CLAIMS

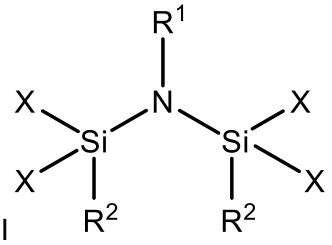
What is claimed is:

1. A method for selective deposition of a silicon and oxygen containing dielectric film onto a substrate, comprising:

a) providing at least one substrate comprising at least one first surface and at least one second surface in a reactor, wherein the at least one first surface is a dielectric surface and the at least one second surface is a silicon surface, a metal surface, a metal compound surface, or hydride surfaces thereof;

b) heating the reactor to at least one temperature ranging from 25°C to 600°C and optionally maintaining the reactor at a pressure of 100 torr or less;

c) introducing into the reactor at least one precursor comprising a halogenated silicon-containing compound that forms a silicon-containing layer more abundantly on the at least one first surface than on the at least one second surface,

wherein the halogenated silicon-containing compound is selected from the group consisting of trichlorosilane, tetrachlorosilane, hexachlorodisilane, pentachlorodisilane, tetrachlorodisilane, octachlorotrisilane, dichlorosilane, hexachlorodisiloxane, pentachlorodisiloxane, tetrachlorodisiloxane, octaclorotrisiloxane, a halogenated carbosilane having one or two Si-C-Si linkages, and a halogenated silazane represented by Formula I 

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wherein R^1 is selected from the group consisting of hydrogen, a linear or branched C_1 to C_{10} alkyl group, a linear or branched C_3 to C_{10} alkenyl group, a linear or branched C_3 to C_{10} alkynyl group, a C_3 to C_{10} cyclic alkyl group, a C_2 to C_6 dialkylamino group, an electron withdrawing group, and a C_6 to C_{10} aryl group; R^2 is selected from the group consisting of hydrogen, a linear or branched C_1 to C_{10} alkyl group, a linear or branched C_2 to C_6 alkenyl group, a linear or branched C_3 to C_6 alkynyl group, a C_3 to C_{10} cyclic alkyl group, a C_2 to C_6 dialkylamino group, a C_6 to C_{10} aryl group, a linear or branched C_1 to C_6 fluorinated alkyl group, an electron withdrawing group, a C_4 to C_{10} aryl group, and a

halide selected from the group consisting of Cl, Br, and I; and X is a halide selected from the group consisting of Cl, Br, and I;

d) purging any unreacted precursor from the reactor using inert gas;

e) introducing a nitrogen source to react with the silicon-containing layer to form silicon nitride or a carbon doped silicon nitride film;

f) purging the reactor using inert gas;

g) introducing an oxygen-containing source into the reactor to react with the silicon nitride or the carbon doped silicon nitride film to form the silicon and oxygen containing dielectric film;

h) purging any unreacted oxygen-containing source from the reactor using inert gas; and

i) optionally treating the substrate using a reducing agent.

2. The method of claim 1, wherein the at least one second surface comprises at least one selected from the group consisting of Si, Co, Cu, Al, Ta, Mo, W, TiN, TiSi, MoN, WN, and hydrides thereof.

3. The method of claim 1, wherein the at least one first surface is selected from the group consisting of Cu oxide, Ta oxide, Al oxide, silicon oxide, carbon doped silicon oxide, carbon doped Mo oxide, carbon doped Ti oxide, Al nitride, silicon nitride, carbon doped silicon oxynitride, and silicon oxynitride.

4. The method of claim 1, wherein the silicon and oxygen-containing dielectric film is selected from the group consisting of silicon oxide, carbon doped silicon oxide, silicon oxynitride, and carbon doped silicon oxynitride.

5. The method of claim 1, wherein nitrogen source is selected from the group consisting of ammonia, ethylenediamine, methylenediamine and piperazine.

6. The method of claim 1, wherein the oxygen-containing source is introduced after silicon nitride or carbon doped silicon nitride film is deposited to a predetermined thickness by repeating steps c to f.

7. The method of claim 1, wherein when repeating some or all of steps c through h, the oxygen-containing source is always introduced after the nitrogen source is introduced to react with the silicon-containing layer.

8. The method of claim 1, wherein the oxygen-containing source is selected from the group consisting of air, molecular oxygen, nitrous oxide, water vapor and hydrogen peroxide.

9. The method of claim 1, wherein the oxygen-containing source is selected from ozone, oxygen plasma, nitrous oxide plasma, carbon dioxide plasma and combinations thereof.

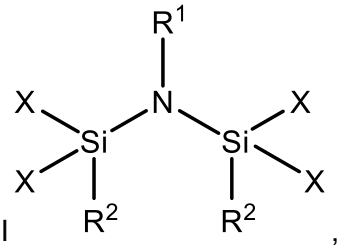
10. The method of claim 1 comprising step i, which comprises introducing hydrogen or hydrogen plasma as the reducing agent into the reactor to remove some residual films.

