CLAIMS

1. A composition comprising

a compound of structure (I), and an organic spin casting solvent, wherein

in said compound of structure (I), A is a core moiety which is selected from structure (Ia), (Ib), (Ic) and (Id), to which is attached through X, a direct valence bond or a divalent linking group, m number of linear alkylene moieties of chain length n, wherein n ranges from 8 to 12 and where each said linear alkylene moiety has a terminal B reactive moiety, and further wherein * designates possible attachment point of said linear alkylene moieties in each structure, wherein structure (Ia), and (Ib), have 2 or 3 attachment points (m=2 or 3) which are on adjacent carbons, structure (Ic) has 2 attachment point (m=2), structure (Id), has three attachment point (m=3),

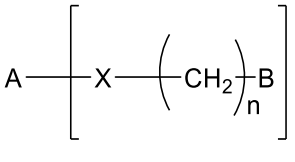
B is selected from -OH, -CH=CH_2, -O-(P=O)$(OR)_2$, -O-(P=O)(OR)Rs, -N_3, and -SH, wherein R and Rs are independently selected from a C-1 to C-8 alkyl,

R_{1a} and R_{1b} are independently selected from H a C-1 to C-4 alkyl, a C-1 to C-4 alkyloxy, a C-3 to C-6, methyl(carbonyloxyalkyl) (--CH_2-(C=O)-O-alkyl), a C-2 to C-5 carbonyloxyalkyl (-(C=O)-O-alkyl), nitro (NO_2), NH_2, and CN,

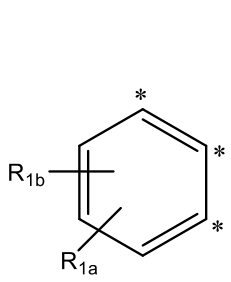
R_{1c}, $R_{1d,}$ R_{1e}, R_{1f} and R_{1g} are independently selected from H a C-1 to C-4 alkyl, a C-1 to C-4 alkyloxy, C-2 to C-5 carbonyloxyalkyl (-(C=O)-O-alkyl), a C-3 to C-6 methylcarbonyloxyalkyl (--CH_2-(C=O)-O-alkyl), and CN, and

wherein for the core moieties (Ia), (Ib), (Ic) the said divalent linking group is selected from the group consisting the group consisting of oxy (-O-), oxycarbonyl (-O-C(=O)-), carbonyloxy(-C(=O)-O-), carbonyl (-(C=O)-), sulfinyl (-(S(=O))-), and sulfone (-S(=$O)_2$-) and for core moieties (Id), the divalent linking group is selected from the group consisting of oxy (-O-), oxycarbonyl (-O-C(=O)-), carbonyloxy(-C(=O)-O-), ethyne (—≡≡—), 1,4-phenylene(-Ph-), 1,4-phenyleneoxy(-Ph-O-), 1,4-oxyphenylene(-O-Ph-), carbonyl (-(C=O)-), sulfinyl (-(S(=O))-), sulfone (-S(=$O)_2$-), 1,2-ethene(-CH=CH-), 1,1-ethene (-C(=CH_2)-), and methylene (-CH_2-), and

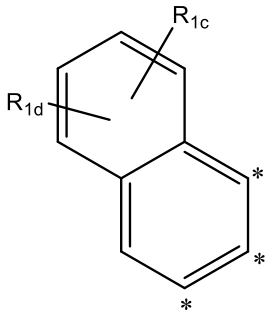
where said organic spin casting solvent is selected from the group consisting of a glycol ether derivative, a glycol ether ester derivative, a carboxylate, carboxylates of dibasic acids, a dicarboxylate of a glycol, a dicarboxylate of s glycol, a ketone ester, a ketone ether derivative, ketone alcohol derivative, lactones, an amide derivative, and mixtures thereof, and further wherein said compound of structure (I) comprises from 0.5 wt. % to 3.00 wt. % of said composition,



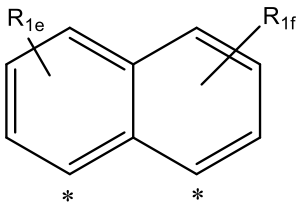
(I),



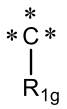
(Ia)



(Ib)



(Ic)

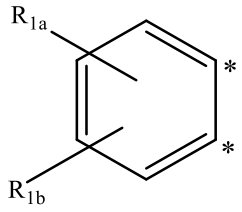


(Id).

