CLAIMS

1. A composition comprising components a), b) and c), wherein

a) is a block copolymer component or blend of at least two block copolymers,

b) is a low T_g additive selected from the group consisting of

an oligo random copolymer b-1), made by radical polymerization using an (E)-2,2'-(diazene-1,2-diyl)bis(2-alkylpropanenitrile radical initiator and an alkyl thiol chain transfer agent,

an oligo diblock copolymer b-2), made by anionic polymerization using an alkyl lithium initiator,

an oligo diblock copolymer b-3), made by anionic polymerization using an alkyl lithium initiator,

and mixture thereof, wherein further;

b-1) is an oligo random copolymer, of two repeat units, which have structure (Ib) and structure (IIb), wherein R_{1b} and R_{3b} are independently selected from H or a C-1 to C-4 alkyl, R_{2b} is H or a C-1 to C-8 alkyl, R_{4b} is a C-1 to C-8 alkyl, and

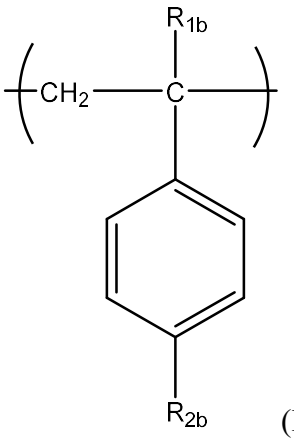
the mole % values, based on the total moles of repeat units of structures (Ib) and (IIb), are for the repeat units of structure (Ib) from 40 mole % to 80 mole % and for the repeat units of structure (IIb) from 20 mole % to 60 mole %, and

wherein the individual values of the mole % for the repeat units of structures (Ib) and (IIb) are selected from their respective ranges to add up to 100 mole % of the total moles of repeat units of structures (Ib) and (IIb); and further

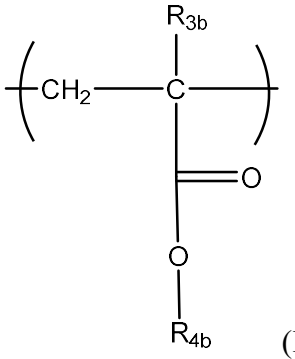
said oligo random copolymer b-1) has a T_g which is from 0°C to 80°C, and

has an M_n which is from 1000 g/mole to 5,000 g/mole, and

has a polydispersity from 1.3 to 1.8,



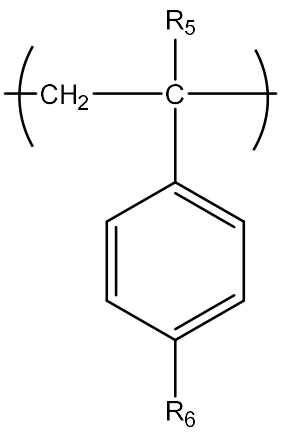
(Ib)



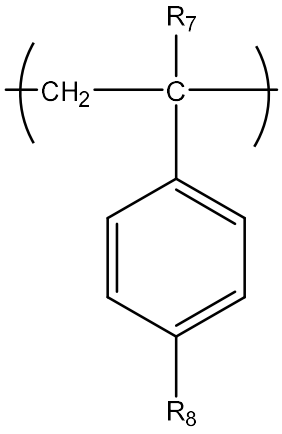
(IIb);

b-2) is an oligo diblock copolymer of block A-b) and block B-b), having an M_n from 1,000 to 35,000, and a polydispersity from 1.0 to 1.1, wherein

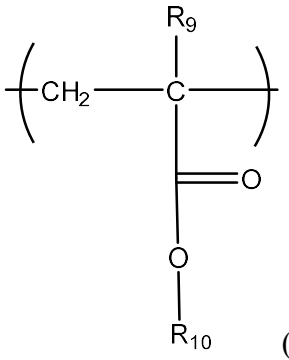
block A-b) is a random copolymer of repeat units having structures (III), and (IV), and block B-b) is a random copolymer of repeat units having structures (V), and (VI), and R_5, R_7, R_9, and R_{11}, are independently selected from H or a C-1 to C-4 alkyl, R_6 is a C-7 to C-10 linear alkyl, R_8 is H or a C-1 to C-4 alkyl, R_{10} is a C-1 to C-4 alkyl, R_{12} and R_{13} are individually selected from a C-2 to C-5 alkylene, and R_{14} is a C-1 to C-4 alkyl, and said oligo diblock copolymer b-2) has a T_g which has a value from 0°C to 95°C,



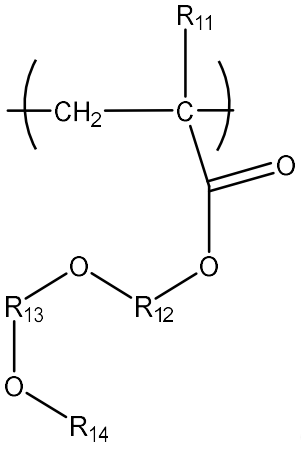
(III)



(IV);



(V)



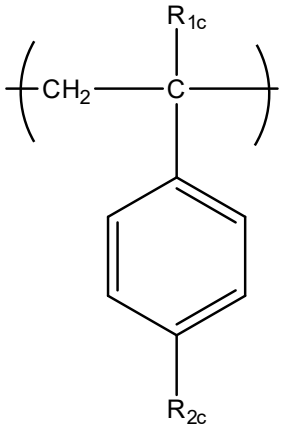
(VI); and

b-3) is an oligo diblock copolymer of block A-c), with repeat units having structure (Ic), and a block B-c), with repeat units having structure (IIc), wherein R_{1c} and R_{3c} are independently selected from H or a C-1 to C-4 alkyl, R_{2c} is H or a C-1 to C-8 alkyl, R_{4c} is a C-1 to C-8 alkyl, and

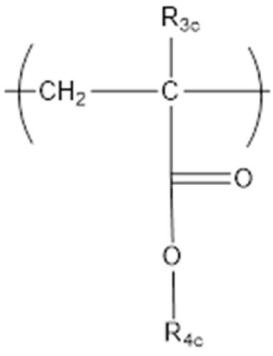
the mole % values, based on the total moles of repeat units of structures (Ic) and (IIc), are for the repeat units of structure (Ic) from 36 mole % to 74 mole % and for the repeat units of structure (IIc) from 26 mole % to 64 mole %, and the individual

values of the mole % for the repeat units of structures (Ic) and (IIc) are selected from their respective ranges to add up to 100 mole % of the total moles of repeat units of structures (Ic) and (IIc), and

said oligo diblock copolymer b-3) has an M_n from 1000 g/mole to 23,400 g/mole, a polydispersity from 1.0 to 1.1, and a T_g from 0°C to 90°C,



(Ic)



(IIc);

c) is a spin casting organic solvent.

2. The composition of claim 1, wherein said component a) is selected from either a single triblock copolymer and blends of at least two triblock copolymers, or a single diblock copolymer and blends of at least two diblock copolymers.

3. The composition of claim 1, wherein either said component a) is an ABA triblock copolymer component selected from the group consisting of ABA triblock copolymer a-1t), an ABA triblock copolymer a-2t) and a blend of ABA triblock polymer a-1t) and ABA triblock copolymer a-2t), wherein

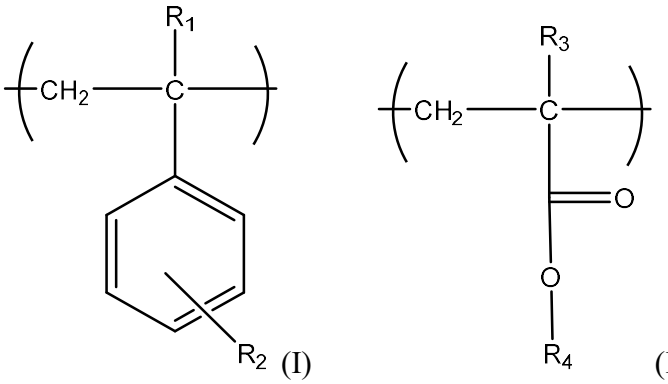
a-1t) is an ABA triblock copolymer, comprising a middle B) styrenic block segment of repeat units having styrenic structure (I), and two end acrylic block A) segments of equal length having structure (II), wherein R_1 and R_3 are independently selected from H and C-1 to C-4 alkyl, R_2 is H or a C-1 to C-8 alkyl, R_4 is a C-1 to C-8 alkyl, and

the mole % values, based on the total moles of repeat units of structures (I) and (II), are for the repeat units of structure (I) from 40 mole % to 80 mole % and for the repeat units of structure (II) from 20 mole % to 60 mole %,

wherein the individual values of the mole % for the repeat units of structures (I) and (II) are selected from their respective ranges to add up to 100 mole % of the total moles of repeat units of structures (I) and (II), and

said triblock copolymer a-1t) has a polydispersity from 1.0 to 1.1 and

has an M_n from 70,000 g/mole to 350,000 g/mole,



(I) (II);

