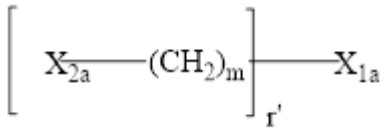
We claim:

1. A compound

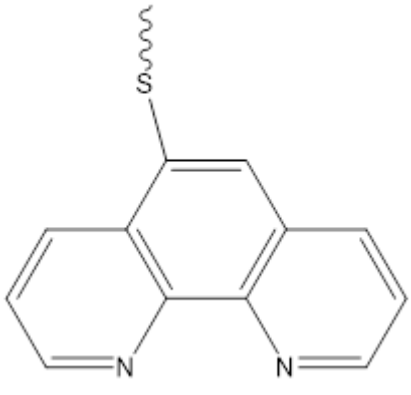
having structure (1a), wherein X_{1a} is a head group which has structure (3); X_{2a} is a tail group selected from the group consisting of structures (4), and (4a);

~~~ represents a point of attachment;

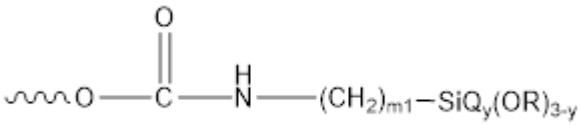
Q and Q1 are independently selected from hydrogen or an alkyl group; wherein m is a integer ranging from 2 to 8, wherein, r' is the number of tail groups attached to the head group, and r', is 1 if the head group X1a is selected from (3) or (3b), and r', is 2 if the head group X1a is (3a),and m1 and m2 are integers independently ranging from 2 to 8; y and y1 independently are 0, 1 or 2; and further wherein R and R1 are independently selected from a C1 to C6 alkyl group;



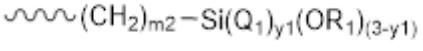
(1a)



(3)



(4)



(4a).

2. The compound of claim 1, wherein the tail group has structure (4).

3. The compound of claim 1, wherein the tail group has structure (4a).
~~~

4. A composition comprised of the following;
a compound of any one of claims 1, 2 to 3;

a solvent containing 0.5 to 2.5 wt% water;

an organic nonmetallic basic compound having a pK_a in water from 9 to 15.7.

5. A composition produced by the steps of

a1) combining a compound of any one of claims 1, 2 to 3, a solvent containing 0.5 to 2.5 wt% water, and a nonmetallic basic compound having a pK_a in water from 9 to 15.7;

b1) aging the solution at room temperature for 2 to 3 weeks to partially hydrolyze and oligomerize the alkoxy silyl moieties in said compound.

6. A process for forming a self-assembled monolayer on an unpatterned substrate comprising the steps;

a2) coating a composition of claim 5 on a substrate to produce a coating;

b2) baking the coating at a temperature ranging from 180 to 220°C, under an inert gas, for 10 to 30 minutes to produce a baked film;

c2) rising the baked film with a solvent to remove un-grafted material leaving a self-assembled monolayer on the substrate.

7. A process for forming a self-assembled monolayer on a patterned porous dielectric substrate having a k value which ranges from 2.2 to 2.55, to cap pores in said patterned porous dielectric comprising the steps:

a3) coating a composition of claim 4 on a patterned dielectric substrate to produce a coating on the patterned substrate;

b3) baking the coating on the patterned substrate at a temperature ranging from 180 to 220°C under an inert gas, for 10 to 30 minutes to produce a baked film;

c3) rising said baked film with a solvent to produce a capped patterned dielectric, wherein a self-assembled monolayer on the surface of said patterned dielectric substrate, caps pores on said surface which have a diameter ranging from 10 Å to 20 Å.

8. The process of claim 7 wherein in step b3 the baking at a temperate ranging from 175 to 200°C.

9. A process for copper metallization of a capped patterned dielectric substrate having a k value which ranges from 2.2 to 2.55 comprising the steps

a4) coating a composition of claim 5 on a patterned porous dielectric substrate to produce a coating on the patterned substrate;

b4) baking the coating on the patterned substrate at a temperature ranging from 180 to 220°C under an inert gas, for 10 to 30 minutes to produce a baked film;

c4) rising said baked film with a solvent to produce a capped patterned porous dielectric, wherein a self-assembled monolayer on the surface of said patterned porous dielectric substrate, caps pores on said surface which have a diameter ranging from 1 nm to 2 nm;

d4) depositing on said capped patterned porous dielectric a layer of metal using atomic layer deposition.