2. The composition according to claim 1, wherein said organic spin casting solvent is selected from the group consisting of o a glycol ether derivative, a glycol ether ester derivative, and mixtures thereof.

3. The composition according to claim 1, wherein said compound of structure (I) is selected from the group consisting of 11,11',11"-((ethane-1,1,1-triyltris(benzene-4,1-diyl))tris(oxy))tris(undecan-1-ol) (M-1), 11,11',11"-(propane-1,2,3-triyltris(oxy))tris(undecan-1-ol) (M-2), (11,11',11"-(benzene-1,2,3-triyltris(oxy))tris(undecan-1-ol).(M-3), (11,11'-(1,2-phenylenebis(oxy))bis(undecan-1-ol). (M-4), 11,11'-(naphthalene-2,3-diylbis(oxy))bis(undecan-1-ol(M-5), 11,11'-(naphthalene-1,8-diylbis(oxy))bis(undecan-1-ol (M-6), 11,11'-(1,2-phenylenebis(oxy))bis(undecan-1-ol (M-7), 11,11'-((4-(tert-butyl)-1,2-phenylene)bis(oxy))bis(undecan-1-ol) (M-8), 1,2-phenylenebis(oxy))bis(hexadecan-1-ol (M-9), 3,4-bis((11-hydroxyundecyl)oxy)benzonitrile (M-10), 11-(2,6-bis(undec-10-en-1-yloxy)phenoxy)undecan-1-ol (M-11), 10,10'-(1,2-phenylenebis(oxy))bis(decan-1-ol (M-12), 11,11'-(1,2-phenylenebis(oxy))bis(undecane-1-thiol) (M-13), 1,2-bis((11-azidoundecyl)oxy)benzene (M-14), tetraethyl ((1,2-phenylenebis(oxy))bis(undecane-11,1-diyl))bis(phosphonate) (M-15), 11,11'-((4-methyl-1,2-phenylene)bis(oxy))bis(undecan-1-ol) (M-16), methyl 3,4-bis((11-hydroxyundecyl)oxy)benzoate (M-17), 11,11'-((4-nitro-1,2-phenylene)bis(oxy))bis(undecan-1-ol) (M-18), dimethyl 4,5-bis((11-hydroxyundecyl)oxy)phthalate (M-19), 3,4-bis((11-hydroxyundecyl)oxy)benzonitrile (M-20), and (E)-11,11'-((4-(hex-1-en-1-yl)-1,2-phenylene)bis(oxy))bis(undecan-1-ol) (M-21).

4. The composition of claim 1, wherein structure (Ia) has structure (Ia-1) and m=2, where * designates the position of the two attachment points, wherein in said compound of structure (I), said core moiety A, structure (Ia), has structure (Ia-1) with m=2,

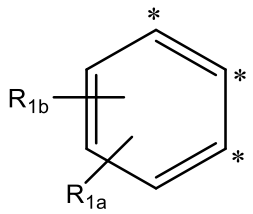


(Ia-1).

5. The composition of claim 4, wherein said compound of structure (Ia-1) is one where X, is selected from the group consisting of a direct valence bond or oxy (-O-)., and methylene (-CH_2-),

6. The composition of claim 1, wherein said compound of structure (I) is selected from the group consisting of (11,11'-(1,2-phenylenebis(oxy))bis(undecan-1-ol). (M-4), 11,11'-(1,2-phenylenebis(oxy))bis(undecan-1-ol (M-7), 1,2-phenylenebis(oxy))bis(hexadecan-1-ol (M-9), 3,4-bis((11-hydroxyundecyl)oxy)benzonitrile (M-10), 10,10'-(1,2-phenylenebis(oxy))bis(decan-1-ol (M-12), 11,11'-((4-methyl-1,2-phenylene)bis(oxy))bis(undecan-1-ol) (M-16), methyl 3,4-bis((11-hydroxyundecyl)oxy)benzoate (M-17), 11,11'-((4-nitro-1,2-phenylene)bis(oxy))bis(undecan-1-ol) (M-18), dimethyl 4,5-bis((11-hydroxyundecyl)oxy)phthalate (M-19), 3,4-bis((11-hydroxyundecyl)oxy)benzonitrile (M-20), and (E)-11,11'-((4-(hex-1-en-1-yl)-1,2-phenylene)bis(oxy))bis(undecan-1-ol) (M-21).