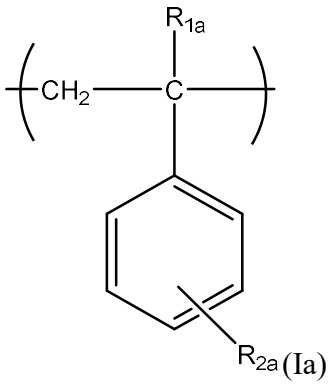
a-2t) is an ABA triblock copolymer, comprising a middle B) block segment of repeat units having styrenic structure (Ia), and two end block B) segments of equal length having acrylic structure (IIa), wherein R_{1a} and R_{3a} are independently selected from H and C-1 to C-4 alkyl, R_{2a} is H or a C-1 to C-8 alkyl, R_{4a} is a C-1 to C-8 alkyl,

the mole % values, based on the total moles of repeat units of structures (Ia) and (IIa), are for the repeat units of structure (Ia) from 40 mole % to 80 mole % and for the repeat units of structure (IIa) from 20 mole % to 60 mole %, and

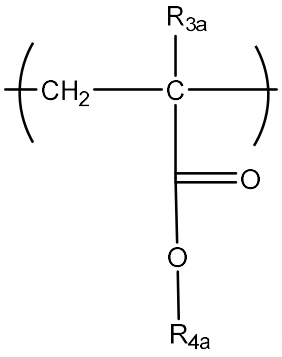
wherein the individual values of the mole % for the repeat units of structures (Ia) and (IIa) are selected from their respective ranges to add up to 100 mole % of the total moles of repeat units of structures (Ia) and (IIa), and

said triblock copolymer a-2t) has a polydispersity from 1.0 to 1.1,

has an M_n from 70,000 g/mole to 350,000 g/mol,

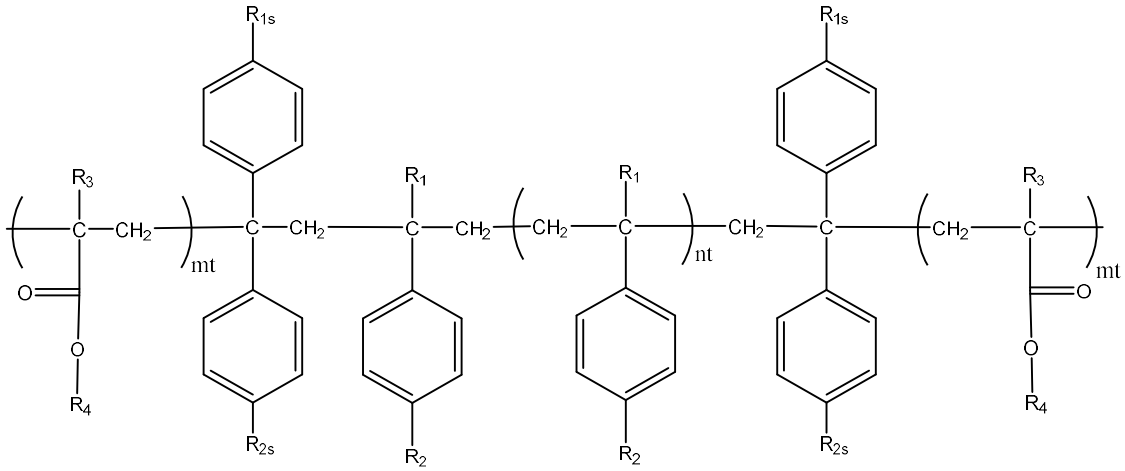


(Ia)

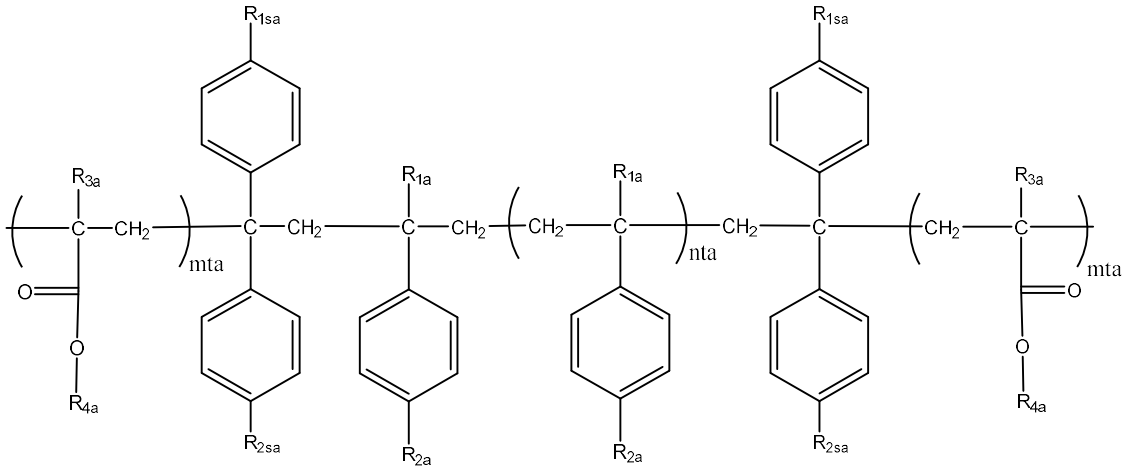


(IIa),

4. The composition of claim 1, wherein component a) is a triblock copolymer selected from a triblock copolymer of structure (ABA-1), a triblock copolymer of structure (ABA-2) and a mixture of these two block copolymers, wherein mt, mta, nt and nta are the number of repeat units, R_{1s}, R_{1sa}, R_{2s}, and R_{2sa} are independently selected from hydrogen, a C-1 to C-8 alkyl, -$N(R_{3s})_2$, -OR_{4s}, and $Si(R_{5s})_3$, wherein R_{3s}, R_{4s} and R_{5s} are independently selected from a C-1 to C-4 alkyl,



(ABA-1)



(ABA-2).

5. The composition of claim 1, wherein

a) is a diblock copolymer component selected from the group consisting of diblock copolymer a-1), diblock copolymer a-2) and a blend of a-1) and a-2), wherein

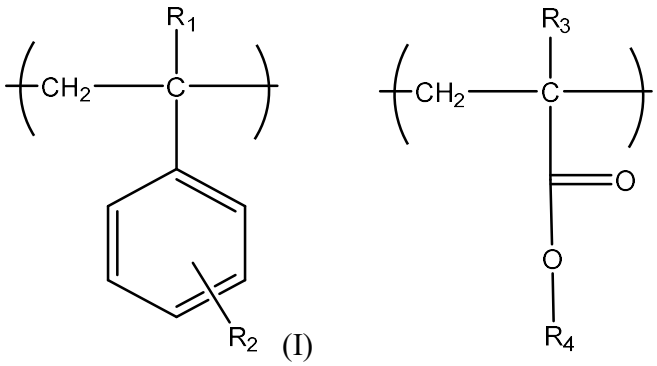
a-1) is a diblock copolymer of block A), with styrenic repeat units having styrenic structure (I), and block B), having acrylic structure (II), wherein R_1 and R_3 are independently selected from H and C-1 to C-4 alkyl, R_2 is H or a C-1 to C-8 alkyl, R_4 is a C-1 to C-8 alkyl, and

the mole % values, based on the total moles of repeat units of structures (I) and (II), are for the repeat units of structure (I) from 40 mole % to 80 mole % and for the repeat units of structure (II) from 20 mole % to 60 mole %,

wherein the individual values of the mole % for the repeat units of structures (I) and (II) are selected from their respective ranges to add up to 100 mole % of the total moles of repeat units of structures (I) and (II), and

said diblock copolymer a-1) has a polydispersity from 1.0 to 1.1

has an M_n from 50,000 g/mole to 150,000 g/mole,



(I) (II);

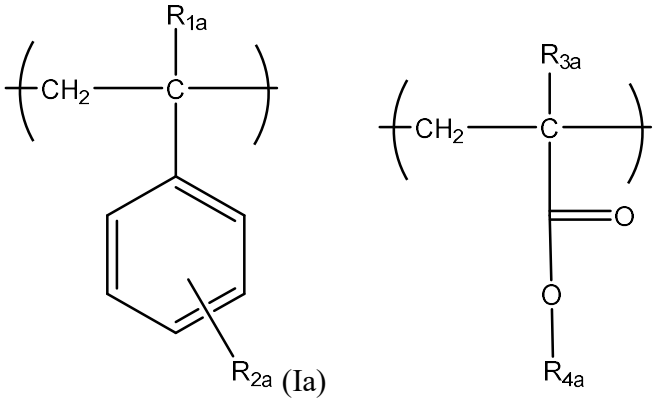
a-2) is a di-block copolymer of a block A-a), with repeat units having styrenic structure (Ia), and block B-a), with repeat units having acrylic structure (IIa), wherein R_{1a} and R_{3a} are independently selected from H or a C-1 to C-4 alkyl, R_{2a} is H or a C-1 to C-8 alkyl, C_{4a} is a C-1 to C-8 alkyl and,

the mole % values, based on the total moles of repeat units of structures (Ia) and (IIa), are for the repeat units of structure (Ia) from 40 mole % to 80 mole % and for the repeat units of structure (IIa) from 20 mole % to 60 mole %, and

wherein the individual values of the mole % for the repeat units of structures (Ia) and (IIa) are selected from their respective ranges to add up to 100 mole % of the total moles of repeat units of structures (Ia) and (IIa), and

