CLAIMS

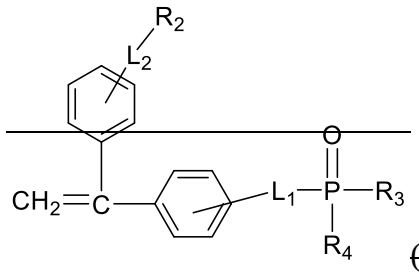
What is claimed is:

1. A compound of structure (I), wherein

R_2 is H, a halide, a C-1 to C-8 linear alkyl, a C-3 to C-8 branched alkyl, a C-3 to C-8 cyclic alkyl, a C-1 to C-8 linear alkyloxy, a C-3 to C-8 branched alkyloxy, a C-3 to C-8 cyclic alkyloxy, or -P(=O)(R_3)(R_4);

R_3 and R_4 are independently an aryl, an alkylenearyl (i.e. -alkylene-aryl), a C-2 to C-8 alkyleneoxyalkyl (i.e. -alkylene-O-alkyl), a C-2 to C-8 haloalkyl, a C-1 to C-8 linear alkyl, a C-3 to C-8 branched alkyl, a C-3 to C-8 cyclic alkyl, a C-1 to C-8 linear alkyloxy, a C-3 to C-8 branched alkyloxy or a C-3 to C-8 cyclic alkyloxy; and

L_1 and L_2 are independently a direct valence bond, or a C-1 to C-8 alkylene spacer group;



(I).

2. The compound of claim 1, wherein

R_2 is H, a C-1 to C-8 linear alkyl, a C-3 to C-8 branched alkyl, a C-3 to C-8 cyclic alkyl, a C-1 to C-8 linear alkyloxy, a C-3 to C-8 branched alkyloxy, a C-3 to C-8 cyclic alkyloxy, or -P(=O)(R_3)(R_4);

R_3 and R_4 are independently an aryl, an alkylenearyl (i.e. -alkylene-aryl), a C-2 to C-8 alkyleneoxyalkyl (i.e. -alkylene-O-alkyl), a C-2 to C-8 haloalkyl, a C-1 to C-8 linear alkyl, a C-3 to C-8 branched alkyl, a C-3 to C-8 cyclic alkyl, a C-1 to C-8 linear alkyloxy, a C-3 to C-8 branched alkyloxy or a C-3 to C-8 cyclic alkyloxy; and

L_1 and L_2 are independently a direct valence bond, or a C-1 to C-8 alkylene spacer group.

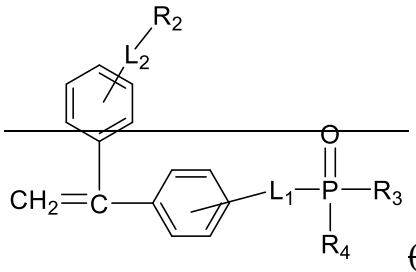
3. The compound of claims 1 or 2, wherein said compound has structure (Ia), wherein

R_2 is H, or -P(=O)(R_3)(R_4);

R_3 and R_4 are independently an aryl, an alkylenearyl (i.e. -alkylene-aryl), a C-2 to C-8 alkyleneoxyalkyl (i.e. -alkylene-O-alkyl), a C-2 to C-8 haloalkyl, a C-1 to C-8 linear alkyl, a C-3 to

C-8 branched alkyl, a C-3 to C-8 cyclic alkyl, a C-1 to C-8 linear alkyloxy, a C-3 to C-8 branched alkyloxy or a C-3 to C-8 cyclic alkyloxy; and

L_1 and L_2 are independently a direct valence bond, or a C-1 to C-8 alkylene spacer group;



(Ia).

4. The compound of claim 3, wherein

R_3 is a C-1 to C-8 linear alkyl, a C-3 to C-8 branched alkyl, a C-3 to C-8 cyclic alkyl, C-1 to C-8 linear alkyloxy, a C-3 to C-8 branched alkyloxy or a C-3 to C-8 cyclic alkyloxy; and

R_4 is a C-1 to C-8 linear alkyloxy, a C-3 to C-8 branched alkyloxy or a C-3 to C-8 cyclic alkyloxy.

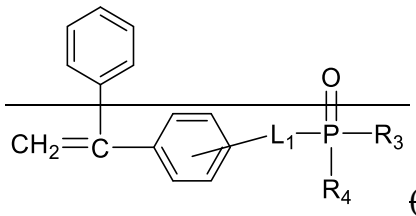
5. The compound of claims 3 or 4, wherein R_3 and R_4 are independently selected from a C-1 to C-8 linear alkyloxy, a C-3 to C-8 branched alkyloxy or a C-3 to C-8 cyclic alkyloxy.

6. The compound of any one of claims 3 to 5, wherein L_1 and L_2 are both a direct valence bond.

7. The compound of claims 1 or 2, wherein said compound has structure (Ib), wherein

R_3 and R_4 are independently an aryl, an alkylenearyl (i.e. -alkylene-aryl), a C-2 to C-8 alkyleneoxyalkyl (i.e. -alkylene-O-alkyl), a C-2 to C-8 haloalkyl, a C-1 to C-8 linear alkyl, a C-3 to C-8 branched alkyl, a C-3 to C-8 cyclic alkyl, a C-1 to C-8 linear alkyloxy, a C-3 to C-8 branched alkyloxy or a C-3 to C-8 cyclic alkyloxy; and

L_1 is a direct valence bond, or a C-1 to C-8 alkylene spacer group;



(Ib).

8. The compound of claim 7, wherein

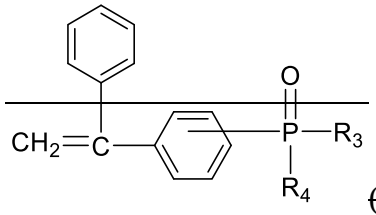
R_3 is a C-1 to C-8 linear alkyl, a C-3 to C-8 branched alkyl, a C-3 to C-8 cyclic alkyl, C-1 to C-8 linear alkyloxy, a C-3 to C-8 branched alkyloxy or a C-3 to C-8 cyclic alkyloxy; and

~~R_4 is a C-1 to C-8 linear alkyloxy, a C-3 to C-8 branched alkyloxy or a C-3 to C-8 cyclic alkyloxy.~~

~~**9.** The compound of claims 7 or 8, wherein~~

~~R_3 and R_4 are independently selected from a C-1 to C-8 linear alkyloxy, a C-3 to C-8 branched alkyloxy or a C-3 to C-8 cyclic alkyloxy.~~

~~**10.** The compound of any one of claims 7 to 9, wherein L_1 is a direct valence bond and has structure (1c);~~