7. The composition of claim 1, wherein in said compound of structure (I), said core moiety A, has structure (Ia), with m=3,



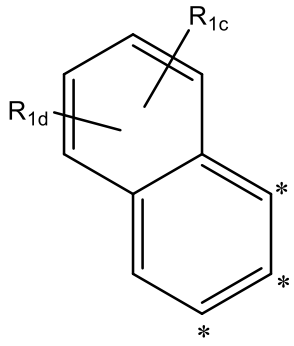
(Ia) .

8. The composition of claim 7, wherein said compound of structure (Ia) is one is one where B is selected from the group consisting of -OH, -CH=CH_2 and -SH.

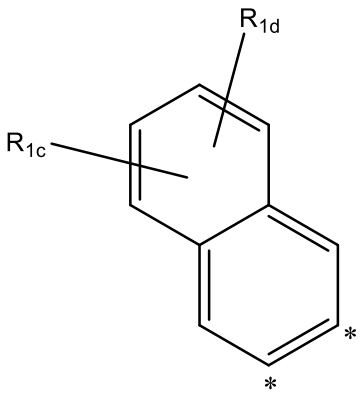
9. The composition of claim 8, wherein said compound of structure (Ia) is one where X, is selected from the group consisting of a direct valence bond, and a oxy (-O-) and methylene (-CH_2-).

10. The composition of claim 9, wherein said compound of structure (Ia), is either (11,11',11''-(benzene-1,2,3-triyltris(oxy))tris(undecan-1-ol) (M-3) or 11-(2,6-bis(undec-10-en-1-yloxy)phenoxy)undecan-1-ol (M-11).

11. The composition of claim 1, wherein said compound of structure (I) in one wherein said core moiety A, either has structure (Ib), where m is 3 or structure (Ib-1), where * designates the attachment points and B is selected from the group consisting of -OH, -CH=CH_2 and -SH,



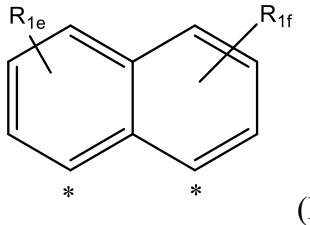
(Ib)



(Ib-1).

12. The composition of claim 11, wherein X is selected from the group consisting of a direct valence bond, and oxy (-O-) and methylene (-CH_2-).

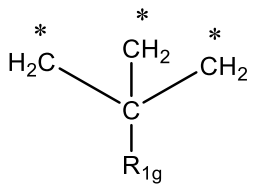
13. The composition of claim 1, wherein in said compound of structure (I), said core moiety A, has structure (Ic), where * designates the attachment points and B is selected from the group consisting of -OH, -CH=CH_2 and -SH,



(Ic).

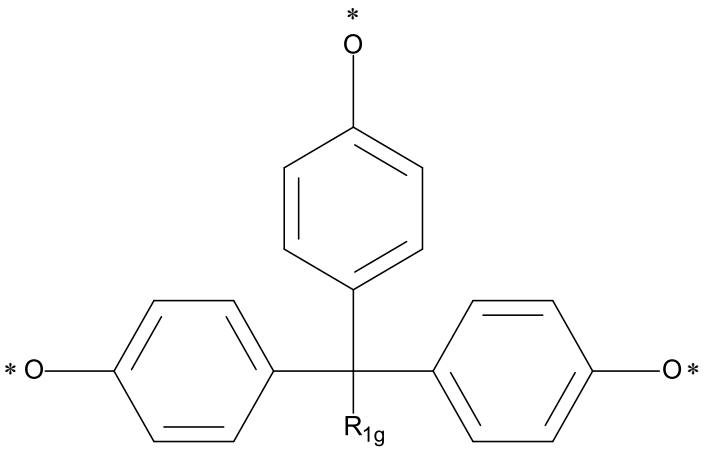
14. The composition of claim 13, wherein X is selected from the group consisting of a direct valence bond, and oxy (-O-) and methylene (-CH_2-).

15. The composition of claim 1, wherein said compound of structure (I) in one wherein said core moiety has structure (Id), wherein X is methylene (-CH_2-) and the combination of A and X has structure (Id-1), where * designates the attachment point, and B is selected from the group consisting of -OH, -CH=CH_2 and -SH,



(Id-1).