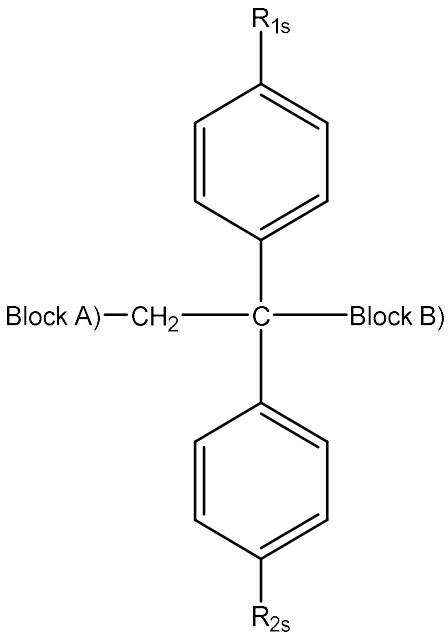
said diblock copolymer a-2) has a polydispersity from 1.0 to 1.1,

has an M_n from 30,000 g/mole to 90,000 g/mole,

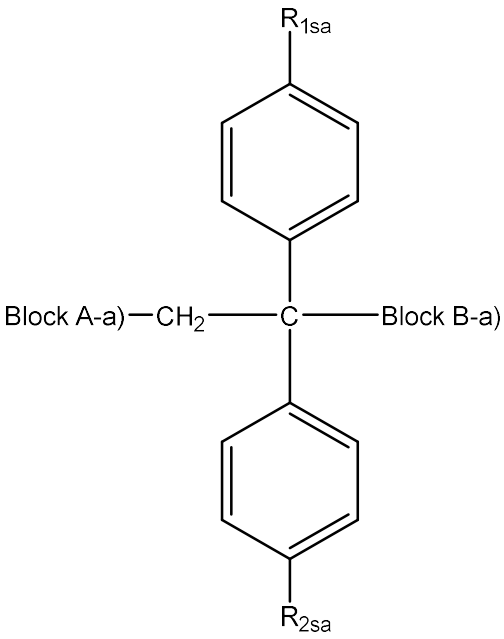


(Ia) (IIa).,

6. The composition of claim 5, wherein the diblock copolymers a-1) and a-2), respectively, have structure (I-S), and structure (I-S-a), wherein R_{1s}, R_{1sa}, R_{2s}, and R_{2sa} are independently selected from hydrogen, a C-1 to C-8 alkyl, $-N(R_{3s})_2$, $-OR_{4s}$, and $Si(R_{5s})_3$, wherein R_{3s}, R_{4s} and R_{5s} are independently selected from a C-1 to C-4 alkyl,

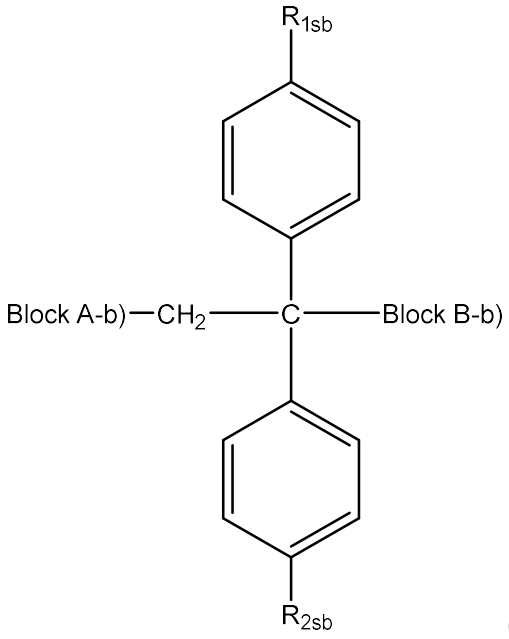


(I-S)

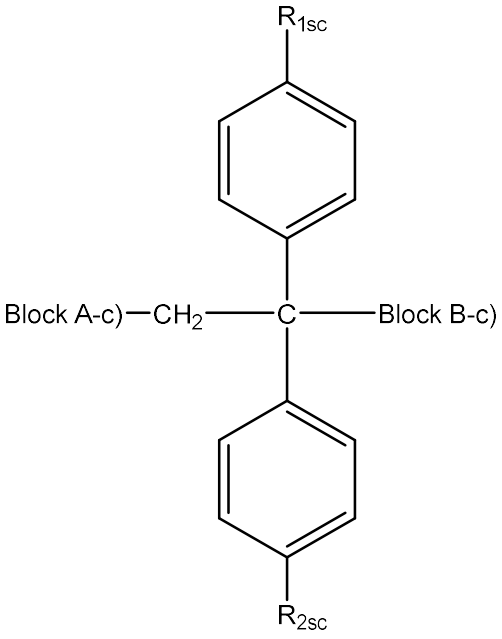


(I-S-a).

7. The composition of claim 1, wherein the oligo diblock copolymer components b-2) and b-3) have a spacer moiety, respectively between block A-b) and block B-b) or between block A-c) and block B-c) as shown, respectively, in structure (I-S-b), and structure (I-S-c) wherein R_{1sb}, R_{1sc}, R_{2sb}, and R_{2sc} are independently selected from hydrogen, a C-1 to C-8 alkyl, $-N(R_{3s})_2$, $-OR_{4s}$, $Si(R_{5s})_3$, wherein R_{3s}, R_{4s} and R_{5s} are independently selected from a C-1 to C-4 alkyl,



(I-S-b)



(I-S-c).

8. The composition of claim 5, wherein for component a) the diblock copolymer component a-1), has a polydispersity from 1.00 to 1.03.

9. The composition of claim 5, wherein for component a) the diblock copolymer component a-1), the mole % values, for the repeat units of structure (I) are from 40 mole % to 60 mole % and for the repeat units of structure (II) from 40 mole % to 60 mole %.

10. The composition of claim 5, wherein the component a) the deblock copolymer component a-1, the mole % values, for the repeat units of structure (I) are from 60 mole % to 75 mole % and for the repeat units of structure (II) from 25 mole % to 40 mole %.

11. The composition of claim 5, wherein for component a) the diblock copolymer component a-2), has a polydispersity from 1.00 to 1.03.

12. The composition of claim 5, wherein for component a) the total mole % values, for the repeat units of structures (I) and (Ia) is from 40 mole % to 60 mole % and the total mole % value, for the repeat units of structures (II) and (IIa) is from 40 mole % to 60 mole % in for either a single block copolymer a-1) or a-2) or in a blend of a-1) and a-2).

13. The composition of Claim 4, wherein for component a) the total mole % values, for the repeat units of structures (I) and (Ia) is from 60 mole % to 75 mole % and the total mole % value, for the repeat units of structures (II) and (IIa) is from 25 mole % to 40 mole % for either a single block copolymer a-1) or a-2) or in a blend of a-1) and a-2).

14. The composition of claim 5, wherein component a) is a blend of a-1 and a-2.

15. The composition of claim 5, wherein component a) is either a-1) or a-2).

16. The composition of claim 1, wherein for component b), the oligo random copolymer b-1), has a polydispersity from 1.3 to 1.5.

14. The composition of claim 5, wherein component a) is a blend of a-1) and a-2).

15. The composition of claim 5, wherein component a) is either a-1) or a-2).

16. The composition of claim 1, wherein for component b), the oligo random copolymer b-1), has a polydispersity from 1.3 to 1.5.

17. The composition of claim 1, wherein for component b), the oligo random copolymer b-1), has an M_n from 1000 g/mole to 5000 g/mole.

18. The composition of claim 1, wherein for component b), the oligo random copolymer b-1), has a T_g from 50°C to 80°C.

19. The composition of claim 1, wherein component b) is oligo random copolymer b-1).

20. The composition of claim 1, wherein for component b), the oligo diblock copolymer b-2) it is one in which R_5, R_7 and R_8 are H, R_6 is n-octyl or n-nonyl, R_9 and R_{11} are methyl, R_{10} is methyl or ethyl, R_{12} and R_{13} are independently ethylene or propylene, and R_{14} is methyl or ethyl.

21. The composition of claim 1, wherein for component b), the oligo diblock copolymer b-2) it is one in which R_6 is n-octyl, R_{10} is methyl, R_{12} and R_{13} are ethylene, and R_{14} is methyl.

22. The composition of claim 1, wherein for component b), the oligo diblock copolymer b-2) it is one wherein,
said mole % for the repeat units of structure (IV) is from 25 mole % to 50 mole %, and
said mole % for the repeat units of structure (V) is from 40 mole % to 60 mole %.

23. The composition of claim 1, wherein for component b), the oligo diblock copolymer b-2) it is one wherein,
said mole % for the repeat unit of structure (III) its mole % is from 20% to 30% of the mole % of the repeat unit of structure (IV), and

for the repeat unit of structure (VI) its mole % is from 12% to 20% of the mole % of the repeat unit of structure (V).

24. The composition of claim 1, wherein for component b), the oligo diblock copolymer b-2), has a polydispersity from 1.03 to 1.08.

25. The composition of claim 1, wherein for component b), the oligo diblock copolymer b-2), has an M_n from 15000 g/mole to 32000 g/mole.

26. The composition of claim 1, wherein for component b), the oligo diblock copolymer b-2), has a T_g from 50°C to 90°C.

27. The composition of claim 1, wherein component b) is oligo diblock copolymer b-2).

28. The composition of claim 1, wherein for component b), the oligo diblock copolymer b-3) has an M_n from 15,000 to 23,400 g/mole.

