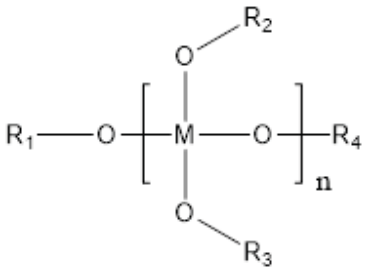
We claim:

1. A composition comprising:

a. a metal compound having the structure (I):



(I)

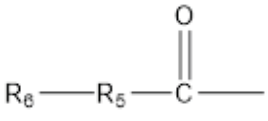
wherein,

M is a metal having a valence of four (4);

n is an integer from 1 to 20;

each of R_1, R_2, R_3, and R_4 is independently selected from the group consisting:

1) a first organic moiety having the structure (II):

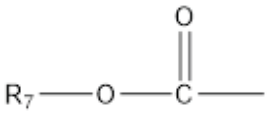


(II)

wherein,

R_5 is selected from the group consisting of C_2-C_{10} alkylenes, C_3-C_{12} branched alkylenes, C_5-C_{12} cycloalkylenes, C_2-C_{10} alkylenes containing a C=C double bond, C_3-C_{12} branched alkylenes containing a C=C double bond, and C_5-C_{12} cycloalkylenes containing a C=C double bond; and

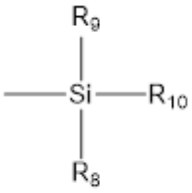
R_6 is hydrogen or an alkyloxycarbonyl having the structure (III):



(III),

wherein, R_7 is a C_1-C_8 alkyl;

2) a silicon bearing organic moiety having at least 2 carbons and having the structure (IV):

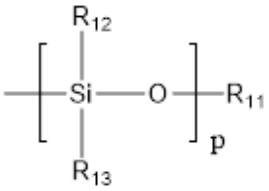


(IV)

wherein,

R_8 and R_9 are each independently selected from the group consisting of C_1-C_8 alkyls, C_3-C_{12} branched alkyls, C_1-C_8 alkyloxys, C_3-C_{12} branched alkyloxys, and C_6-C_{16} aryls;

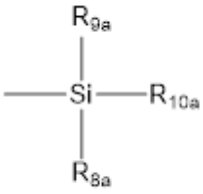
R_{10} is selected from the group consisting of C_1-C_8 alkyls, C_6-C_{16} aryls, hydroxyl and siloxanes having the structure (V):



(V)

wherein,

R_{11} is selected from the group consisting of hydrogen, C_1-C_8 alkyls, C_1-C_8 alkyls substituted with a hydroxyl, a C_6-C_{16} aryl, and a silyl moiety having structure (IVa):



(IVa)

wherein, R_{8a} and R_{9a} are each independently selected from the group consisting of C_1-C_8 alkyls, C_3-C_{12} branched alkyls, C_1-C_8 alkyloxys, C_3-C_{12} branched alkyloxys, and C_6-C_{16} aryls, and R_{10a} is selected from the group consisting of C_1-C_8 alkyls, and a C_6-C_{16} aryls;

R_{12} and R_{13} are each independently selected from the group consisting of C_1-C_8 alkyls, C_3-C_{12} branched alkyls, C_1-C_8 alkyloxys, C_3-C_{12} branched alkyloxys, and C_6-C_{16} aryls; and

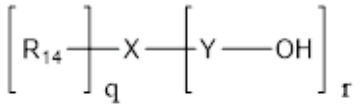
p represents the number of repeat units in the siloxane moiety (V);

3) a second organic moiety selected from the group consisting of C_2-C_8 alkyls, C_2-C_8 alkyl carboxyls, C_6-C_{20} aryl carboxyls, fluorenyl carboxyls, fluorinated

C_2-C_8 alkyl carboxyls, C_2-C_8 alkyl sulfonyls, fluorinated C_2-C_8 alkyl sufonyls, and mixtures thereof; and

4) mixtures thereof;

b. an optional component comprised of a polyol additive having the structure (VI):



(VI)

wherein,

X is C or N;

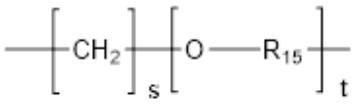
r is at least 2;

q is from 0 to 2;

provided that the sum of q and r is 4 when X is C, and the sum of q and r is 3 when X is N;

R_{14} is selected from the group consisting of hydrogen, C_1-C_8 alkyls and C_2-C_8 hydroxyalkyls;

when X is N, Y is a C_1-C_8 alkylene, or, when X is C, Y is selected from the group consisting of a direct valence bond, C_1-C_8 alkylenes and moieties having the structure (VII):



(VII)

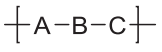
wherein,

R_{15} is a C_2-C_8 alkylene;

s is 0 to 2; and

t is 1 to 2;

c. a high performance polymer additive comprising a unit having the structure (VIII):

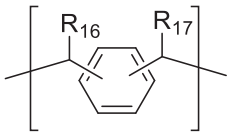


(VIII)

wherein,

A comprises a fused aromatic ring;

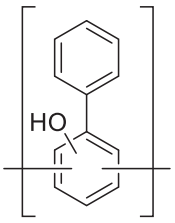
B has the structure (IX):



(IX),

wherein, R_{16} and R_{17} are each independently hydrogen or a C_1-C_4 alkyl; and

C is a hydroxybiphenyl having the structure (X):



(X); and

d. a solvent.