16. The composition of claim 1, wherein said compound of structure (I) in one wherein said core moiety has structure (Id), wherein X is a 1,4-phenyleneoxy (-Ph-O-) linking group, and the combination of A and X has structure (Id-3), where * designates the attachment point, and B is selected from the group consisting of -OH, -CH=CH_2 and -SH,



(Id-3).

17. The composition of claim 1 which is a PMMA affinity SAM composition, wherein in said compound (I),

at least one of R_{1a} and R_{1b}, is a polar substituent selected from a C-1 to C-4 alkyloxy, a C-3 to C-6, methyl(carbonyloxyalkyl) (-CH_2-(C=O)-O-alkyl), a C-2 to C-5 carbonyloxyalkyl (-(C=O)-O-alkyl), a nitro (NO_2), NH_2, and CN;

at least one of R_{1c}, or R_{1d} is a polar substituent selected from a C-1 to C-4 alkyloxy, a C-3 to C-6, methyl(carbonyloxyalkyl) (-CH_2-(C=O)-O-alkyl), a C-2 to C-5 carbonyloxyalkyl (-(C=O)-O-alkyl) and CN;

at least one of R_{1e}, or R_{1f} is a polar substituent selected from a C-1 to C-4 alkyloxy, a C-3 to C-6, methyl(carbonyloxyalkyl) (-CH_2-(C=O)-O-alkyl), a C-2 to C-5 carbonyloxyalkyl (-(C=O)-O-alkyl) and CN;

R_{1g} is a polar substituent selected from a C-1 to C-4 alkyloxy, a C-3 to C-6, methyl(carbonyloxyalkyl) (-CH_2-(C=O)-O-alkyl), a C-2 to C-5 carbonyloxyalkyl (-(C=O)-O-alkyl) and CN, and further wherein if only one of either R_{1a} and $R_{1b,}$ or either R_{1c} and R_{1d}, or either R_{1e} and R_{1f}, is such a polar substituent the other substituent is either H or a C-1 to C-4 alkyl.

18. The composition of claim 1 which is a PS affinity SAM composition, wherein in said compound (I),

at least one of R_{1a}, or R_{1b} is a C-1 to C-4 alkyl, at least one of R_{1c}, or R_{1d} is a C-1 to C-4 alkyl, at least one of R_{1e}, or R_{1f} is a C-1 to C-4 alkyl, R_g is a C-1 to C-4 alkyl, and further wherein if only one of either R_{1a} and $R_{1b,}$ or either R_{1c} and R_{1d}, or either R_{1e} and R_{1f}, is a C-1 to C-4 alkyl, the other substituent is H.

19. The composition of claim 1 which is a neutral affinity SAM composition, wherein in said compound (I), R_{1a}, R_{1b}, R_{1c}, $R_{1d,}$ R_{1e}, $R_{1f,}$ and R_{1g} are H.

20. A process of coating with a PMMA affinity SAM composition, comprising the steps:

i) coating a substrate with the PMMA affinity SAM composition of claim 17,

ii) baking at a temperature ranging from 150°C to 200°C,

iii) rinsing with an organic spin casting solvent to form a self-assembled monolayer with an affinity to the PMMA block segments a block copolymer of polystyrene (PS) and methyl methacrylate (MMA) (PS-b-PMMA).

21. A process of coating with a PS affinity SAM composition, comprising the steps;

ia) coating a substrate with the PS affinity SAM composition of claim 18,

iia) baking at a temperature ranging from 150°C to 200°C,

iiia) rinsing with an organic spin casting solvent to form a self-assembled monolayer with an affinity to PS block segment of a block copolymer of polystyrene (PS) and methyl methacrylate (MMA)(PS-b-PMMA).

22. A process of coating with a Neutral affinity SAM composition, comprising the steps;

ib) coating a substrate with the Neutral affinity SAM composition of claim 19,

iib) baking at a temperature ranging from 150°C to 200°C,

iiib) rinsing with an organic spin casting solvent to form a self-assembled monolayer with a neutral affinity block segment of a block copolymer of polystyrene (PS) and methyl methacrylate (MMA) (PS-b-PMMA).