29. The composition of claim 1, wherein for component b), the oligo diblock copolymer b-3), has a polydispersity from 1.02 to 1.08.

30. The composition of claim 1, wherein component b), is the oligo diblock copolymer b-3), and it is one wherein,
said mole % for the repeat units of structure (Ic) is from 40 mole % to 70 mole %, and said mole % for the repeat units of structure (IIc) is from 40 mole % to 70 mole %.

31. The composition of claim 1, wherein for component b), the oligo diblock copolymer b-3), has a T_g from 50°C to 90°C.

32. The composition of claim 1, wherein component b) is oligo diblock copolymer b-3).

33. The composition of claim 5, wherein component a) is a diblock copolymer component selected from the group consisting of diblock copolymer a-1), diblock copolymer a-2) and a blend of a-1) and a-2), whose total mole % of styrenic repeat units of structures (I) and (Ia) is from 60 mole % to 75 mole % and whose total mole % of acrylic repeat units of structure (II) and (IIa) is from 40 mole % to 60 mole % and component b) is copolymer b-1), oligo diblock copolymer b-2) or copolymer b-3).

34. The composition of claim 5, wherein component a) is a diblock copolymer component selected from the group consisting of diblock copolymer a-1), diblock copolymer a-2) and a blend of a-1) and a-2), whose total mole % of styrenic repeat units of structure (I) and (Ia) is from 60 mole % to 75 mole % and further wherein the total mole % of the acrylic repeat units of structures (II) and (IIa) is from 25 mole % to 40 mole % and component b) is oligo random copolymer b-1), oligo diblock copolymer b-2), or oligo diblock copolymer b-3).

35. The composition of claim 5, wherein component a) is selected from the group consisting of triblock copolymer component a-1t), triblock copolymer a-2t) and a blend of a-1t) and a-2t) whose total mole % of styrenic repeat units of structures (I) and (Ia) is from 60 mole % to 75 mole % and whose total mole % of acrylic repeat units of structure (II) and (IIa) is from 40 mole % to 60 mole %, and component b) is copolymer b-2 or oligo diblock copolymer b-3).

36. The composition of claim 5, wherein component a) is selected from the group consisting of triblock copolymer component a-1t), triblock copolymer a-2t) and a blend of a-1t) and a-2t) whose total mole % of styrenic repeat units of structure (I) and (Ia) is from 60 mole % to 75 mole % and further wherein the total mole % of the acrylic repeat units of structures (II) and (IIa) is from 25 mole % to 40 mole % and component b) is oligo diblock copolymer b-2), or oligo diblock copolymer b-3).

37. A process comprising steps:

i) forming a coating of a neutral layer on a substrate,

ii) coating the composition of claim 1, onto said neutral layer, to form a film

ii) baking said film, in an inert gas atmosphere, at a temperature selected from 240°C to 260°C, to form a self-assembled film, and

iii) etching said substrate with a plasma to pattern transfer said self-assembled film into the substrate.

38. A process for forming a line and space array comprising steps:

ia) forming a coating of a neutral layer on a substrate,

iia) coating the composition of claim 33, onto said neutral layer, to form a film

iiia) baking said film, in an inert gas atmosphere, at a temperature selected from 240°C to 260°C, to form a self-assembled film, and

iva) etching said substrate with a plasma to pattern transfer said self-assembled film into the substrate.

39. A process for forming a contact hole array comprising steps:

ib) forming a coating of a neutral layer on a substrate,

iib) coating the composition of claim 34 onto said neutral layer, to form a film,

iiib) baking said film, in an inert gas atmosphere, at a temperature selected from 240°C to 260°C, to form a self-assembled film, and

ivb) etching said substrate with a plasma to pattern transfer said self-assembled film into the substrate.

40. A process for forming a line and space array comprising steps:

ic) forming a coating of a neutral layer on a substrate,

iiic) coating the composition of claim 35, onto said neutral layer, to form a film,

ivc) baking said film, in an inert gas atmosphere, at a temperature selected from 240°C to 260°C, to form a self-assembled film, and

vc) etching said substrate with a plasma to pattern transfer said self-assembled film into the substrate.

41. A process for forming a contract hole array comprising steps:

id) forming a coating of a neutral layer on a substrate,

iiid) coating the composition of claim 36, onto said neutral layer, to form a film,

ivd) baking said film, in an inert gas atmosphere, at a temperature selected from 240°C to 260°C, to form a self-assembled film, and

vd) etching said substrate with a plasma to pattern transfer said self-assembled film into the substrate.

42. A composition comprising components a), b) and c), wherein

a) is a block copolymer component or blend of at least two block copolymers,

b) is a low Tg additive selected from the group consisting of

an oligo random copolymer b-1), made by radical polymerization using an (E)-2,2'-(diazene-1,2-diyl)bis(2-alkylpropanenitrile radical initiator and an alkyl thiol chain transfer agent,

an oligo diblock copolymer b-2), made by anionic polymerization using an alkyl lithium initiator,

an oligo diblock copolymer b-3), made by anionic polymerization using an alkyl lithium initiator,

and mixture thereof, wherein;

b-1) is an oligo random copolymer, of two repeat units, which have structure (Ib) and structure (IIb), wherein R_{1b} and R_{3b} are independently selected from H or a C-1 to C-4 alkyl, R_{2b} is H or a C-1 to C-8 alkyl, R_{4b} is a C-1 to C-8 alkyl, and

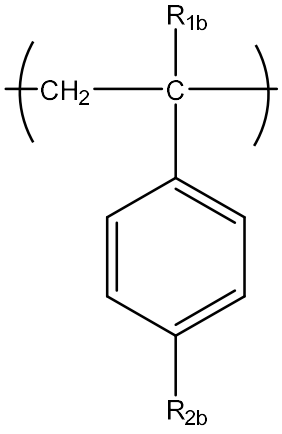
the mole % values, based on the total moles of repeat units of structures (Ib) and (IIb), are for the repeat units of structure (Ib) from 40 mole % to 80 mole % and for the repeat units of structure (IIb) from 20 mole % to 60 mole %, and

wherein the individual values of the mole % for the repeat units of structures (Ib) and (IIb) are selected from their respective ranges to add up to 100 mole % of the total moles of repeat units of structures (Ib) and (IIb); and further,

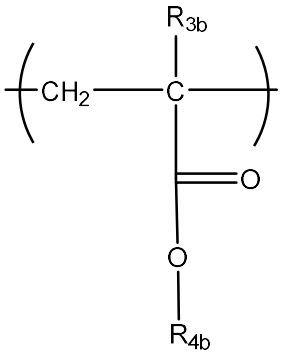
said oligo random copolymer b-1) has a T_g which is from 0°C to 80°C, and

has an M_n which is from 1000 g/mole to 5000 g/mole, and

has a polydispersity from 1.3 to 1.8,



(Ib)

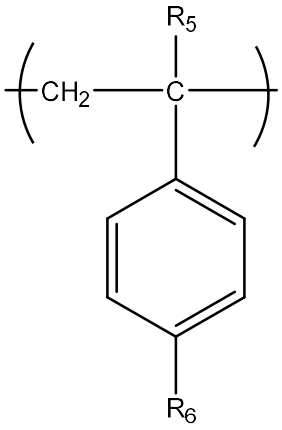


(IIb);

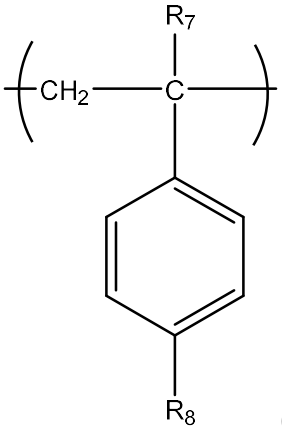
b-2) is an oligo diblock copolymer of block A-b) and block B-b), having an M_n from 1,000 to 35,000, and a polydispersity from 1.0 to 1.1, wherein

block A-b) is a random copolymer of repeat units having structures (III), and (IV), and block B-b) is a random copolymer of repeat units having structures (V), and (VI), and

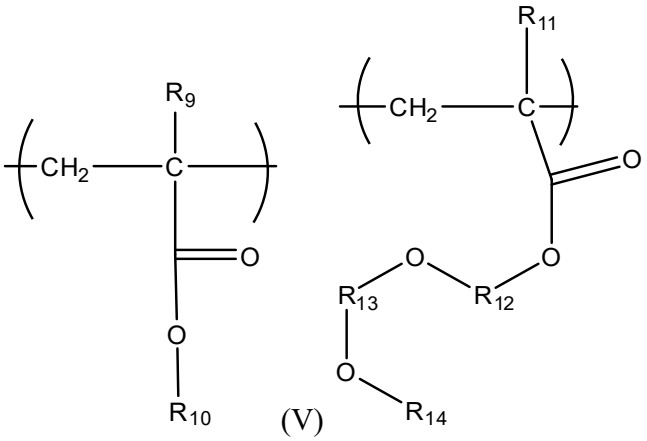
R_5, R_7, R_9, and R_{11}, are independently selected from H or a C-1 to C-4 alkyl, R_6 is a C-7 to C-10 linear alkyl, R_8 is a C-1 to C-4 alkyl, R_{10} is a C-1 to C-4 alkyl, R_{12} and R_{13} are individually selected from a C-2 to C-5 alkylene, and R_{14} is a C-1 to C-4 alkyl, and said oligo diblock copolymer b-2) has a T_g which has a value from 0°C to 95°C,