~~(Ic).~~

~~**11.**~~ A polymer of structure (II), wherein

R_1 is H, a C-1 to C-8 linear alkyl, a C-3 to C-8 branched alkyl, a C-3 to C-8 cyclic alkyl, an aryl, or an alkylenearyl ~~(i.e. -alkylene-aryl)~~;

R_2 is H, a halide, a C-1 to C-8 linear alkyl, a C-3 to C-8 branched alkyl, a C-3 to C-8 cyclic alkyl, a C-1 to C-8 linear alkyloxy, a C-3 to C-8 branched alkyloxy, a C-3 to C-8 cyclic alkyloxy, or -P(=O)(R_3)(R_4);

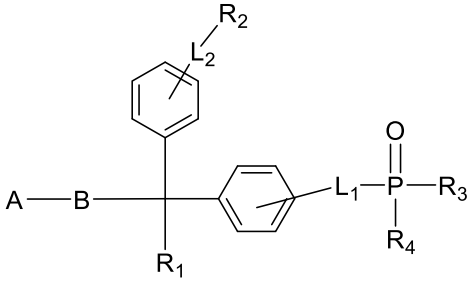
R_3 and R_4 are independently an aryl, an alkylenearyl ~~(i.e. -alkylene-aryl)~~, a C-2 to C-8 alkyleneoxyalkyl ~~(i.e. -alkylene-O-alkyl)~~, a C-2 to C-8 haloalkyl, a C-1 to C-8 linear alkyl, a C-3 to C-8 branched alkyl, a C-3 to C-8 cyclic alkyl, a C-1 to C-8 linear alkyloxy, a C-3 to C-8 branched alkyloxy or a C-3 to C-8 cyclic alkyloxy;

L_1 and L_2 are independently a direct valence bond, or a C-1 to C-8 alkylene spacer group;

B is a direct valence bond, or a methylene spacer (-CH_2-)

A is a styrenic polymer chain, or an acrylic polymer chain; and

said polymer has a polydispersity ranging from 1 to 1.1;



(II).

~~12.~~ The polymer of claim ~~1~~1, wherein

R_1 is H;

R_2 is H, a C-1 to C-8 linear alkyl, a C-3 to C-8 branched alkyl, a C-3 to C-8 cyclic alkyl, a C-1 to C-8 linear alkyloxy, a C-3 to C-8 branched alkyloxy, a C-3 to C-8 cyclic alkyloxy, or $-P(=O)(R_3)(R_4)$;

R_3 and R_4 are independently an aryl, an alkylenearyl ~~(i.e. -alkylene-aryl)~~, a C-2 to C-8 alkyleneoxyalkyl ~~(i.e. -alkylene-O-alkyl)~~, a C-2 to C-8 haloalkyl, a C-1 to C-8 linear alkyl, a C-3 to C-8 branched alkyl, a C-3 to C-8 cyclic alkyl, a C-1 to C-8 linear alkyloxy, a C-3 to C-8 branched alkyloxy or a C-3 to C-8 cyclic alkyloxy;

L_1 and L_2 are independently a direct valence bond, or a C-1 to C-8 alkylene spacer group; and

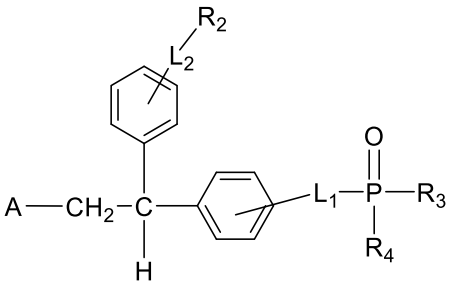
A is a styrenic polymer chain.

~~13.~~ The polymer of claims ~~1~~1 or ~~1~~2, having structure (IIa), wherein

R_2 is H, or $-P(=O)(R_3)(R_4)$;

R_3 and R_4 are independently an aryl, an alkylenearyl ~~(i.e. -alkylene-aryl)~~, a C-2 to C-8 alkyleneoxyalkyl ~~(i.e. -alkylene-O-alkyl)~~, a C-2 to C-8 haloalkyl, a C-1 to C-8 linear alkyl, a C-3 to C-8 branched alkyl, a C-3 to C-8 cyclic alkyl, a C-1 to C-8 linear alkyloxy, a C-3 to C-8 branched alkyloxy or a C-3 to C-8 cyclic alkyloxy; and

L_1 and L_2 are independently a direct valence bond, or a C-1 to C-8 alkylene spacer group;



(IIa).

~~14.~~ ~~The polymer of claims 13 wherein~~

~~R_3 is a C-1 to C-8 linear alkyl, a C-3 to C-8 branched alkyl, a C-3 to C-8 cyclic alkyl, C-1 to C-8 linear alkyloxy, a C-3 to C-8 branched alkyloxy or a C-3 to C-8 cyclic alkyloxy; and~~

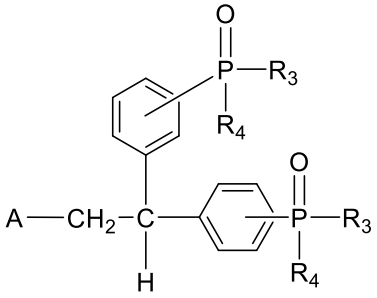
~~R_4 is a C-1 to C-8 linear alkyloxy, a C-3 to C-8 branched alkyloxy or a C-3 to C-8 cyclic alkyloxy.~~

~~15.~~ ~~The polymer of claims 13, or 14, wherein~~

~~R_3 and R_4 are independently selected from a C-1 to C-8 linear alkyloxy, a C-3 to C-8 branched alkyloxy or a C-3 to C-8 cyclic alkyloxy.~~

~~**16.** The polymer of any one of claims 13 to 15, wherein L_1 and L_2 are both a direct valence bond.~~

~~17~~4. The polymer of ~~any of~~ claim~~s~~ ~~1~~3 ~~to 16~~ which has structure (IIb);

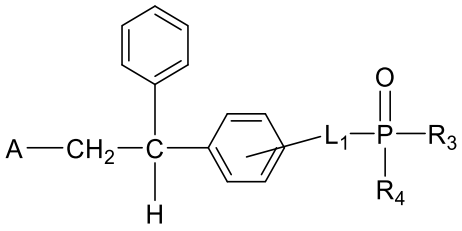


(IIb).

