method of claim 1, wherein the oxidative copolymerization is initiated in the presence of less than 50 weight percent of the total monohydric phenol used.

7. The method of claim 6, wherein addition of remaining monohydric phenol occurs before the temperature ramp period and at the first temperature.

8. The method of claim 1, wherein the hydroxyaryl-terminated polysiloxane comprises, on average, about 20 to about 80 siloxane repeating units.

9. The method of claim 1, wherein the hydroxyaryl-terminated polysiloxane constitutes greater than 8 to about 30 weight percent of the combined weight of the monohydric phenol and the hydroxyaryl-terminated polysiloxane.

10. The method of claim 1, wherein the thermoplastic composition incorporates greater than 80 weight percent of the hydroxyaryl-terminated polysiloxane into the poly(arylene ether)-polysiloxane block copolymer.

11. The method of claim 1, wherein the thermoplastic composition has a weight average molecular weight of at least 30,000 atomic mass units.

12. The method of claim 1, wherein the thermoplastic composition comprises greater than 8 to about 30 weight percent siloxane repeating units and about 70 to less than 92 weight percent arylene ether repeating units.

13. The method of claim 1, wherein the thermoplastic composition comprises 15 to about 25 weight percent siloxane repeating units and about 75 to 85 weight percent arylene ether repeating units.

14. The method of claim 1, wherein the monohydric phenol is 2,6-dimethylphenol;

wherein the hydroxyaryl-terminated polysiloxane is a eugenol-capped polydimethylsiloxane comprising about 20 to about 60 dimethylsiloxane units;

wherein the oxidative copolymerization is conducted with a reaction time of 170 to 220 minutes;

wherein the temperature ramp period comprises increasing the temperature at an average rate of about 0.1 to about 0.3°C per minute;

wherein the hydroxyaryl-terminated polysiloxane constitutes about 10 to about 28 weight percent of the combined weight of the monohydric phenol and the hydroxyaryl-terminated polysiloxane;

wherein the thermoplastic composition incorporates greater than 85 weight percent of the hydroxyaryl-terminated polysiloxane into the poly(arylene ether)-polysiloxane block copolymer;

wherein the thermoplastic composition comprises 15 to about 25 weight percent siloxane repeating units and about 75 to 85 weight percent arylene ether repeating units; and

wherein the thermoplastic composition has a weight average molecular weight of 30,000 to 150,000 atomic mass units.

15. A thermoplastic composition prepared by the method of claim 1.

16. The thermoplastic composition of claim 15, wherein the thermoplastic composition comprises greater than 8 to about 30 weight percent siloxane repeating units and about 70 to less than 92 weight percent arylene ether repeating units.

17. The thermoplastic composition of claim 15, wherein the thermoplastic composition comprises 15 to about 25 weight percent siloxane repeating units and about 75 to 85 weight percent arylene ether repeating units.

18. The thermoplastic composition of claim 15, wherein the hydroxyaryl-terminated polysiloxane comprises, on average, about 35 to about 80 siloxane repeating units.

19. The thermoplastic composition of claim 15, wherein the thermoplastic composition has a weight average molecular weight of at least 30,000 atomic mass units.

20. The thermoplastic composition of claim 15,

wherein the monohydric phenol is 2,6-dimethylphenol;

wherein the hydroxyaryl-terminated polysiloxane is a eugenol-capped polydimethylsiloxane comprising 35 to 60 dimethylsiloxane units;

wherein the thermoplastic composition comprises 15 to about 25 weight percent siloxane repeating units and about 75 to 85 weight percent arylene ether repeating units; and

wherein the thermoplastic composition has a weight average molecular weight of 30,000 to 150,000 atomic mass units.

21. A thermoplastic composition, comprising:

a poly(arylene ether); and

a poly(arylene ether)-polysiloxane block copolymer comprising

a poly(arylene ether) block, and

a polysiloxane block comprising, on average, about 20 to about 80 siloxane repeating units;

wherein the thermoplastic composition comprises greater than 8 to about 30 weight percent siloxane repeating units and about 70 to less than 92 weight percent arylene ether repeating units, based on the total weight of the poly(arylene ether) and the poly(arylene ether)-polysiloxane block copolymer;

wherein the thermoplastic composition is the product of a process comprising oxidatively copolymerizing a monomer mixture comprising a monohydric phenol and a hydroxyaryl-terminated polysiloxane; and

wherein the thermoplastic composition has a weight average molecular weight of at least 30,000 atomic mass units.