(III)



(IV)

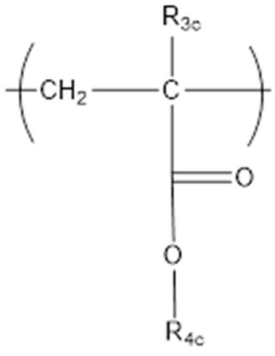


(V) (VI)

and

b-3) is an oligo diblock copolymer of block A-c), with repeat units having structure (Ic), and a block B-c), with repeat units having structure (IIc), wherein R_{1c} and R_{3c} are independently selected from H or a C-1 to C-4 alkyl, R_{2c} is H or a C-1 to C-8 alkyl, R_{4c} is a C-1 to C-8 alkyl, and the mole % values, based on the total moles of repeat units of structures (Ic) and (IIc), are for the repeat units of structure (Ic) from 36 mole % to 74 mole % and for the repeat units of structure (IIc) from 26 mole % to 64 mole %, and the individual values of the mole % for the repeat units of structures (Ic) and (IIc) are selected from their respective ranges to add up to 100 mole % of the total moles of repeat units of structures (Ic) and (IIc), and

said oligo diblock copolymer b-3) has an M_n from 1000 g/mole to 23,400 g/mole, a polydispersity from 1.0 to 1.1, and a T_g from 0°C to 90°C,



(IIc);

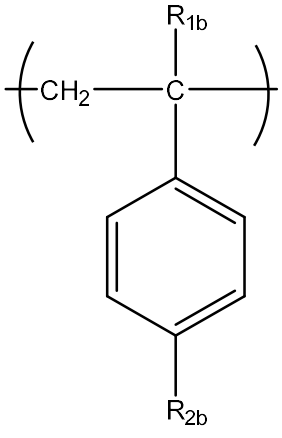
c) is a spin casting organic solvent.

43. A composition comprising components a), b) and c), wherein

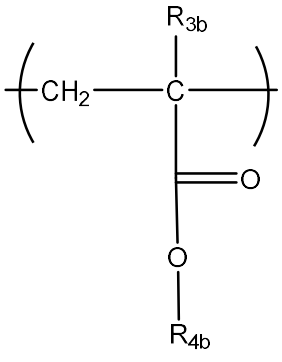
a) is a block copolymer component or blend of at least two block copolymers,

b) is a low T_g additive selected from the group consisting of

an oligo random copolymer b-1), made by radical polymerization using an (E)-2,2'-(diazene-1,2-diyl)bis(2-alkylpropanenitrile radical initiator and an alkyl thiol chain transfer agent,
an oligo diblock copolymer b-2), made by anionic polymerization using an alkyl lithium initiator, wherein;
b-1) is an oligo random copolymer, of two repeat units, which have structure (Ib) and structure (IIb), wherein R_{1b} and R_{3b} are independently selected from H or a C-1 to C-4 alkyl, R_{2b} is H or a C-1 to C-8 alkyl, R_{4b} is a C-1 to C-8 alkyl, and
the mole % values, based on the total moles of repeat units of structures (Ib) and (IIb), are for the repeat units of structure (Ib) from 40 mole % to 80 mole % and for the repeat units of structure (IIb) from 20 mole % to 60 mole %, and
wherein the individual values of the mole % for the repeat units of structures (Ib) and (IIb) are selected from their respective ranges to add up to 100 mole % of the total moles of repeat units of structures (Ib) and (IIb); and further
said oligo random copolymer b-1) has a T_g which is from 0°C to 80°C, and
has an M_n which is from 1000 g/mole to 8000 g/mole, and
has a polydispersity from 1.3 to 1.8, and where said



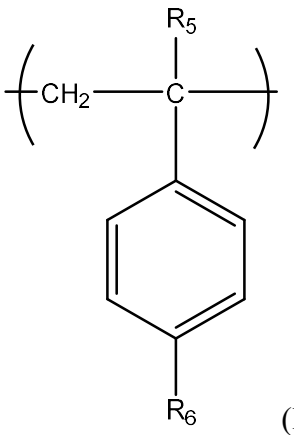
(Ib)



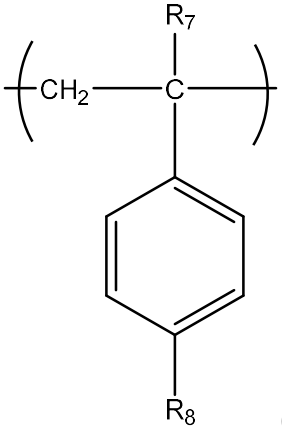
(IIb);

b-2) is an oligo diblock copolymer of block A-b) and block B-b), having an M_n from 1,000 to 35,000, and a polydispersity from 1.0 to 1.1, wherein
block A-b) is a random copolymer of repeat units having structures (III), and (IV), and block B-b) is a random copolymer of repeat units having structures (V), and (VI), and
R_5, R_7, R_9, and R_{11}, are independently selected from H or a C-1 to C-4 alkyl, R_6 is a C-7 to C-10 linear alkyl, R_8 is a C-1 to C-4 alkyl, R_{10} is a C-1 to C-4 alkyl, R_{12} and R_{13} are individually

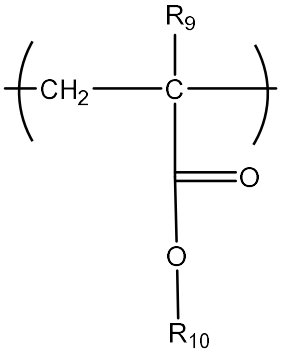
selected from a C-2 to C-5 alkylene, and R_{14} is a C-1 to C-4 alkyl, and said oligo diblock copolymer b-2) has a T_g which has a value from 0°C to 95°C,



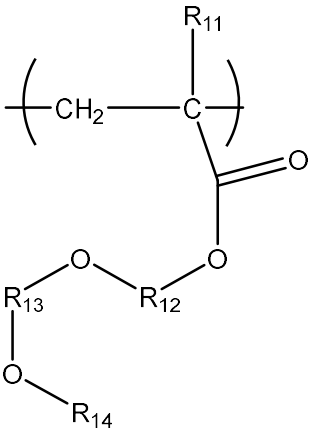
(III)



(IV)



(V)



(VI)

and

c) is a spin casting organic solvent.

44. A composition comprising components a), b) and c), wherein

a) is a block copolymer component or blend of at least two block copolymers, wherein said block copolymer is a) is a diblock copolymer component selected from the group consisting of diblock copolymer a-2) and a blend of a-1) and a-2), wherein

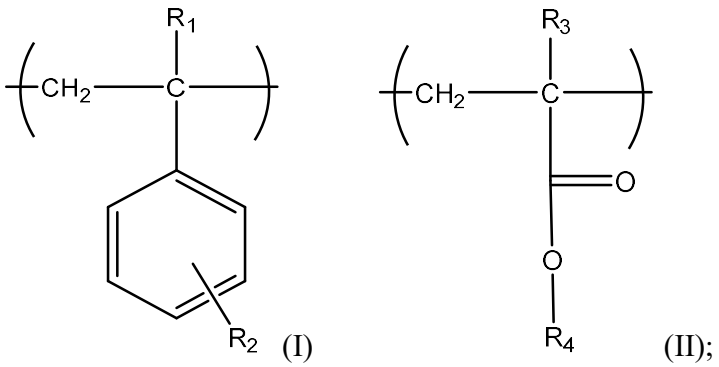
a-1) is a diblock copolymer of block A), with styrenic repeat units having styrenic structure (I), and block B), having acrylic structure (II), wherein Rand R3 are independently selected from H and C-1 to C-4 alkyl, R_2 is H or a C-1 to C-8 alkyl, R_4 is a C-1 to C-8 alkyl, and

the mole % values, based on the total moles of repeat units of structures (I) and (II), are for the repeat units of structure (I) from 40 mole % to 80 mole % and for the repeat units of structure (II) from 20 mole % to 60 mole %,

wherein the individual values of the mole % for the repeat units of structures (I) and (II) are selected from their respective ranges to add up to 100 mole % of the total moles of repeat units of structures (I) and (II), and

said diblock copolymer a-1) has a polydispersity from 1.0 to 1.1

has an M_n from 50,000 g/mole to 150,000 g/mole,



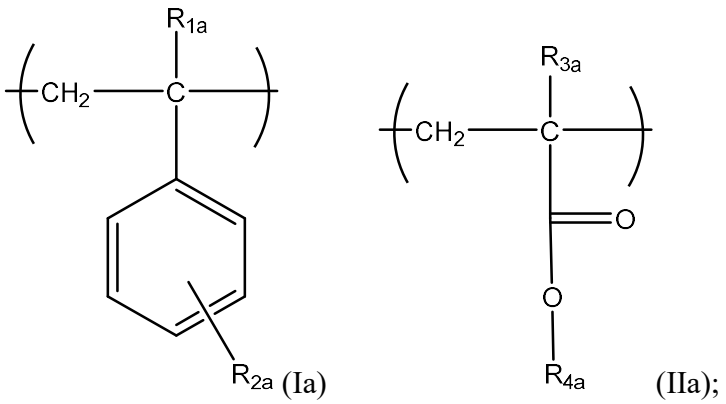
(I) (II);