~~18~~5. The polymer of claims ~~1~~1 or ~~1~~2, wherein it has structure (IIc), wherein

R_3 and R_4 are independently an aryl, an alkylenearyl ~~(i.e. -alkylene-aryl)~~, a C-2 to C-8 alkyleneoxyalkyl ~~(i.e. -alkylene-O-alkyl)~~, a C-2 to C-8 haloalkyl, a C-1 to C-8 linear alkyl, a C-3 to C-8 branched alkyl, a C-3 to C-8 cyclic alkyl, a C-1 to C-8 linear alkyloxy, a C-3 to C-8 branched alkyloxy or a C-3 to C-8 cyclic alkyloxy; and

L_1 is a direct valence bond, or a C-1 to C-8 alkylene spacer group;



(IIc).

~~**19.** The polymer of claim 18, wherein~~

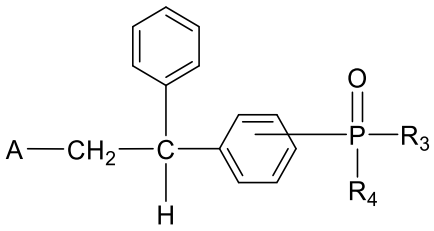
~~R_3 is a C-1 to C-8 linear alkyl, a C-3 to C-8 branched alkyl, a C-3 to C-8 cyclic alkyl, C-1 to C-8 linear alkyloxy, a C-3 to C-8 branched alkyloxy or a C-3 to C-8 cyclic alkyloxy; and~~

~~R_4 is a C-1 to C-8 linear alkyloxy, a C-3 to C-8 branched alkyloxy or a C-3 to C-8 cyclic alkyloxy.~~

~~**20.** The polymer of claims 18 or 19, wherein~~

~~R_3 and R_4 are independently selected from a C-1 to C-8 linear alkyloxy, a C-3 to C-8 branched alkyloxy or a C-3 to C-8 cyclic alkyloxy.~~

~~21~~6. The polymer of ~~any one of~~ claim~~s 18 to 20~~ 5, which has structure (IId);



(IId).

~~22~~7. The polymer of claim ~~1~~1, wherein

R_1 is a C-1 to C-8 linear alkyl, a C-3 to C-8 branched alkyl or a C-3 to C-8 cyclic alkyl, an aryl, an alkylenearyl ~~(i.e. -alkylene-aryl)~~;

R_2 is H, a C-1 to C-8 linear alkyl, a C-3 to C-8 branched alkyl, a C-3 to C-8 cyclic alkyl, a C-1 to C-8 linear alkyloxy, a C-3 to C-8 branched alkyloxy, a C-3 to C-8 cyclic alkyloxy, or -P(=O)(R_3)(R_4);

R_3 and R_4 are independently an aryl, an alkylenearyl ~~(i.e. -alkylene-aryl)~~, a C-2 to C-8 alkyleneoxyalkyl ~~(i.e. -alkylene-O-alkyl)~~, a C-2 to C-8 haloalkyl, a C-1 to C-8 linear alkyl, a C-3 to C-8 branched alkyl, a C-3 to C-8 cyclic alkyl, a C-1 to C-8 linear alkyloxy, a C-3 to C-8 branched alkyloxy or a C-3 to C-8 cyclic alkyloxy;

L_1 and L_2 are independently a direct valence bond, or a C-1 to C-8 alkylene spacer group; and

A is an acrylic polymer chain.

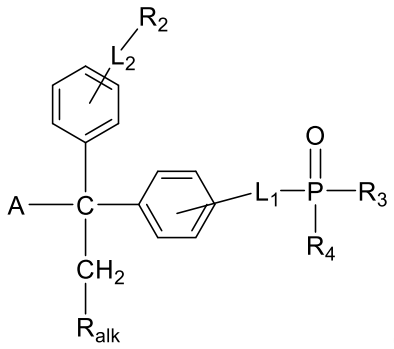
~~23~~8. The polymer of claims ~~1~~1 or ~~22~~ 7, wherein it has structure (IIf), wherein

R_{alk} is a C-1 to C-8 linear alkyl, a C-3 to C-8 branched alkyl, a C-3 to C-8 cyclic alkyl;

R_2 is H, or -P(=O)(R_3)(R_4);

R_3 and R_4 are independently an aryl, an alkylenearyl ~~(i.e. -alkylene-aryl)~~, a C-2 to C-8 alkyleneoxyalkyl ~~(i.e. -alkylene-O-alkyl)~~, a C-2 to C-8 haloalkyl, a C-1 to C-8 linear alkyl, a C-3 to C-8 branched alkyl, a C-3 to C-8 cyclic alkyl, a C-1 to C-8 linear alkyloxy, a C-3 to C-8 branched alkyloxy or a C-3 to C-8 cyclic alkyloxy; and

L_1 and L_2 are independently a direct valence bond, or a C-1 to C-8 alkylene spacer group;



(IIf).

~~**24.** The polymer of claims 23, wherein~~

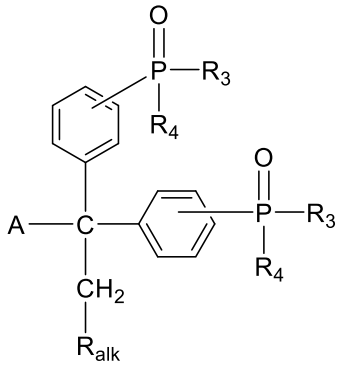
~~R_3 is a C-1 to C-8 linear alkyl, a C-3 to C-8 branched alkyl, a C-3 to C-8 cyclic alkyl, C-1 to C-8 linear alkyloxy, a C-3 to C-8 branched alkyloxy or a C-3 to C-8 cyclic alkyloxy; and~~

~~R_4 is a C-1 to C-8 linear alkyloxy, a C-3 to C-8 branched alkyloxy or a C-3 to C-8 cyclic alkyloxy.~~

~~**25.** The polymer of claims 23 or 24, wherein R_3 and R_4 are independently selected from a C-1 to C-8 linear alkyloxy, a C-3 to C-8 branched alkyloxy or a C-3 to C-8 cyclic alkyloxy.~~

~~**26.** The polymer of any one of claims 23 to 25, wherein L_1 and L_2 are both a direct valence bond.~~

~~**27**~~**9.** The polymer of ~~any one of~~ claim~~s 23 to 26~~ 8, which has structure (IIg);

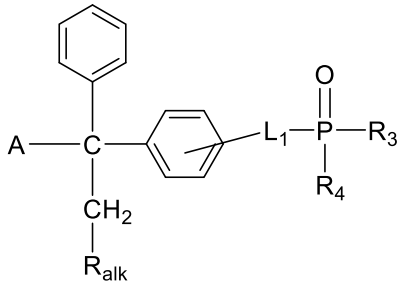


(IIg).