23. A process of selective deposition of a self-assembled monolayer, followed by directed self-assembly of a block copolymer comprising the steps:

ic) using lithography processing to form a chemoepitaxy array of metal and non-metal lines on a substrate,

iic) coating said substrate with a PMMA affinity brush polymer, or a PMMA affinity SAM composition wherein, said PMMA affinity SAM composition is a composition of claim 1, wherein said compound of structure (I) is one wherein,

A is a core moiety which is selected from structure (Ia), (Ib), (Ic) and (Id), to which is attached through X, a direct valence bond or a divalent linking group, m number of linear alkylene moieties of chain length n, wherein n ranges from 8 to 12 and where each said linear alkylene moiety has a terminal B reactive moiety, and further wherein * designates possible attachment point of said linear alkylene moieties in each structure, wherein structure (Ia), and (Ib), have 2 or 3 attachment points (m=2 or 3) which are on adjacent carbons, structure (Ic) has 2 attachment point (m=2), structure (Id), has three attachment point (m=3),

B is selected from -OH, -CH=CH_2, -O-(P=O)$(OR)_2$, -O-(P=O)(OR)Rs, -N_3, and -SH, wherein R and Rs are independently selected from a C-1 to C-8 alkyl

R_{1a} and R_{1b} are independently selected from H a C-1 to C-4 alkyl, a C-1 to C-4 alkyloxy, a C-3 to C-6 methyl(carbonyloxyalkyl) (--CH_2-(C=O)-O-alkyl), a C-2 to C-5 carbonyloxyalkyl (-(C=O)-O-alkyl), nitro (NO_2), NH_2, and CN,

R_{1c}, $R_{1d,}$ R_{1e}, R_{1f} and R_{1g} are independently selected from H a C-1 to C-4 alkyl, a C-1 to C-4 alkyloxy, C-2 to C-5 carbonyloxyalkyl (-(C=O)-O-alkyl), a C-3 to C-6 methylcarbonyloxyalkyl (--CH_2-(C=O)-O-alkyl), and CN; and further wherein,

a least one of R_{1a} and R_{1b}, is a polar substituent selected from a C-1 to C-4 alkyloxy, a C-3 to C-6 methyl(carbonyloxyalkyl) (-CH_2-(C=O)-O-alkyl), a C-2 to C-5 carbonyloxyalkyl (-(C=O)-O-alkyl), a Nitro (NO_2), NH_2, and CN;

at least one of R_{1c}, or R_{1d} is a polar substituent selected from a C-1 to C-4 alkyloxy, a C-3 to C-6 methyl(carbonyloxyalkyl) (-CH_2-(C=O)-O-alkyl), a C-2 to C-5 carbonyloxyalkyl (-(C=O)-O-alkyl) and CN;

at least one of R_{1e}, or R_{1f} is a polar substituent selected a C-1 to C-4 alkyloxy, a C-3 to C-6 methyl(carbonyloxyalkyl) (-CH_2-(C=O)-O-alkyl), a C-2 to C-5 carbonyloxyalkyl (-(C=O)-O-alkyl) and CN;

R_{1g} is a is a polar substituent selected from a C-1 to C-4 alkyloxy, a C-3 to C-6, methyl(carbonyloxyalkyl) (-CH_2-(C=O)-O-alkyl), a C-2 to C-5 carbonyloxyalkyl (-(C=O)-O-alkyl) and CN, and further wherein if only one of either R_{1a} and $R_{1b,}$ or either R_{1c} and R_{1d}, or either R_{1e} and R_{1f}, is such a polar substituent the other substituent is H or a C-1 to C-4 alkyl,

iiic) baking at a temperature ranging from 150°C to 200°C,

ivc) rinsing with an organic spin casting solvent the produce a substrate in which only the metal lines have an attached PMMA affinity brush, or a PMMA affinity self-assembled monolayer,

vc) coating with the Neutral affinity SAM composition of claim 19,

vic) baking at a temperature ranging from 150°C to 200°C,

viic) rising with an organic spin casting solvent to produce a substrate in which the metal lines still have an attached PMMA brush, but also have a Neutral affinity self-assembled monolayer attached to the non-metal lines,

viiic) coating the substrate formed in step viic) with a block copolymer solution,

vivc) annealing the block copolymer coating to form directed self-assembled block copolymer L/S pattern.