11. A method for selective deposition of a silicon and oxygen containing dielectric film onto a substrate, comprising:

a) providing at least one substrate comprising at least one first surface and at least one second surface in a reactor, wherein the at least one first surface is a dielectric surface and the at least one second surface is a silicon surface, a metal surface, a metal compound surface, or hydride surfaces thereof;

b) heating the reactor to at least one temperature ranging from 25 °C to 600°C and optionally maintaining the reactor at a pressure of 100 torr or less;

c) introducing into the reactor at least one precursor comprising a halogenated silicon-containing compound that forms a silicon-containing layer more abundantly on the at least one first surface than on the at least one second surface,

wherein the halogenated silicon-containing compound is selected from the group consisting of trichlorosilane, tetrachlorosilane, hexachlorodisilane, pentachlorodisilane, tetrachlorodisilane, octachlorotrisilane, dichlorosilane, hexachlorodisiloxane, pentachlorodisiloxane, tetrachlorodisiloxane, octaclorotrisiloxane, a halogenated carbosilane having one or two Si-C-Si linkages, and a halogenated silazane represented by Formula I 

,

wherein R^1 is selected from the group consisting of hydrogen, a linear or branched C_1 to C_{10} alkyl group, a linear or branched C_3 to C_{10} alkenyl group, a linear or branched C_3 to C_{10} alkynyl group, a C_3 to C_{10} cyclic alkyl group, a C_2 to C_6 dialkylamino group, an electron withdrawing group, and a C_6 to C_{10} aryl group; R^2 is selected from the group consisting of hydrogen, a linear or branched C_1 to C_{10} alkyl group, a linear or branched C_2 to C_6 alkenyl group, a linear or branched C_3 to C_6 alkynyl group, a C_3 to C_{10} cyclic alkyl group, a C_2 to C_6 dialkylamino group, a C_6 to C_{10} aryl group, a linear or branched C_1 to C_6 fluorinated alkyl group, an electron withdrawing group, a C_4 to C_{10} aryl group, and a halide selected from the group consisting of Cl, Br, and I; and X is a halide selected from the group consisting of Cl, Br, and I;

d) purging away any unreacted precursor from the reactor using inert gas;

e) introducing a nitrogen source to react with the silicon-containing layer to form a silicon nitride film or a carbon doped silicon nitride film;

f) purging the reactor using inert gas;

g) exposing the silicon nitride film or carbon doped silicon nitride film to an oxygen-containing source to react with the silicon nitride or the carbon doped silicon nitride film to form the silicon and oxygen containing dielectric film;

h) purging away any unreacted oxygen-containing source from the reactor using inert gas, only when the oxygen-containing source is introduced into the reactor; and

i) optionally treating the substrate using a reducing agent; and repeating some or all of steps c through h until the silicon and oxygen containing dielectric film reaches a desired thickness.

12. The method of claim 11, wherein the at least one second surface comprises at least one selected from the group consisting of Si, Co, Cu, Al, Ta, Mo, W, TiN, TiSi, MoN, WN, and hydrides thereof.

13. The method of claim 11, wherein the at least one first surface is selected from the group consisting of Cu oxide, Ta oxide, Al oxide, silicon oxide, carbon doped silicon oxide, carbon doped Mo oxide, carbon doped Ti oxide, Al nitride, silicon nitride, carbon doped silicon oxynitride, and silicon oxynitride.

14. The method of claim 11, wherein the silicon and oxygen-containing dielectric film is selected from the group consisting of silicon oxide, carbon doped silicon oxide, silicon oxynitride, and carbon doped silicon oxynitride.

15. The method of claim 11, wherein nitrogen source is selected from the group consisting of ammonia, ethylenediamine, methylenediamine and piperazine.

16. The method of claim 11, wherein the silicon nitride film or carbon doped silicon nitride film is exposed to the oxygen-containing source after the silicon nitride or carbon doped silicon nitride film is deposited to a predetermined thickness by repeating steps c to f.

17. The method of claim 11, wherein when repeating some or all of steps c through h, the silicon nitride film or carbon doped silicon nitride film is exposed to the oxygen-containing source only after the nitrogen source is introduced to react with the silicon-containing layer.

18. The method of claim 11, wherein the silicon nitride film or carbon doped silicon nitride film is exposed to the oxygen-containing source while in the reactor, and wherein the oxygen-containing source is selected from the group consisting of air, molecular oxygen, nitrous oxide, water vapor and hydrogen peroxide.

19. The method of claim 11, wherein the silicon nitride film or carbon doped silicon nitride film is exposed to the oxygen-containing source while in the reactor, and wherein the oxygen-containing source is selected from the group consisting of ozone, oxygen plasma, nitrous oxide plasma, carbon dioxide plasma and combinations thereof.

20. The method of claim 11, wherein the silicon nitride film or carbon doped silicon nitride film is exposed to the oxygen containing source while outside the reactor, and wherein the oxygen-containing source is air.

21. The method of claim 11 further comprising step i, which comprises introducing hydrogen or hydrogen plasma as the reducing agent into the reactor to remove some residual films.