22. The thermoplastic composition of claim 21, wherein the thermoplastic composition comprises 15 to about 25 weight percent siloxane repeating units and about 75 to 85 weight percent arylene ether repeating units.

23. The thermoplastic composition of claim 21, wherein the thermoplastic composition has a weight average molecular weight of about 35,000 to about 150,000 atomic mass units.

24. The thermoplastic composition of claim 21, wherein the thermoplastic composition has an intrinsic viscosity of at least 0.3 as measured at 25°C in chloroform.

25. The thermoplastic composition of claim 21, wherein the thermoplastic composition has an intrinsic viscosity of 0.3 to 0.6 deciliter per gram as measured at 25°C in chloroform.

26. The thermoplastic composition of claim 21, wherein the thermoplastic composition comprises less than 20 weight percent of molecules having a molecular weight less than 10,000 atomic mass units.

27. The thermoplastic composition of claim 21, wherein the molecules having a molecular weight less than 10,000 atomic mass units comprise, on average, about 10 to about 18 weight percent siloxane repeating units.

28. The thermoplastic composition of claim 21, wherein the thermoplastic composition comprises less than 26 weight percent of molecules having a molecular weight greater than 100,000 atomic mass units.

29. The thermoplastic composition of claim 21, wherein the molecules having a molecular weight greater than 100,000 atomic mass units comprise, on average, about 17 to about 25 weight percent siloxane repeating units.

30. The thermoplastic composition of claim 21,

wherein the thermoplastic composition comprises less than 20 weight percent of molecules having a molecular weight less than 10,000 atomic mass units; and

wherein the thermoplastic composition comprises less than 26 weight percent of molecules having a molecular weight greater than 100,000 atomic mass units.

31. The thermoplastic composition of claim 21,

wherein the molecules having a molecular weight less than 10,000 atomic mass units comprise, on average, about 10 to about 18 weight percent siloxane repeating units; and

wherein the molecules having a molecular weight greater than 100,000 atomic mass units comprise, on average, about 17 to about 25 weight percent siloxane repeating units.

32. The thermoplastic composition of claim 21, wherein the hydroxyaryl-terminated polysiloxane comprises 35 to about 60 siloxane repeating units.

33. The thermoplastic composition of claim 21, wherein the hydroxyaryl-terminated polysiloxane comprises about 40 to about 50 siloxane repeating units.

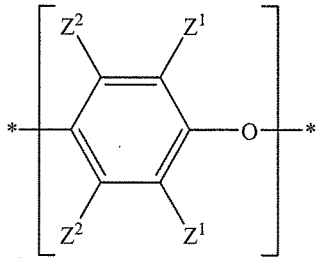
34. The thermoplastic composition of claim 21, wherein the monohydric phenol consists of 2,6-dimethylphenol, and wherein the thermoplastic composition comprises less than or equal to 0.4 weight percent of 2,6-dimethylphenoxy tail end groups.

35. The thermoplastic composition of claim 21, wherein the monohydric phenol consists of 2,6-dimethylphenol, and wherein the thermoplastic composition comprises 0.1 to 0.4 weight percent of 2,6-dimethylphenoxy tail end groups.

36. The thermoplastic composition of claim 21, wherein the monohydric phenol consists of 2,6-dimethylphenol, and wherein the thermoplastic composition comprises 0.1 to 2.0 weight percent of 2,6-dimethyl-4-(3,5-dimethyl-4-hydroxyphenyl)-phenoxy groups.