~~**28**~~**10.** The polymer of claims ~~1~~1 or ~~22~~ 7, wherein it has structure (IIh), wherein

R_3 and R_4 are independently an aryl, an alkylenearyl ~~(i.e. -alkylene-aryl)~~, a C-2 to C-8 alkyleneoxyalkyl ~~(i.e. -alkylene-O-alkyl)~~, a C-2 to C-8 haloalkyl, a C-1 to C-8 linear alkyl, a C-3 to C-8 branched alkyl, a C-3 to C-8 cyclic alkyl, a C-1 to C-8 linear alkyloxy, a C-3 to C-8 branched alkyloxy or a C-3 to C-8 cyclic alkyloxy; and

L_1 is a direct valence bond, or a C-1 to C-8 alkylene spacer group;



(IIh).

~~**29.** The polymer of claim 28, wherein~~

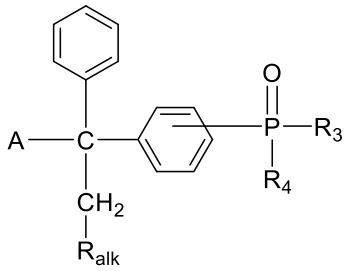
~~R_3 is a C-1 to C-8 linear alkyl, a C-3 to C-8 branched alkyl, a C-3 to C-8 cyclic alkyl, C-1 to C-8 linear alkyloxy, a C-3 to C-8 branched alkyloxy or a C-3 to C-8 cyclic alkyloxy; and~~

~~R_4 is a C-1 to C-8 linear alkyloxy, a C-3 to C-8 branched alkyloxy or a C-3 to C-8 cyclic alkyloxy.~~

~~**30.** The polymer of claims 28 or 29, wherein~~

~~R_3 and R_4 are independently selected from a C-1 to C-8 linear alkyloxy, a C-3 to C-8 branched alkyloxy or a C-3 to C-8 cyclic alkyloxy.~~

~~31~~11. The polymer of ~~any one of~~ claim~~s~~ 10~~28 to 30~~, wherein L_1 and L_2 are both a direct valence bond and the polymer of structure (II) has structure (IIi);



(IIi).

3~~1~~2. The polymer of any one of claims ~~12~~ 1 to~~21~~ 6, wherein said polymer is a styrenic polymer having structure (III), wherein

R_{e1} is H, a C-1 to C-8 linear alkyl, a C-3 to C-8 branched alkyl, a C-3 to C-8 cyclic alkyl, an aryl, or an alkylenearyl ~~(i.e. -alkylene-aryl)~~;

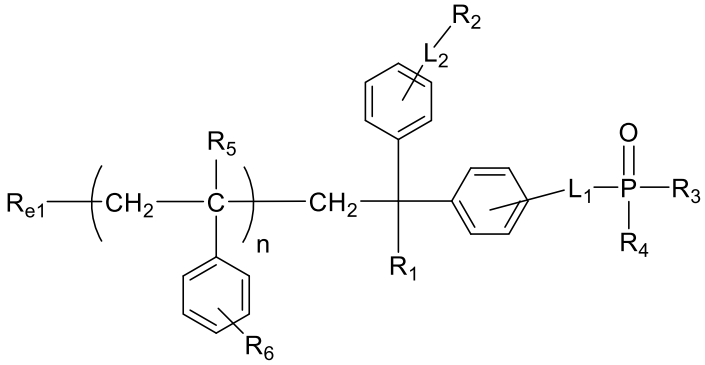
R_2 is H, a halide, a C-1 to C-8 linear alkyl, a C-3 to C-8 branched alkyl, a C-3 to C-8 cyclic alkyl, a C-1 to C-8 linear alkyloxy, a C-3 to C-8 branched alkyloxy, a C-3 to C-8 cyclic alkyloxy, or -P(=O)(R_3)(R_4);

R_3 and R_4 are independently an aryl, an alkylenearyl ~~(i.e. -alkylene-aryl)~~, a C-2 to C-8 alkyleneoxyalkyl ~~(i.e. -alkylene-O-alkyl)~~, a C-2 to C-8 haloalkyl, a C-1 to C-8 linear alkyl, a C-3 to C-8 branched alkyl, a C-3 to C-8 cyclic alkyl, a C-1 to C-8 linear alkyloxy, a C-3 to C-8 branched alkyloxy or a C-3 to C-8 cyclic alkyloxy;

L_1 and L_2 are independently a direct valence bond, or a C-1 to C-8 alkylene spacer group;

R_5 is H, a C-1 to C-4 linear alkyl; R_6 is H, a halide, a C-1 to C-8 linear alkyl, a C-3 to C-8 branched alkyl, a C-3 to C-8 cyclic alkyl, a C-1 to C-8 linear alkyloxy, a C-3 to C-8 branched alkyloxy or a C-3 to C-8 cyclic alkyloxy ; n is the number of repeat units; and

said styrenic polymer has a polydispersity ranging from 1 to 1.1;



(III).

~~**33.** The polymer of claim 32, wherein~~

~~R_{e1} is H;~~

~~R_2 is H, a C-1 to C-8 linear alkyl, a C-3 to C-8 branched alkyl, a C-3 to C-8 cyclic alkyl, a C-1 to C-8 linear alkyloxy, a C-3 to C-8 branched alkyloxy, a C-3 to C-8 cyclic alkyloxy, or -P(=O)(R_3)(R_4);~~

~~R_3 and R_4 are independently an aryl, an alkylenearyl (i.e. -alkylene-aryl), a C-2 to C-8 alkyleneoxyalkyl (i.e. -alkylene-O-alkyl), a C-2 to C-8 haloalkyl, a C-1 to C-8 linear alkyl, a C-3 to C-8 branched alkyl, a C-3 to C-8 cyclic alkyl, a C-1 to C-8 linear alkyloxy, a C-3 to C-8 branched alkyloxy or a C-3 to C-8 cyclic alkyloxy; and~~

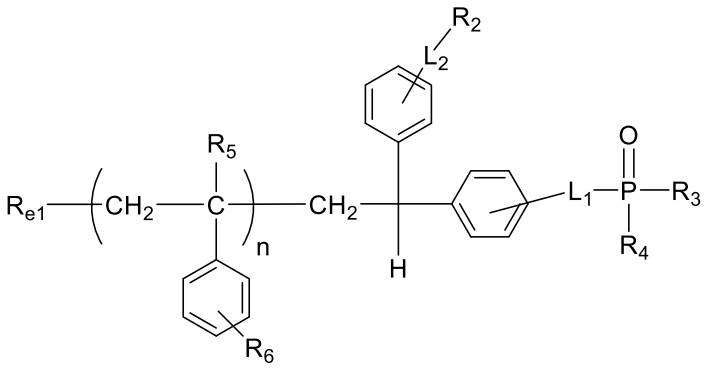
~~L_1 and L_2 are independently a direct valence bond, or a C-1 to C-8 alkylene spacer~~

~~34~~13. The polymer of claim~~s 32 or 33~~ 12, wherein it has structure (IIIa), wherein

R_2 is H, or -P(=O)(R_3)(R_4);

R_3 and R_4 are independently an aryl, an alkylenearyl ~~(i.e. -alkylene-aryl)~~, a C-2 to C-8 alkyleneoxyalkyl ~~(i.e. -alkylene-O-alkyl)~~, a C-2 to C-8 haloalkyl, a C-1 to C-8 linear alkyl, a C-3 to C-8 branched alkyl, a C-3 to C-8 cyclic alkyl, a C-1 to C-8 linear alkyloxy, a C-3 to C-8 branched alkyloxy or a C-3 to C-8 cyclic alkyloxy; and

L_1 and L_2 are independently a direct valence bond, or a C-1 to C-8 alkylene spacer group;



(IIIa).