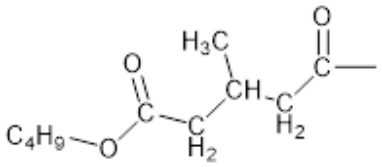
2. The composition of claim 1, wherein, M is selected from the group consisting of Zr, Ta, Hf, Ti, Sn, Si, Pb, Nb, Mo, Ge and W.

3. The composition of claim 1, wherein, component a, is a mixture of two or more different metal compounds having structure (I).

4. The composition of claim 1, wherein, at least one metal compound in the mixture does not have M equal to Si.

5. The composition of claim 1, wherein, at least one of R_1, R_2, R_3 and R_4 is selected from the group consisting of a first organic moiety having the structure (II) and a silicon bearing organic moiety having at least 2 carbons and having the structure (IV).

6. The composition of any one of claims 1 to 5, wherein, at least one of R_1, R_2, R_3 and R_4 is selected from the group consisting of:



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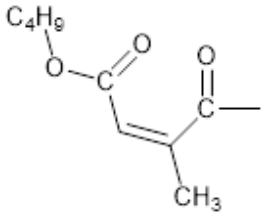

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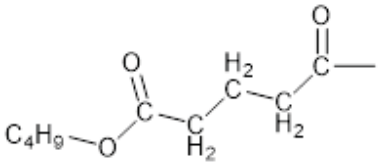
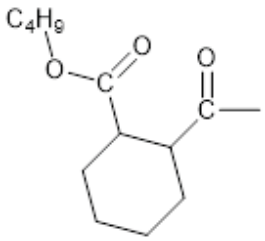


, and



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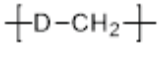
7. The composition of any one of claims 1 to 5, wherein, each of R_1, R_2, R_3 and R_4 is independently selected from the group consisting of a first organic moiety having the structure (II) and a silicon bearing organic moiety having at least 2 carbons and having the structure (IV).

8. The composition of any one of claims 1 to 5, wherein, n is 2-20.

9. The composition of any one of claims 1 to 5, wherein, n is 1.

10. The composition of claim 1, wherein, A has the structure (XI):



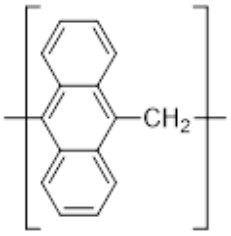
(XI)

wherein, D is a group comprising 2-8 fused aromatic rings.

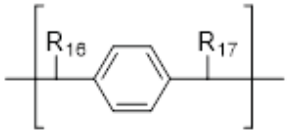
11. The composition of claim 10, wherein, D is anthracene.

12. The composition of claim 1, wherein, A is anthracene.

13. The composition of claim 1, wherein, A has the structure:



14. The composition of claim 1, wherein, B has the structure:



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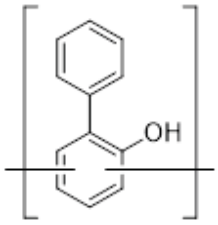
15. The composition of claim 1, wherein, C has the structure:



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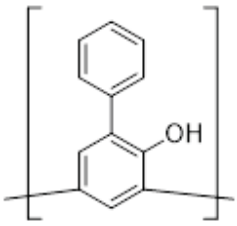
16. The composition of claim 1, wherein, C has the structure:



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17. The composition of claim 14, wherein, each of R_{16} and R_{17} is independently hydrogen or methyl.

18. A method of manufacturing an electronic device comprising:

a) applying a composition of claim 1, onto a substrate to form a coating film; and

b) heating the coating film at a temperature between 150°C and 400°C and for a time from 30 to 240 seconds, thereby forming a cured coating film.

19. The method according to claim 18, wherein, the substrate comprises a topography comprising topographical features, and further comprising one or more of the steps of:

c) removing the portion of said cured coating film overlaying a top of the topography using a chemical stripper or a fluorinated plasma etch, thereby producing filled topographical features wherein the cured coating film is flush with a top of said topographical features;

d) removing said patterned organic high carbon coating or said patterned photoresist with an oxygen plasma, thereby forming a negative tone image of said patterned photoresist or said patterned organic high carbon coating, wherein, the remaining said filled topographic features, after removal of said patterned photoresist or said patterned organic high carbon coating, forms a pattern comprised of metal oxide; and

e) using said pattern comprised of metal oxide as a patterned hard mask plasma etch barrier and etching into the semiconductor substrate with a fluorinated plasma.

20. The process according to claim 19, wherein, said topographical features have an aspect ratio of 1:1 to 10:1.

21. The process according to claim 20, wherein, said topographical features have an aspect ratio of 1 to 10 and are selected from ones that range in critical dimension (CD) from 10 nm to 100 nm.

22. A process of coating a hard mask composition on a silicon substrate comprising:

a3) applying a composition of claim 1 onto said silicon to form a coating film,

b3) baking the coating film to form a hard mask film,

c3) coating a bottom antireflective coating on top of said hard mask film,

d3) coating a photoresist on top of said antireflective coating,

e3) patterning the photoresist to form a photoresist pattern,

f3) etching through said bottom antireflective coating not protected by said photoresist pattern down to the hard mask coating with a fluorinated plasma,

g3) etching through said hard mask film not protected by the bottom antireflective coating and said photoresist pattern down to the silicon substrate with a chlorine plasma producing a patterned hard mask film, and

h3) etching with a fluorinated plasma into the silicon substrate in those area not protected by said patterned hard mask film producing topographical features into the silicon features.