24. The process of claim 23, wherein the PMMA affinity SAM composition is a PMMA affinity SAM composition, wherein in said compound (I),

at least one of R_{1a} and R_{1b}, is a polar substituent selected from a C-1 to C-4 alkyloxy, a C-3 to C-6, methyl(carbonyloxyalkyl) (-CH_2-(C=O)-O-alkyl), a C-2 to C-5 carbonyloxyalkyl (-(C=O)-O-alkyl), a nitro (NO_2), NH_2, and CN;

at least one of R_{1c}, or R_{1d} is a polar substituent selected from a C-1 to C-4 alkyloxy, a C-3 to C-6, methyl(carbonyloxyalkyl) (-CH_2-(C=O)-O-alkyl), a C-2 to C-5 carbonyloxyalkyl (-(C=O)-O-alkyl) and CN;

at least one of R_{1e}, or R_{1f} is a polar substituent selected from a C-1 to C-4 alkyloxy, a C-3 to C-6, methyl(carbonyloxyalkyl) (-CH_2-(C=O)-O-alkyl), a C-2 to C-5 carbonyloxyalkyl (-(C=O)-O-alkyl) and CN;

R_{1g} is a polar substituent selected from a C-1 to C-4 alkyloxy, a C-3 to C-6, methyl(carbonyloxyalkyl) (-CH_2-(C=O)-O-alkyl), a C-2 to C-5 carbonyloxyalkyl (-(C=O)-O-alkyl) and CN, and further wherein if only one of either R_{1a} and $R_{1b,}$ or either R_{1c} and R_{1d}, or either R_{1e} and R_{1f}, is such a polar substituent the other substituent is either H or a C-1 to C-4 alkyl.

25. A process of selective removal of a self-assembled monolayer and directed self-assembly of a polymer comprising the steps:

id) using lithography processing to form a chemoepitaxy array of metal and non-metal lines on a substrate,

iid) coating with a composition of the PS affinity SAM composition of claim 18,

iiid) baking at a temperature ranging from 150°C to 200°C,

ivd) rinsing with an organic spin casting solvent to produce a substrate in which the whole substrate has an attached PS affinity self-assembled monolayer, on both the metal and non-metal lines,

vd) treating with a removal solution, to selectively remove the PS affinity self-assembled monolayer, wherein said removal solution is selected from the group consisting of

a removal solution with a pH from 3 to 5 comprising, water, glycine, hydrogen peroxide solutions and a secondary acid component selected from a dicarboxylic acid, a tricarboxylic acid or an aryl sulfonic acid substituted with an alkyl,

a removal solution with a pH from 3 to 5 consisting of an alcoholic glycolic spin casting solvent, water, and an acid component selected from tricarboxylic acid, having a pK_a from 2.9 to 5, a dicarboxylic acid having a pK_a from 3 to 5 or an alkyl substituted aryl sulfonic acid,

a removal solution consisting of an alcoholic glycolic spin casting solvent, and a dithiol and

a removal solution consisting of an alcoholic glycolic spin casting solvent, and an amine,

vid) optionally baking at a temperature ranging from 100°C to 200°C,

viid) rinsing with an organic spin casting solvent to produce a substrate in which on the whole substrate only has PS affinity self-assembled monolayer on the non-metal lines,

viiid) coating with the composition of a Neutral affinity SAM composition of claim 19,

ixd) baking at a temperature ranging from 150°C to 200°C,

xd) rinsing with an organic spin casting solvent to produce a substrate in which the metal lines have an attached Neutral affinity self-assembled monolayer, and the non-metal lines have an attached PS affinity self-assembled monolayer,

xd) xid) coating the substrate formed in step ixd) with a solution of a block copolymer which has polar and non-polar block segments,

xid) xiid) annealing the block copolymer coating to form directed self-assembled block copolymer L/S pattern.

26. A process of coating with a PMMA affinity SAM composition on a chemoepitaxy array of metal and non-metal lines and selectively removing deposited SAM on the metal lines, comprising the steps:

ie) using lithography processing to form a chemoepitaxy array of metal and non-metal lines on a substrate,

iie) coating a substrate with the PMMA affinity SAM composition of claim 17,

iiie) baking at a temperature ranging from 150°C to 200°C,

ive) rinsing with an organic spin casting solvent to form a PMMA affinity self-assembled monolayer on both the metal lines and non-metal lines,

ve) treating with a removal solution, to selectively remove the PMMA affinity self-assembled monolayer from the metal lines, wherein said removal solution is selected from the group consisting of