~~**35.** The polymer of claim 34, wherein~~

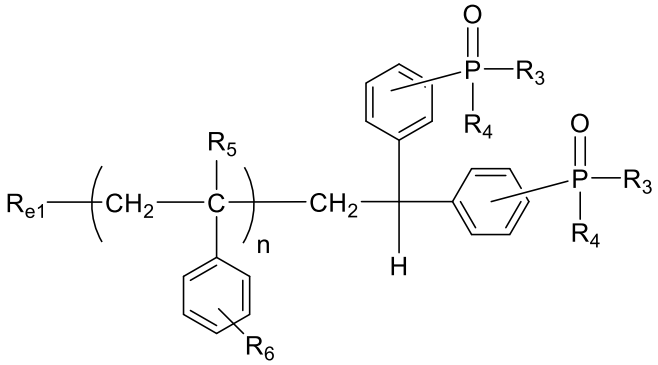
~~R_3 is a C-1 to C-8 linear alkyl, a C-3 to C-8 branched alkyl, a C-3 to C-8 cyclic alkyl, C-1 to C-8 linear alkyloxy, a C-3 to C-8 branched alkyloxy or a C-3 to C-8 cyclic alkyloxy;~~

~~R_4 is a C-1 to C-8 linear alkyloxy, a C-3 to C-8 branched alkyloxy or a C-3 to C-8 cyclic alkyloxy.~~

~~**36.** The polymer of claims 34 or 35, wherein R_3 and R_4 are independently selected from a C-1 to C-8 linear alkyloxy, a C-3 to C-8 branched alkyloxy or a C-3 to C-8 cyclic alkyloxy.~~

~~**37.** The polymer of any one of claims 34 to 36, wherein L_1 and L_2 are both a direct valence bond.~~

~~38~~14. The polymer of ~~any one of~~ claim~~s 34 to 37~~ 13, which has structure (IIIb);

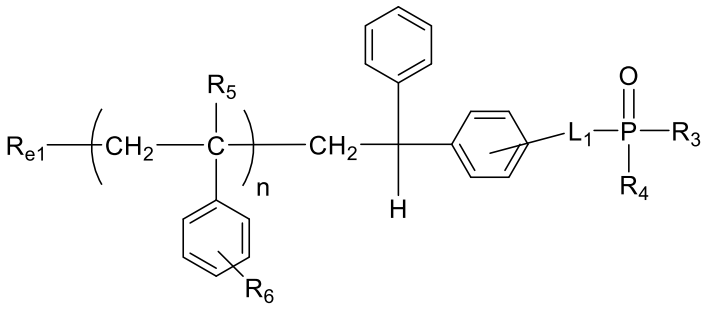


(IIIb).

~~39~~15. The polymer ~~of any one of~~ claim 12 or 13~~s 32 to 34~~, wherein it has structure (IIIc), wherein

R_3 and R_4 are independently an aryl, an alkylenearyl ~~(i.e. -alkylene-aryl)~~, a C-2 to C-8 alkyleneoxyalkyl ~~(i.e. -alkylene-O-alkyl)~~, a C-2 to C-8 haloalkyl, a C-1 to C-8 linear alkyl, a C-3 to C-8 branched alkyl, a C-3 to C-8 cyclic alkyl, a C-1 to C-8 linear alkyloxy, a C-3 to C-8 branched alkyloxy or a C-3 to C-8 cyclic alkyloxy; and

L_1 is a direct valence bond, or a C-1 to C-8 alkylene spacer group;



(IIIc).

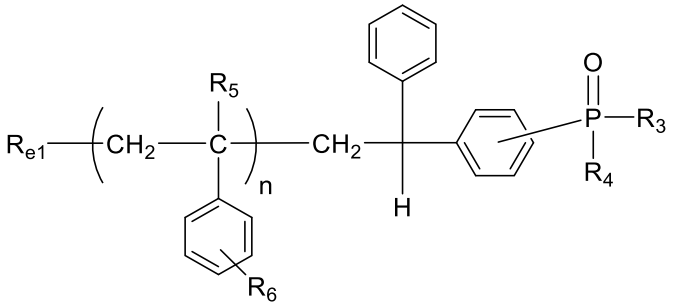
~~**40.** The polymer of claim 39, wherein~~

~~R_3 is a C-1 to C-8 linear alkyl, a C-3 to C-8 branched alkyl, a C-3 to C-8 cyclic alkyl, C-1 to C-8 linear alkyloxy, a C-3 to C-8 branched alkyloxy or a C-3 to C-8 cyclic alkyloxy; and~~

~~R_4 is a C-1 to C-8 linear alkyloxy, a C-3 to C-8 branched alkyloxy or a C-3 to C-8 cyclic alkyloxy.~~

~~**41.** The polymer of claims 39 or 40, wherein R_3 and R_4 are independently selected from a C-1 to C-8 linear alkyloxy, a C-3 to C-8 branched alkyloxy or a C-3 to C-8 cyclic alkyloxy;~~

42<u>16</u>. The polymer ~~of any one~~ of claim <u>15</u>~~s 37 to 39~~, wherein L_1 ~~and L_2 are both~~ <u>is</u> a direct valence bond and has structure (IIId);



(IIId).