a-2) is a di-block copolymer of a block A-a), with repeat units having styrenic structure (Ia), and block B-a), with repeat units having acrylic structure (IIa), wherein R_{1a} and R_{3a} are independently selected from H or a C-1 to C-4 alkyl, R_{2a} is H or a C-1 to C-8 alkyl, C_{4a} is a C-1 to C-8 alkyl and, the mole % values, based on the total moles of repeat units of structures (Ia) and (IIa), are for the repeat units of structure (Ia) from 40 mole % to 80 mole % and for the repeat units of structure (IIa) from 20 mole % to 60 mole %, and

wherein the individual values of the mole % for the repeat units of structures (Ia) and (IIa) are selected from their respective ranges to add up to 100 mole % of the total moles of repeat units of structures (Ia) and (IIa), and

said diblock copolymer a-2) has a polydispersity from 1.0 to 1.03,

has an M_n from 30,000 g/mole to 90,000 g/mole,



(Ia) (IIa);

b) is a low T_g additive selected from the group consisting of

an oligo random copolymer b-1),

an oligo diblock copolymer b-2),

an oligo diblock copolymer b-3) and

mixture thereof, wherein;

b-1) is an oligo random copolymer, of two repeat units, which have structure (Ib) and structure (IIb), wherein R_{1b} and R_{3b} are independently selected from H or a C-1 to C-4 alkyl, R_{2b} is H or a C-1 to C-8 alkyl, R_{4b} is a C-1 to C-8 alkyl, and

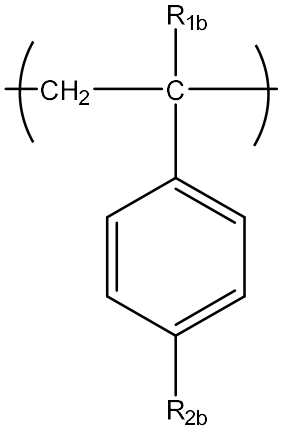
the mole % values, based on the total moles of repeat units of structures (Ib) and (IIb), are for the repeat units of structure (Ib) from 40 mole % to 80 mole % and for the repeat units of structure (IIb) from 20 mole % to 60 mole %, and

wherein the individual values of the mole % for the repeat units of structures (Ib) and (IIb) are selected from their respective ranges to add up to 100 mole % of the total moles of repeat units of structures (Ib) and (IIb); and further

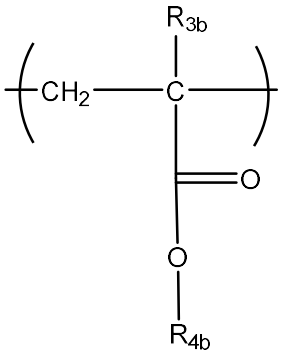
said oligo random copolymer b-1) has a T_g which is from 0°C to 80°C, and

has an M_n which is from 1000 g/mole to 8,000 g/mole, and

has a polydispersity from 1.3 to 1.8,



(Ib)



(IIb);

b-2) is an oligo diblock copolymer of block A-b) and block B-b), having an M_n from 1,000 to 35,000, and a polydispersity from 1.0 to 1.1, wherein

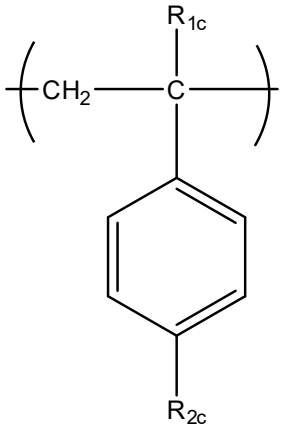
block A-b) is a random copolymer of repeat units having structures (III), and (IV), and block B-b) is a random copolymer of repeat units having structures (V), and (VI), and

R_5, R_7, R_9, and R_{11}, are independently selected from H or a C-1 to C-4 alkyl, R_6 is a C-7 to C-10 linear alkyl, R_8 is a C-1 to C-4 alkyl, R_{10} is a C-1 to C-4 alkyl, R_{12} and R_{13} are individually selected from a C-2 to C-5 alkylene, and R_{14} is a C-1 to C-4 alkyl, and said oligo diblock copolymer b-2) has a T_g which has a value from 0°C to 95°C,

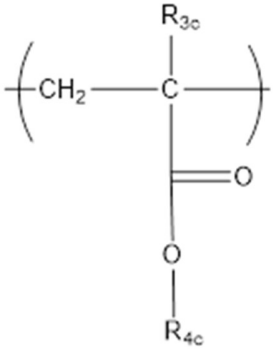
and

b-3) is an oligo diblock copolymer of block A-c), with repeat units having structure (Ic), and a block B-c), with repeat units having structure (IIc), wherein R_{1c} and R_{3c} are independently selected from H or a C-1 to C-4 alkyl, R_{2c} is H or a C-1 to C-8 alkyl, R_{4c} is a C-1 to C-8 alkyl, and the mole % values, based on the total moles of repeat units of structures (Ic) and (IIc), are for the repeat units of structure (Ic) from 36 mole % to 74 mole % and for the repeat units of structure (IIc) from 26 mole % to 64 mole %, and the individual values of the mole % for the repeat units of structures (Ic) and (IIc) are selected from their respective ranges to add up to 100 mole % of the total moles of repeat units of structures (Ic) and (IIc), and

said oligo diblock copolymer b-3) has an M_n from 1000 g/mole to 23,400 g/mole, a polydispersity from 1.0 to 1.1, and a T_g from 0°C to 90°C,



(Ic)



(IIc);

c) is a spin casting organic solvent.

45. A composition comprising components a), b) and c), wherein

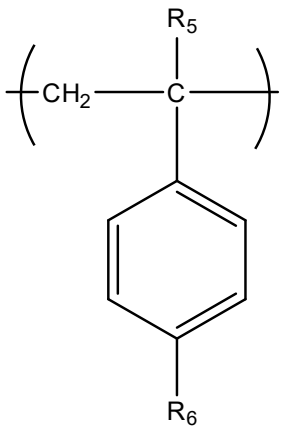
a) is a block copolymer component or blend of at least two block copolymers,

b) is a low T_g additive which is an an oligo diblock copolymer b-2), wherein;

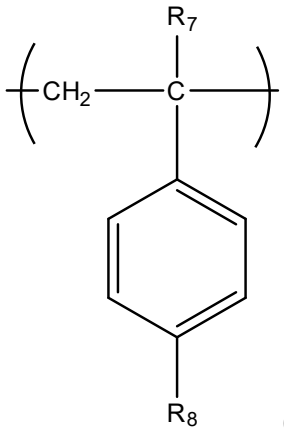
b-2) is an oligo diblock copolymer of block A-b) and block B-b), having an M_n from 1,000 to 35,000, and a polydispersity from 1.0 to 1.1, wherein

block A-b) is a random copolymer of repeat units having structures (III), and (IV), and block B-b) is a random copolymer of repeat units having structures (V), and (VI), and

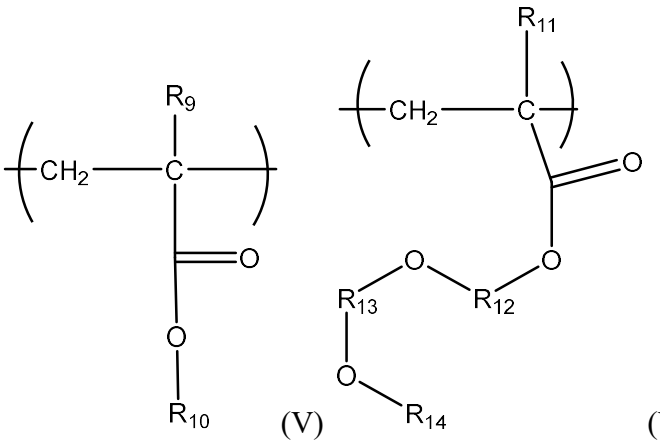
R_5, R_7, R_9, and R_{11}, are independently selected from H or a C-1 to C-4 alkyl, R_6 is a C-7 to C-10 linear alkyl, R_8 is a C-1 to C-4 alkyl, R_{10} is a C-1 to C-4 alkyl, R_{12} and R_{13} are individually selected from a C-2 to C-5 alkylene, and R_{14} is a C-1 to C-4 alkyl, and said oligo diblock copolymer b-2) has a T_g which has a value from 0°C to 95°C,



(III)



(IV)



(V) (VI)

and

c) is a spin casting organic solvent.