a removal solution with a pH from 3 to 5 comprising, water, glycine, hydrogen peroxide solutions and a secondary acid component selected from a dicarboxylic acid, a tricarboxylic acid or an aryl sulfonic acid substituted with an alkyl,

a removal solution with a pH from 3 to 5 consisting of an alcoholic glycolic spin casting solvent, water, and an acid component selected from tricarboxylic acid, having a pK_a from 2.9 to 5, a dicarboxylic acid having a pK_a from 3 to 5 or an alkyl substituted aryl sulfonic acid,

a removal solution consisting of an alcoholic glycolic spin casting solvent, and a dithiol and

a removal solution consisting of an alcoholic glycolic spin casting solvent, and an amine,

vie) optionally baking at a temperature ranging from 100°C to 200°C,

viie) treating with an organic spin casting solvent to remove the cleaved SAM producing a substrate in which only the non-metal lines have attached a PMMA affinity self-assembled monolayer.

27. A process of coating with a PS affinity SAM composition on a chemoepitaxy array of metal and non-metal lines and selectively removing deposited SAM on the metal lines, comprising the steps:

if) using lithography processing to form a chemoepitaxy array of metal and non-metal lines on a substrate,

iif) coating a substrate with the PS affinity SAM composition of claim 18,

iiif) baking at a temperature ranging from 150°C to 200°C,

ivf) rinsing with an organic spin casting solvent to form a PS affinity self-assembled monolayer on both the metal lines and non-metal lines,

vf) treating with a removal solution to selectively remove the PS affinity self-assembled monolayer from the metal lines, wherein said removal solution is selected from the group consisting of

- a removal solution with a pH from 3 to 5 comprising, water, glycine, hydrogen peroxide solutions and a secondary acid component selected from a dicarboxylic acid, a tricarboxylic acid or an aryl sulfonic acid substituted with an alkyl,
- a removal solution with a pH from 3 to 5 consisting of an alcoholic glycolic spin casting solvent, water, and an acid component selected from tricarboxylic acid, having a pK_a from 2.9 to 5, a dicarboxylic acid having a pK_a from 3 to 5 or an alkyl substituted aryl sulfonic acid,
- a removal solution consisting of an alcoholic glycolic spin casting solvent, and a dithiol and
- a removal solution consisting of an alcoholic glycolic spin casting solvent, and an amine,

vif) optionally baking at a temperature ranging from 100°C to 200°C,

viif) treating with organic spin casting solvent to remove the cleaved PS affinity self-assembled monolayer from the metal lines producing a substrate in which only the non-metal lines have attached a PS affinity self-assembled monolayer.

28. A process of coating with a Neutral affinity SAM composition on a chemoepitaxy array of metal and non-metal lines and selectively removing deposited SAM on the metal lines, comprising the steps:

ig) using lithography processing to form a chemoepitaxy array of metal and non-metal lines on a substrate,

iig) coating a substrate with the Neutral affinity SAM composition of claim 19,

iiig) baking at a temperature ranging from 150°C to 200°C,

ivg) rinsing with an organic spin casting solvent to form a Neutral affinity self-assembled monolayer on both the metal lines and non-metal lines,

vg) treating with a removal solution to selectively remove the Neutral affinity self-assembled monolayer from the metal lines, wherein said removal solution is selected from the group consisting of

- a removal solution with a pH from 3 to 5 comprising water, glycine, hydrogen peroxide solutions and a secondary acid component selected from a dicarboxylic acid, a tricarboxylic acid or an aryl sulfonic acid substituted with an alkyl,
- a removal solution with a pH from 3 to 5 consisting of an alcoholic glycolic spin casting solvent, water, and an acid component selected from tricarboxylic acid, having a pK_a from 2.9 to 5, a dicarboxylic acid having a pK_a from 3 to 5 or an alkyl substituted aryl sulfonic acid,
- a removal solution consisting of an alcoholic glycolic spin casting solvent, and a dithiol and
- a removal solution consisting of an alcoholic glycolic spin casting solvent, and an amine,

vig) optionally baking at a temperature ranging from 100°C to 200°C,

viig) treating with an organic spin casting solvent to remove the cleaved Neutral affinity self-assembled monolayer from the metal lines producing a substrate in which only the non-metal lines have attached a Neutral affinity self-assembled monolayer.