43<u>17</u>. The polymer of any one of claims ~~22 to 31~~ <u>1 or 7 to 11</u> wherein said polymer is an acrylic polymer having structure (IV), wherein

R_{alk} is a C-1 to C-8 linear alkyl, a C-3 to C-8 branched alkyl or a C-3 to C-8 cyclic alkyl;

R_2 is H, a halide, a C-1 to C-8 linear alkyl, a C-3 to C-8 branched alkyl, a C-3 to C-8 cyclic alkyl, a C-1 to C-8 linear alkyloxy, a C-3 to C-8 branched alkyloxy, a C-3 to C-8 cyclic alkyloxy, or -P(=O)(R_3)(R_4);

R_3 and R_4 are independently an aryl, an alkylenearyl ~~(i.e. -alkylene-aryl)~~, a C-2 to C-8 alkyleneoxyalkyl ~~(i.e. -alkylene-O-alkyl)~~, a C-2 to C-8 haloalkyl, a C-1 to C-8 linear alkyl, a C-3 to C-8 branched alkyl, a C-3 to C-8 cyclic alkyl, a C-1 to C-8 linear alkyloxy, a C-3 to C-8 branched alkyloxy or a C-3 to C-8 cyclic alkyloxy;

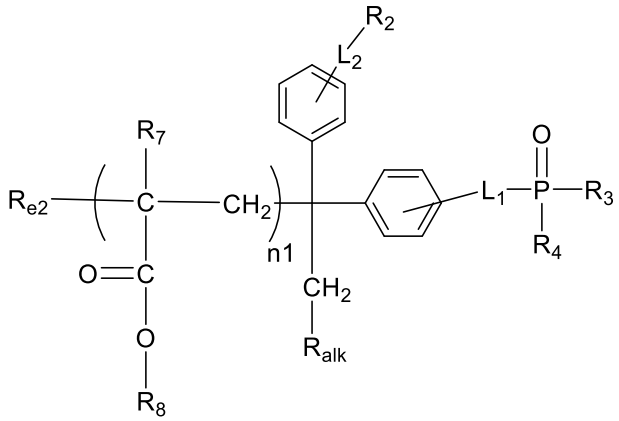
L_1 and L_2 are independently a direct valence bond, or a C-1 to C-8 alkylene spacer group;

R_7 is H or a C-1 to C-4 linear alkyl;

R_8 is a C-1 to C-8 linear alkyl, a C-3 to C-8 branched alkyl or a C-3 to C-8 cyclic alkyl;

R_{e2} is and end group selected from H, a C-1 to C-8 linear alkyl, a C-3 to C-8 branched alkyl, or a C-3 to C-8 cyclic alkyl;

n1 is the number of repeat units in said acrylate polymer of structure (IV); and said acrylic polymer has a polydispersity ranging from 1 to 1.1;



(IV).

44. ~~The polymer of claim 43, wherein~~

~~R_{alk} is a C-1 to C-8 linear alkyl, a C-3 to C-8 branched alkyl, a C-3 to C-8 cyclic alkyl;~~

~~R_{e2} is H, a C-1 to C-8 linear alkyl, a C-3 to C-8 branched alkyl, a C-3 to C-8 cyclic alkyl, a C-1 to C-8 linear alkyloxy, a C-3 to C-8 branched alkyloxy, a C-3 to C-8 cyclic alkyloxy, or -P(=O)(R_3)(R_4);~~

~~R_3 and R_4 are independently an aryl, an alkylenearyl (i.e. -alkylene-aryl), a C-2 to C-8 alkyleneoxyalkyl (i.e. -alkylene-O-alkyl), a C-2 to C-8 haloalkyl, a C-1 to C-8 linear alkyl, a C-3 to C-8 branched alkyl, a C-3 to C-8 cyclic alkyl, a C-1 to C-8 linear alkyloxy, a C-3 to C-8 branched alkyloxy or a C-3 to C-8 cyclic alkyloxy; and~~

~~L_1 and L_2 are independently a direct valence bond, or a C-1 to C-8 alkylene spacer group.~~

~~45~~18. The polymer of claim 17~~s 43 or 44~~, wherein it has structure (IVa), wherein

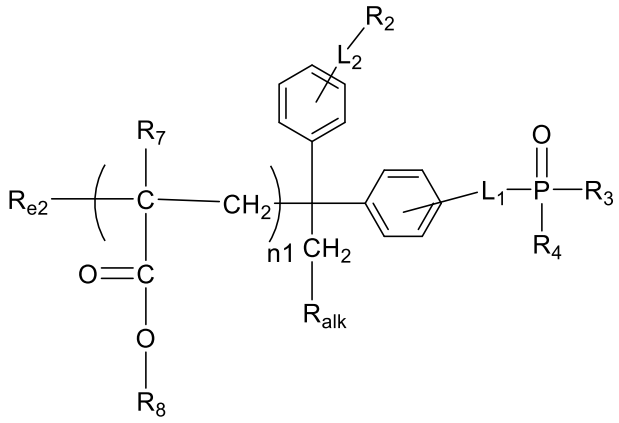
R_{alk} is a C-1 to C-8 linear alkyl, a C-3 to C-8 branched alkyl, a C-3 to C-8 cyclic alkyl;

R_2 is H, or -P(=O)(R_3)(R_4);

R_3 and R_4 are independently an aryl, an alkylenearyl ~~(i.e. -alkylene-aryl)~~, a C-2 to C-8 alkyleneoxyalkyl ~~(i.e. -alkylene-O-alkyl)~~, a C-2 to C-8 haloalkyl, a C-1 to C-8 linear alkyl, a C-3 to

C-8 branched alkyl, a C-3 to C-8 cyclic alkyl, a C-1 to C-8 linear alkyloxy, a C-3 to C-8 branched alkyloxy or a C-3 to C-8 cyclic alkyloxy; and

L_1 and L_2 are independently a direct valence bond, or a C-1 to C-8 alkylene spacer group;



(IVa).

~~**46.** The polymer of claim 45, wherein~~

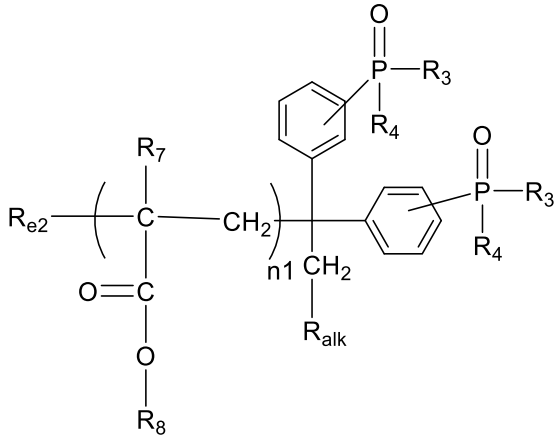
~~R_3 is a C-1 to C-8 linear alkyl, a C-3 to C-8 branched alkyl, a C-3 to C-8 cyclic alkyl, C-1 to C-8 linear alkyloxy, a C-3 to C-8 branched alkyloxy or a C-3 to C-8 cyclic alkyloxy; and~~

~~R_4 is a C-1 to C-8 linear alkyloxy, a C-3 to C-8 branched alkyloxy or a C-3 to C-8 cyclic alkyloxy.~~