46. The composition of claim 43, where said low T_g additive is said oligo random copolymer b-1).

47. The composition of claim 43, where said low T_g additive is said oligo random copolymer b-2).

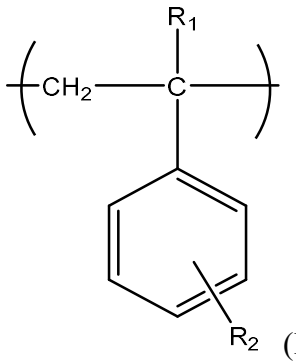
48. The composition of claim 43, wherein said component a) is an ABA triblock copolymer component selected from the group consisting of ABA triblock copolymer a-1t), a ABA triblock copolymer a-2t) and a blend of ABA triblock polymer a-1t) and ABA triblock copolymer a-2t), wherein

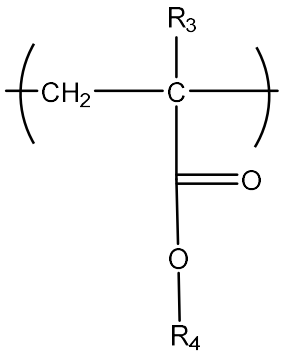
a-1t) is an ABA triblock copolymer, comprising a middle B) styrenic block segment of repeat units having styrenic structure (I), and two end acrylic block A) segments of equal length having structure (II), wherein R_1 and R_3 are independently selected from H and C-1 to C-4 alkyl, R_2 is H or a C-1 to C-8 alkyl, R_4 is a C-1 to C-8 alkyl, and

the mole % values, based on the total moles of repeat units of structures (I) and (II), are for the repeat units of structure (I) from 40 mole % to 80 mole % and for the repeat units of structure (II) from 20 mole % to 60 mole %,

wherein the individual values of the mole % for the repeat units of structures (I) and (II) are selected from their respective ranges to add up to 100 mole % of the total moles of repeat units of structures (I) and (II), and

said triblock copolymer a-1t) has a polydispersity from 1.0 to 1.1 and has an M_n from 70,000 g/mole to 350,000 g/mole,



(I)


(II);

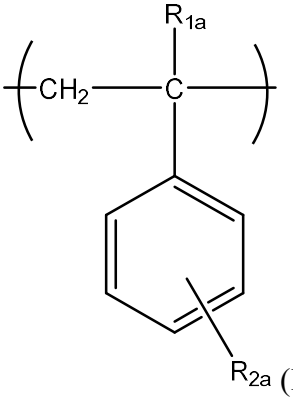
a-2t) is an ABA triblock copolymer, comprising a middle B) block segment of repeat units having styrenic structure (Ia), and two end block B) segments of equal length having acrylic structure (IIa), wherein R_{1a} and R_{3a} are independently selected from H and C-1 to C-4 alkyl, R_{2a} is H or a C-1 to C-8 alkyl, R_{4a} is a C-1 to C-8 alkyl,

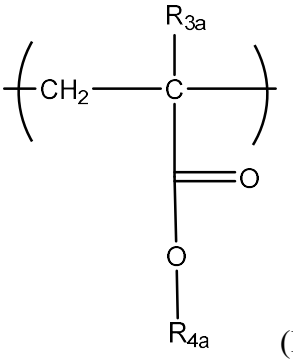
the mole % values, based on the total moles of repeat units of structures (Ia) and (IIa), are for the repeat units of structure (Ia) from 40 mole % to 80 mole % and for the repeat units of structure (IIa) from 20 mole % to 60 mole %, and

wherein the individual values of the mole % for the repeat units of structures (Ia) and (IIa) are selected from their respective ranges to add up to 100 mole % of the total moles of repeat units of structures (Ia) and (IIa), and

said triblock copolymer a-2t) has a polydispersity from 1.0 to 1.1,

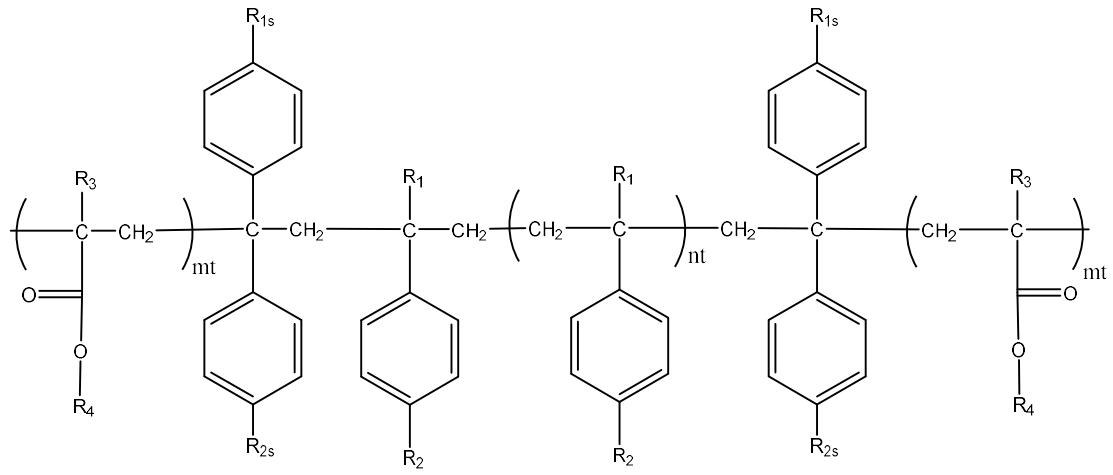
has an M_n from 70,000 g/mole to 350,000 g/mol,



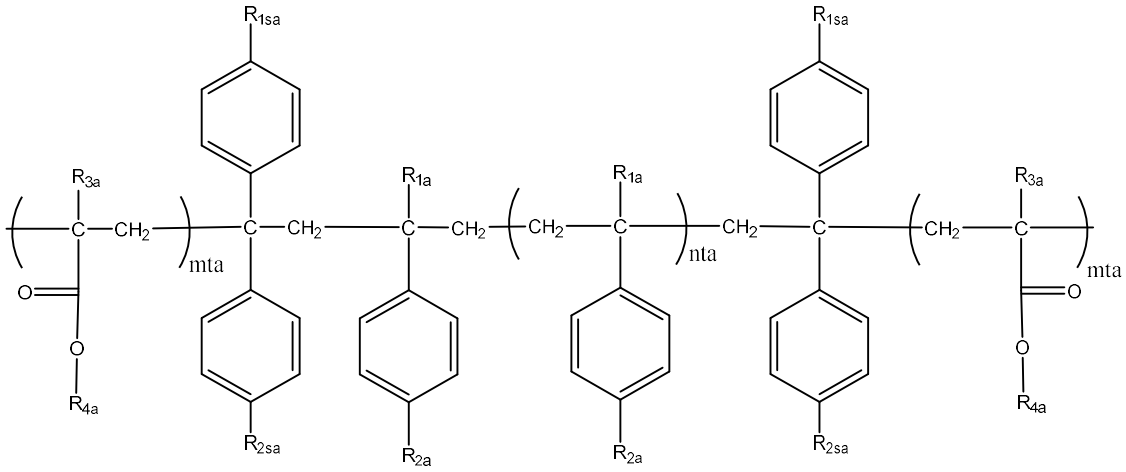
(Ia)


(IIa).

49. The composition of claim 43, wherein component a) is a triblock copolymer selected from a triblock copolymer of structure (ABA-1), a triblock copolymer of structure (ABA-2) and a mixture of these two block copolymers, wherein mt, mta, nt and nta are the number of repeat units, R_{1s}, R_{1sa}, R_{2s}, and R_{2sa} are independently selected from hydrogen, a C-1 to C-8 alkyl, —$N(R_{3s})_2$, —OR_{4s}, and $Si(R_{5s})_3$, wherein R_{3s}, R_{4s} and R_{5s} are independently selected from a C-1 to C-4 alkyl,



(ABA-1)

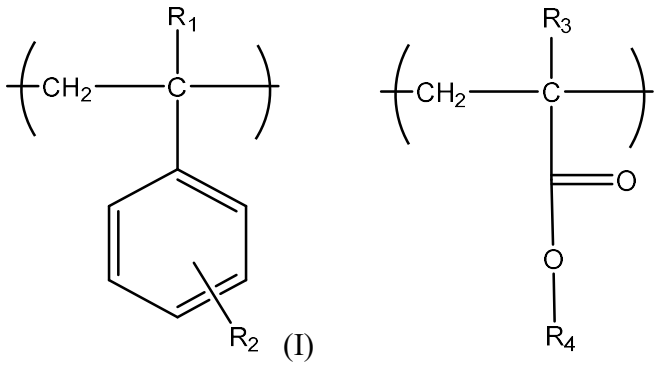


(ABA-2).

