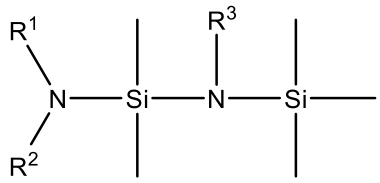
CLAIMS

1. A process to deposit a silicon oxide film onto a substrate comprises:

a) providing a substrate in a reactor;

b) introducing into the reactor at least one organoaminodisilazane precursor having the following Formula IA:



IA

wherein R^1 and R^2 are independently selected from a C_1 to C_6 alkyl group; R^3 is selected from hydrogen, a linear or branched C_1 to C_6 alkyl group, and a C_6 to C_{10} aryl group; and either R^1 and R^2 are linked to form a cyclic ring structure or R^1 and R^2 are not linked to form a cyclic ring structure;

c) purging the reactor with purge gas to purge away unconsumed reactants and/or reaction byproducts;

d) introducing an oxygen source into the reactor to react with the precursor and form the silicon oxide film; and

e) purging the reactor with purge gas to purge away unconsumed reactants and/or reaction byproducts;

wherein steps b through e are repeated until a desired thickness of the silicon oxide film is deposited, wherein the process in conducted at one or more temperatures ranging from 500 to 800 ^{0}C and one or more pressures ranging from 50 miliTorr (mT) to 760 Torr.

2. The process of claim 1, wherein the at least one organoaminodisilazane precursor is selected from the group consisting of 1-dimethylamino-1,1,3,3,3-pentamethyldisilazane, 1-diethylamino-1,1,3,3,3-pentamethyldisilazane, 1-methylethylamino-1,1,3,3,3-pentamethyldisilazane, 1-pyrrolidino-1,1,3,3,3-pentamethyldisilazane, 1-(2-methylpyrrolidino)-1,1,3,3,3-pentamethyldisilazane, 1-(2,5-dimethylpyrrolidino)-1,1,3,3,3-pentamethyldisilazane, 1-piperidino-1,1,3,3,3-pentamethyldisilazane, 1-(2,5-dimethylpiperidino)-1,1,3,3,3-pentamethyldisilazane, 1-pyrrolyl-1,1,3,3,3-pentamethyldisilazane, 1-imidazolyl-1,1,3,3,3-pentamethyldisilazane,

1-dimethylamino-1,1,2,3,3,3-hexamethyldisilazane, 1-diethylamino-1,1,2,3,3,3-hexamethyldisilazane, 1-methylethylamino-1,1,2,3,3,3-hexamethyldisilazane, 1-pyrrolidino-1,1,2,3,3,3-hexamethyldisilazane, 1-(2-methylpyrrolidino)-1,1,2,3,3,3-hexamethyldisilazane, 1-(2,5-dimethylpyrrolidino)-1,1,2,3,3,3-hexamethyldisilazane, 1-piperidino-1,1,2,3,3,3-hexamethyldisilazane, 1-(2,6-dimethylpiperidino)-1,1,2,3,3,3-hexamethyldisilazane, 1-pyrrolyl-1,1,2,3,3,3-hexamethyldisilazane, 1-imidazolyl-1,1,2,3,3,3-hexamethyldisilazane, 1-dimethylamino-2-ethyl-1,1,3,3,3-pentamethyldisilazane, 1-diethylamino-2-ethyl-1,1,3,3,3-pentamethyldisilazane, 1-methylethylamino-2-ethyl-1,1,3,3,3-pentamethyldisilazane, 1-pyrrolidino-2-ethyl-1,1,3,3,3-pentamethyldisilazane, 1-(2-methylpyrrolidino)-2-ethyl-1,1,3,3,3-pentamethyldisilazane, 1-2,5-dimethylpyrrolidino-2-ethyl-1,1,3,3,3-pentamethyldisilazane, 1-piperidino-2-ethyl--1,1,3,3,3-pentamethyldisilazane, 1-(2,6-dimethylpiperidino)-2-ethyl-1,1,3,3,3-pentamethyldisilazane, 1-pyrrolyl-2-ethyl-1,1,3,3,3-pentamethyldisilazane, 1-imidazolyl-2-ethyl-1,1,3,3,3-pentamethyldisilazane, and mixtures thereof.