~~**47.** The polymer of claims 45 or 46, wherein R_3 and R_4 are independently selected from a C-1 to C-8 linear alkyloxy, a C-3 to C-8 branched alkyloxy or a C-3 to C-8 cyclic alkyloxy.~~

~~**48.** The polymer of any one of claims 45 to 47, wherein L_1 and L_2 are both a direct valence bond.~~

4<u>1</u>9. The polymer of ~~any one of~~ claim <u>18</u>~~s 45 to 48~~, which has structure (IVb);

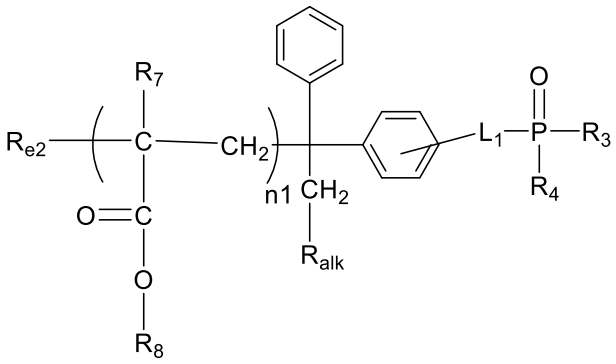


(IVb).

~~50~~<u>20</u>. The polymer of claim <u>17</u>~~s 43 or 44~~, wherein it has structure (IVc), wherein

R_3 and R_4 are independently an aryl, an alkylenearyl ~~(i.e. -alkylene-aryl)~~, a C-2 to C-8 alkyleneoxyalkyl ~~(i.e. -alkylene-O-alkyl)~~, a C-2 to C-8 haloalkyl, a C-1 to C-8 linear alkyl, a C-3 to C-8 branched alkyl, a C-3 to C-8 cyclic alkyl, a C-1 to C-8 linear alkyloxy, a C-3 to C-8 branched alkyloxy or a C-3 to C-8 cyclic alkyloxy; and

L_1 is a direct valence bond, or a C-1 to C-8 alkylene spacer group;



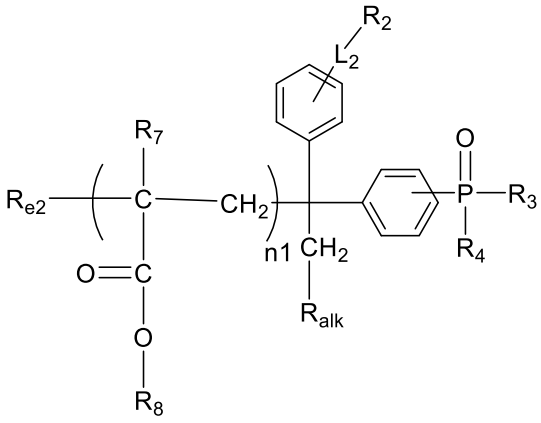
(IVc).

~~**51.** The polymer of claim 50, wherein R_3 is a C-1 to C-8 linear alkyl, a C-3 to C-8 branched alkyl, a C-3 to C-8 cyclic alkyl, C-1 to C-8 linear alkyloxy, a C-3 to C-8 branched alkyloxy or a C-3 to C-8 cyclic alkyloxy;~~

~~R_4 is a C-1 to C-8 linear alkyloxy, a C-3 to C-8 branched alkyloxy or a C-3 to C-8 cyclic alkyloxy.~~

~~**52.** The polymer of claims 50 or 51, wherein R_3 and R_4 are independently selected from a C-1 to C-8 linear alkyloxy, a C-3 to C-8 branched alkyloxy or a C-3 to C-8 cyclic alkyloxy.~~

~~53~~21. The polymer of ~~any one of~~ claims ~~43~~ 17 to ~~52~~ 20, wherein L_1 is a direct valence bond and the polymer has structure (IVd);



(IVd).

~~54~~22. A composition comprising a polymer according to any one of claims 1 to 21 and a spin casting solvent.

~~55~~23. A process of forming a pinning layer brush selectively on a substrate which comprises both metallic surface areas and a non-metallic surface area, comprising the steps;

i) coating said composition according to claim ~~54~~ 22, on a said substrate, forming a film,

ii) baking said film at a temperature from ~~about~~ 120°C to ~~about~~ 250°C for ~~about~~ 1 minute to ~~about~~ 1 hour, to form a baked film,

iii) washing said baked film with a solvent to remove ungrafted polymer, forming a pinning layer brush only on said metallic surface areas of said substrate.

~~**56.** The process according to claim 55 wherein said metallic surface areas are selected from the group consisting of Cu, Au, Ag, W, Ta, Nb, Fe, Ni, Co, Mo, Al, Pt, Rh, Pb, Cd, Ti, Zr, Hf, and Ru and said non-metallic surface areas are selected from the group consisting of Si, SiOx (silicon oxide), SiNx (silicon nitride), SiON (silicon oxynitride) and organic dielectric substrates.~~

~~57~~**24.** A process comprising the steps;

ia) coating said composition according to claim ~~54~~ 22, on a substrate which comprises both metallic surface areas and non-metallic surface areas, forming a film,

iia) baking said film at a temperature from ~~about~~ 120°C to ~~about~~ 250°C for ~~about~~ 1 minute to ~~about~~ 1 hour, to form a baked film,

iiia) washing said baked film with a solvent to remove ungrafted polymer, forming a grafted substrate wherein pinning layer brushes are only present on said metallic surface areas of said substrate,

iva) coating said grafted substrate with a neutral layer composition, forming a neutral layer coating,

va) curing said neutral layer coating,

via) washing away, with a solvent, uncured neutral layer, leaving in said non-metallic areas of said substrate a neutral directing brush forming on said substrate a chemoepitaxy directing layer,

viia) coating said chemoepitaxy directing layer with a block copolymer solution, forming a coating of block copolymer,

viiia) annealing said coating of block copolymer, to form a directed self-assembled film of the block copolymer on said chemoepitaxy directing layer.