50. The composition of claim 43, wherein

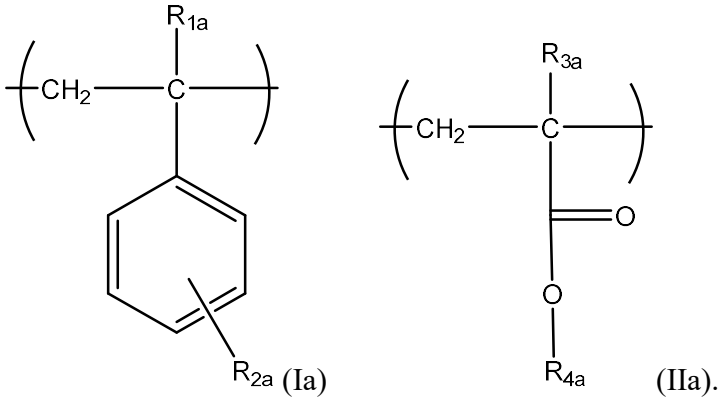
a) is a diblock copolymer component selected from the group consisting of diblock copolymer a-1), diblock copolymer a-2) and a blend of a-1) and a-2), wherein

a-1) is a diblock copolymer of block A), with styrenic repeat units having styrenic structure (I), and block B), having acrylic structure (II), wherein R_1 and R_3 are independently selected from H and C-1 to C-4 alkyl, R_2 is H or a C-1 to C-8 alkyl, R_4 is a C-1 to C-8 alkyl, and
the mole % values, based on the total moles of repeat units of structures (I) and (II), are for the repeat units of structure (I) from 40 mole % to 80 mole % and for the repeat units of structure (II) from 20 mole % to 60 mole %,
wherein the individual values of the mole % for the repeat units of structures (I) and (II) are selected from their respective ranges to add up to 100 mole % of the total moles of repeat units of structures (I) and (II), and
said diblock copolymer a-1) has a polydispersity from 1.0 to 1.1
has an M_n from 50,000 g/mole to 150,000 g/mole,



(I) (II);

a-2) is a di-block copolymer of a block A-a), with repeat units having styrenic structure (Ia), and block B-a), with repeat units having acrylic structure (IIa), wherein R_{1a} and R_{3a} are independently selected from H or a C-1 to C-4 alkyl, R_{2a} is H or a C-1 to C-8 alkyl, C_{4a} is a C-1 to C-8 alkyl and,
the mole % values, based on the total moles of repeat units of structures (Ia) and (IIa), are for the repeat units of structure (Ia) from 40 mole % to 80 mole % and for the repeat units of structure (IIa) from 20 mole % to 60 mole %, and
wherein the individual values of the mole % for the repeat units of structures (Ia) and (IIa) are selected from their respective ranges to add up to 100 mole % of the total moles of repeat units of structures (Ia) and (IIa), and
said diblock copolymer a-2) has a polydispersity from 1.0 to 1.1,
has an M_n from 30,000 g/mole to 90,000 g/mole,



(Ia) (IIa).

51. The composition of claim 45 wherein said block copolymer component a) is selected from the group consisting of

a diblock copolymer component selected from the group consisting of diblock copolymer a-1), diblock copolymer a-2) and a blend of a-1) and a-2), wherein

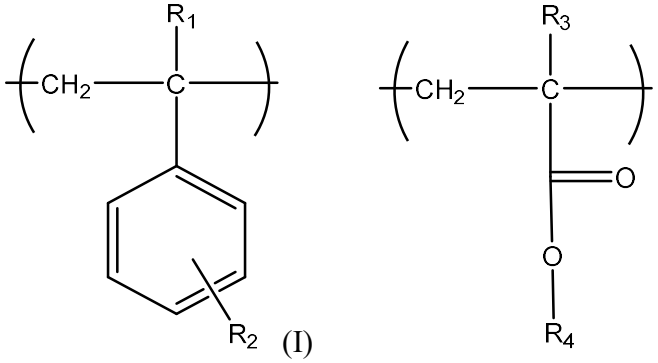
a-1) is a diblock copolymer of block A), with styrenic repeat units having styrenic structure (I), and block B), having acrylic structure (II), wherein R_1 and R_3 are independently selected from H and C-1 to C-4 alkyl, R_2 is H or a C-1 to C-8 alkyl, R_4 is a C-1 to C-8 alkyl, and

the mole % values, based on the total moles of repeat units of structures (I) and (II), are for the repeat units of structure (I) from 40 mole % to 80 mole % and for the repeat units of structure (II) from 20 mole % to 60 mole %,

wherein the individual values of the mole % for the repeat units of structures (I) and (II) are selected from their respective ranges to add up to 100 mole % of the total moles of repeat units of structures (I) and (II), and

said diblock copolymer a-1) has a polydispersity from 1.0 to 1.1

has an M_n from 50,000 g/mole to 150,000 g/mole,



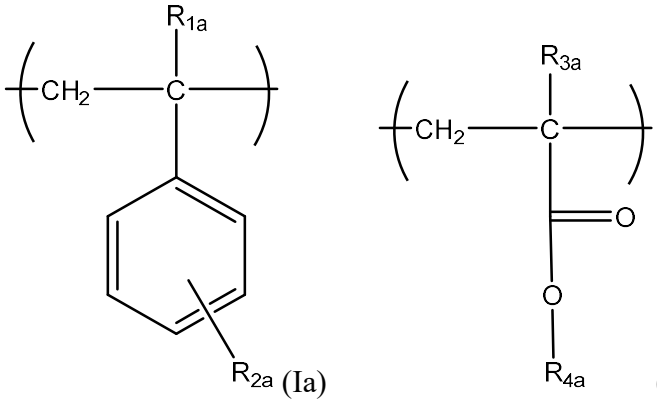
(I) (II);

a-2) is a di-block copolymer of a block A-a), with repeat units having styrenic structure (Ia), and block B-a), with repeat units having acrylic structure (IIa), wherein R_{1a} and R_{3a} are independently selected from H or a C-1 to C-4 alkyl, R_{2a} is H or a C-1 to C-8 alkyl, C_{4a} is a C-1 to C-8 alkyl and, the mole % values, based on the total moles of repeat units of structures (Ia) and (IIa), are for the repeat units of structure (Ia) from 40 mole % to 80 mole % and for the repeat units of structure (IIa) from 20 mole % to 60 mole %, and

wherein the individual values of the mole % for the repeat units of structures (Ia) and (IIa) are selected from their respective ranges to add up to 100 mole % of the total moles of repeat units of structures (Ia) and (IIa), and

said diblock copolymer a-2) has a polydispersity from 1.0 to 1.1,

has an M_n from 30,000 g/mole to 90,000 g/mole, and



(Ia) (IIa);

an ABA triblock copolymer component selected from the group consisting of ABA triblock copolymer a-1t), a ABA triblock copolymer a-2t) and a blend of ABA triblock polymer a-1t) and ABA triblock copolymer a-2t), wherein

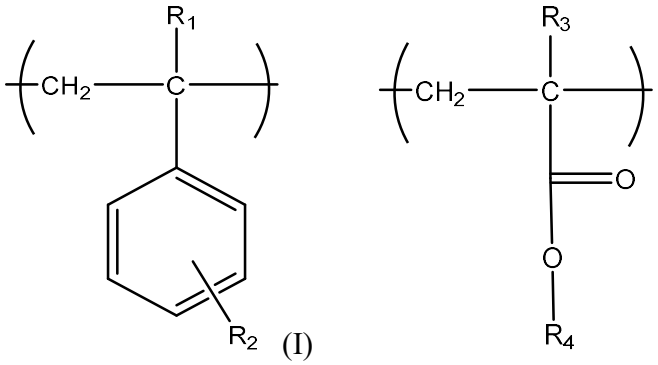
a-1t) is an ABA triblock copolymer, comprising a middle B) styrenic block segment of repeat units having styrenic structure (I), and two end acrylic block A) segments of equal length having structure (II), wherein R_1 and R_3 are independently selected from H and C-1 to C-4 alkyl, R_2 is H or a C-1 to C-8 alkyl, R_4 is a C-1 to C-8 alkyl, and

the mole % values, based on the total moles of repeat units of structures (I) and (II), are for the repeat units of structure (I) from 40 mole % to 80 mole % and for the repeat units of structure (II) from 20 mole % to 60 mole %,

wherein the individual values of the mole % for the repeat units of structures (I) and (II) are selected from their respective ranges to add up to 100 mole % of the total moles of repeat units of structures (I) and (II), and

said triblock copolymer a-1t) has a polydispersity from 1.0 to 1.1 and

has an M_n from 70,000 g/mole to 350,000 g/mole,



(I) (II);

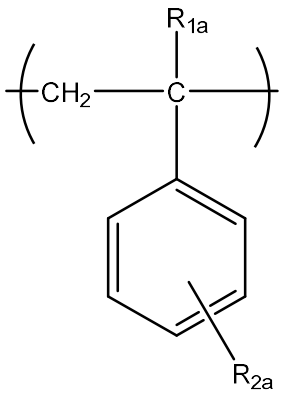
a-2t) is an ABA triblock copolymer, comprising a middle B) block segment of repeat units having styrenic structure (Ia), and two end block B) segments of equal length having acrylic structure (IIa), wherein R_{1a} and R_{3a} are independently selected from H and C-1 to C-4 alkyl, R_{2a} is H or a C-1 to C-8 alkyl, R_{4a} is a C-1 to C-8 alkyl,

the mole % values, based on the total moles of repeat units of structures (Ia) and (IIa), are for the repeat units of structure (Ia) from 40 mole % to 80 mole % and for the repeat units of structure (IIa) from 20 mole % to 60 mole %, and

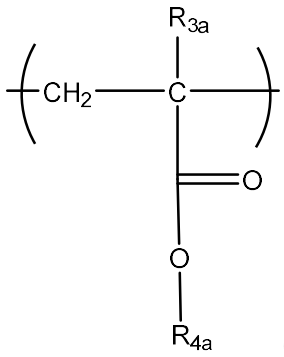
wherein the individual values of the mole % for the repeat units of structures (Ia) and (IIa) are selected from their respective ranges to add up to 100 mole % of the total moles of repeat units of structures (Ia) and (IIa), and

said triblock copolymer a-2t) has a polydispersity from 1.0 to 1.1,

has an M_n from 70,000 g/mole to 350,000 g/mol,



(Ia)



(IIa).