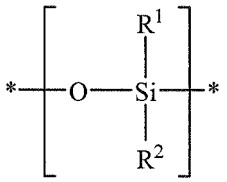
37. The thermoplastic composition of claim 21,

wherein the poly(arylene ether) block comprises arylene ether repeating units having the structure



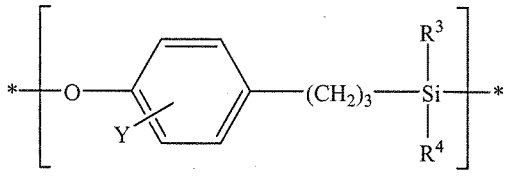
wherein for each repeating unit, each Z^1 is independently halogen, unsubstituted or substituted C_1-C_{12} hydrocarbyl provided that the hydrocarbyl group is not tertiary hydrocarbyl, C_1-C_{12} hydrocarbylthio, C_1-C_{12} hydrocarbyloxy, or C_2-C_{12} halohydrocarbyloxy wherein at least two carbon atoms separate the halogen and oxygen atoms; and each Z^2 is independently hydrogen, halogen, unsubstituted or substituted C_1-C_{12} hydrocarbyl provided that the hydrocarbyl group is not tertiary hydrocarbyl, C_1-C_{12} hydrocarbylthio, C_1-C_{12} hydrocarbyloxy, or C_2-C_{12} halohydrocarbyloxy wherein at least two carbon atoms separate the halogen and oxygen atom;

wherein the polysiloxane block comprises repeating units having the structure



wherein each occurrence of R^1 and R^2 is independently hydrogen, C_1-C_{12} hydrocarbyl or C_1-C_{12} halohydrocarbyl; and

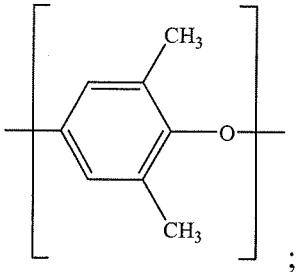
wherein the polysiloxane block further comprises a terminal unit having the structure



wherein Y is hydrogen, C_1-C_{12} hydrocarbyl, C_1-C_{12} hydrocarbyloxy, or halogen, and wherein each occurrence of R^3 and R^4 is independently hydrogen, C_1-C_{12} hydrocarbyl or C_1-C_{12} halohydrocarbyl.

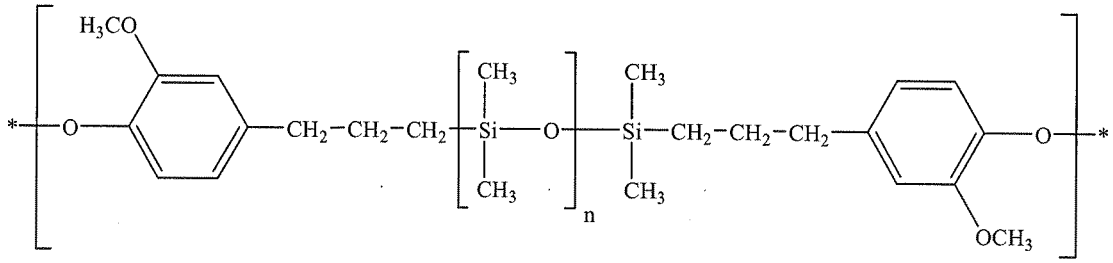
38. The thermoplastic composition of claim 21,

wherein the poly(arylene ether) block comprises arylene ether repeating units having the structure



; and

wherein the polysiloxane block has the structure



wherein n is 35 to 60; and

wherein the thermoplastic composition has a number average molecular weight of 10,000 to 30,000 atomic mass units.

39. A polymer blend, comprising:

about 5 to about 95 weight percent of a polymer selected from the group consisting of polystyrenes, polyamides, polyolefins, polyesters, and combinations thereof; and

about 5 to about 95 weight percent of a thermoplastic composition, comprising

a poly(arylene ether); and

a poly(arylene ether)-polysiloxane block copolymer comprising

a poly(arylene ether) block, and

a polysiloxane block comprising, on average, about 20 to about 80 siloxane repeating units;

wherein the thermoplastic composition comprises greater than 8 to about 30 weight percent siloxane repeating units and about 70 to less than 92 weight percent arylene ether repeating units, based on the total weight of the poly(arylene ether) and the poly(arylene ether)-polysiloxane block copolymer;

wherein the thermoplastic composition is the product of a process comprising oxidatively copolymerizing a monomer mixture comprising a monohydric phenol and a hydroxyaryl-terminated polysiloxane; and

wherein the thermoplastic composition has a weight average molecular weight of at least 30,000 atomic mass units.