~~**58.** The process according to claim 57, wherein in said substrate, said metallic surface areas are Tungsten and said non-metallic surface areas are Silicon or Silicon oxide.~~

~~**59.** The process according to claims 57 or 58, wherein said block copolymer is a block copolymer comprised of styrenic repeat units and alkyl acrylic repeat units.~~

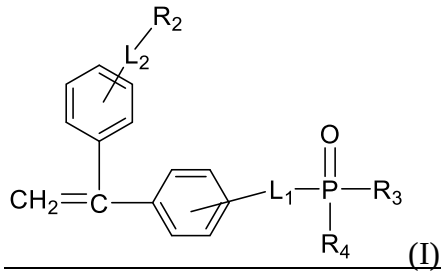
~~**60.** The process according to any one of claims 57 to 59 wherein said block copolymer is either an AB diblock copolymer of alkyl acrylic repeat unit and styrenic repeat units, or an ABA triblock copolymer of alkyl acrylic repeat unit and styrenic repeat units.~~

~~61~~25. The use of a compound of structure (I), wherein

R_2 is H, a halide, a C-1 to C-8 linear alkyl, a C-3 to C-8 branched alkyl, a C-3 to C-8 cyclic alkyl, a C-1 to C-8 linear alkyloxy, a C-3 to C-8 branched alkyloxy, a C-3 to C-8 cyclic alkyloxy, or -P(=O)(R_3)(R_4);

R_3 and R_4 are independently an aryl, an alkylenearyl, a C-2 to C-8 alkyleneoxyalkyl, a C-2 to C-8 haloalkyl, a C-1 to C-8 linear alkyl, a C-3 to C-8 branched alkyl, a C-3 to C-8 cyclic alkyl, a C-1 to C-8 linear alkyloxy, a C-3 to C-8 branched alkyloxy or a C-3 to C-8 cyclic alkyloxy; and

L_1 and L_2 are independently a direct valence bond, or a C-1 to C-8 alkylene spacer group;



(I)

~~according to any one of claims 1 to 10~~ for the preparation of a polymer according to any one of claims ~~11~~ 1 to ~~53~~ 21.

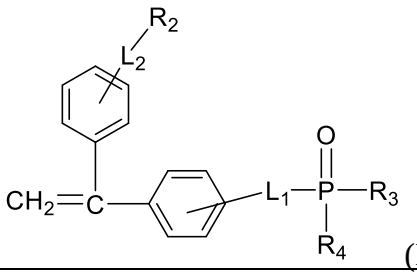
~~62~~26. The use of a polymer according to any one of claims ~~1~~1 to ~~53~~ 21 or of the composition of claim ~~54~~ 22 for forming a pinning layer brush on a substrate.

27. A compound of structure (I), wherein

R_2 is a halide, a C-1 to C-8 linear alkyl, a C-3 to C-8 branched alkyl, a C-3 to C-8 cyclic alkyl, a C-1 to C-8 linear alkyloxy, a C-3 to C-8 branched alkyloxy, a C-3 to C-8 cyclic alkyloxy, or -P(=O)(R_3)(R_4);

R_3 and R_4 are independently an aryl, an alkylenearyl, a C-2 to C-8 alkyleneoxyalkyl, a C-2 to C-8 haloalkyl, a C-1 to C-8 linear alkyl, a C-3 to C-8 branched alkyl, a C-3 to C-8 cyclic alkyl, a C-1 to C-8 linear alkyloxy, a C-3 to C-8 branched alkyloxy or a C-3 to C-8 cyclic alkyloxy; and

L_1 and L_2 are independently a direct valence bond, or a C-1 to C-8 alkylene spacer group;



(I).

28. The compound of claim 27, wherein

R_2 is a C-1 to C-8 linear alkyl, a C-3 to C-8 branched alkyl, a C-3 to C-8 cyclic alkyl, a C-1 to C-8 linear alkyloxy, a C-3 to C-8 branched alkyloxy, a C-3 to C-8 cyclic alkyloxy, or -$P(=O)(R_3)(R_4)$;

R_3 and R_4 are independently an aryl, an alkylenearyl, a C-2 to C-8 alkyleneoxyalkyl, a C-2 to C-8 haloalkyl, a C-1 to C-8 linear alkyl, a C-3 to C-8 branched alkyl, a C-3 to C-8 cyclic alkyl, a C-1 to C-8 linear alkyloxy, a C-3 to C-8 branched alkyloxy or a C-3 to C-8 cyclic alkyloxy; and

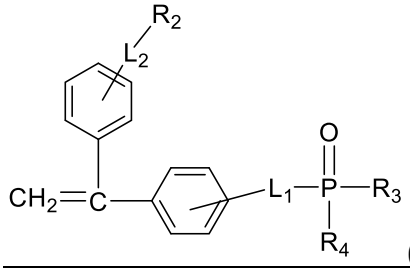
L_1 and L_2 are independently a direct valence bond, or a C-1 to C-8 alkylene spacer group.

29. The compound of claims 27 or 28, wherein said compound has structure (Ia), wherein

R_2 is -$P(=O)(R_3)(R_4)$;

R_3 and R_4 are independently an aryl, an alkylenearyl, a C-2 to C-8 alkyleneoxyalkyl, a C-2 to C-8 haloalkyl, a C-1 to C-8 linear alkyl, a C-3 to C-8 branched alkyl, a C-3 to C-8 cyclic alkyl, a C-1 to C-8 linear alkyloxy, a C-3 to C-8 branched alkyloxy or a C-3 to C-8 cyclic alkyloxy; and

L_1 and L_2 are independently a direct valence bond, or a C-1 to C-8 alkylene spacer group;

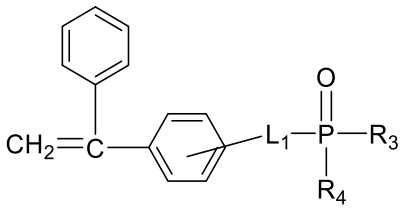


(Ia).

30. A compound of structure (Ib), wherein

R_3 and R_4 are independently an aryl, an alkylenearyl, a C-2 to C-8 alkyleneoxyalkyl, a C-2 to C-8 haloalkyl, a C-1 to C-8 linear alkyl, a C-3 to C-8 branched alkyl, a C-3 to C-8 cyclic alkyl, a C-1 to C-8 linear alkyloxy, a C-3 to C-8 branched alkyloxy or a C-3 to C-8 cyclic alkyloxy; and

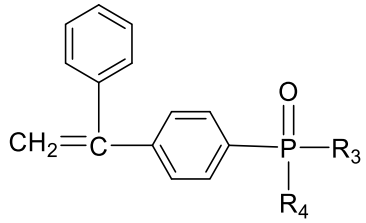
L_1 is a C-1 to C-8 alkylene spacer group;



(Ib).

31. A compound of structure (Id), wherein

R_3 and R_4 are independently an aryl, an alkylenearyl, a C-2 to C-8 alkyleneoxyalkyl, a C-2 to C-8 haloalkyl, a C-1 to C-8 linear alkyl, a C-3 to C-8 branched alkyl, a C-3 to C-8 cyclic alkyl, a C-1 to C-8 linear alkyloxy, a C-3 to C-8 branched alkyloxy or a C-3 to C-8 cyclic alkyloxy;



(Id).