3. The process of claim 1, wherein the purge gas is selected from the group consisting of nitrogen, helium, argon, and mixtures thereof.

4. The process of claim 1, wherein the oxygen source is selected from the group consisting of oxygen, peroxide, oxygen plasma, water vapor, water vapor plasma, hydrogen peroxide, ozone source, and mixtures thereof.

5. The process of claim 1 wherein the oxygen-containing source comprises a plasma.

6. The process of claim 5 wherein the plasma is generated in situ.

7. The process of claim 5 wherein the plasma is generated remotely.

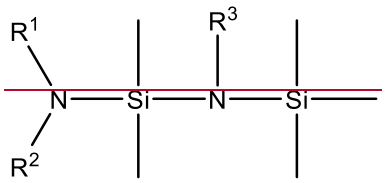
8. The process of claim 4 wherein the silicon oxide film has a density of ~~about~~ 2.0 g/cm^3 or greater.

9. The process of claim 1 wherein the silicon oxide film further comprises carbon.

10. The process of claim 9 wherein the silicon oxide film has a density of at least ~~about~~ 1.8 g/cm^3.

11. The process of claim 9 wherein the carbon content of the silicon oxide film is at least 0.5 atomic weight percent (at.%) as measured by x-ray photospectroscopy.

12. A composition for depositing a silicon oxide film or a carbon doped silicon oxide film using a vapor deposition process, wherein the composition comprises at least one silicon precursor ~~having a structure represented by Formula IA:~~



~~IA~~

~~wherein R^1 and R^2 are selected from a C_1 to C_6 alkyl group; R^3 is selected from hydrogen, a linear or branched C_1 to C_6 alkyl group, and a C_6 to C_{10} aryl group; and either R^1 and R^2 are linked to form a cyclic ring structure or R^1 and R^2 are not linked to form a cyclic ring structure.~~

~~13. The composition of claim 12, wherein the at least one silicon precursor is~~ selected from the group consisting of 1-dimethylamino-1,1,3,3,3-pentamethyldisilazane, ~~1-diethylamino-1,1,3,3,3-pentamethyldisilazane,~~ 1-methylethylamino-1,1,3,3,3-pentamethyldisilazane, 1-pyrrolidino-1,1,3,3,3-pentamethyldisilazane, 1-(2-methylpyrrolidino)-1,1,3,3,3-pentamethyldisilazane, 1-(2,5-dimethylpyrrolidino)-1,1,3,3,3-pentamethyldisilazane, 1-piperidino-1,1,3,3,3-pentamethyldisilazane, 1-(2,5-dimethylpiperidino)-1,1,3,3,3-pentamethyldisilazane, 1-pyrrolyl-1,1,3,3,3-pentamethyldisilazane, 1-imidazolyl-1,1,3,3,3-pentamethyldisilazane, ~~1-dimethylamino-1,1,2,3,3,3-hexamethyldisilazane,~~ 1-diethylamino-1,1,2,3,3,3-hexamethyldisilazane, 1-methylethylamino-1,1,2,3,3,3-hexamethyldisilazane, 1-pyrrolidino-1,1,2,3,3,3-hexamethyldisilazane, 1-(2-methylpyrrolidino)-1,1,2,3,3,3-hexamethyldisilazane, 1-(2,5-dimethylpyrrolidino)-1,1,2,3,3,3-hexamethyldisilazane, 1-piperidino-1,1,2,3,3,3-hexamethyldisilazane, 1-(2,6-dimethylpiperidino)-1,1,2,3,3,3-hexamethyldisilazane, 1-pyrrolyl-1,1,2,3,3,3-hexamethyldisilazane, 1-imidazolyl-1,1,2,3,3,3-hexamethyldisilazane, 1-dimethylamino-2-ethyl-1,1,3,3,3-pentamethyldisilazane, 1-diethylamino-2-ethyl-

1,1,3,3,3-pentamethyldisilazane, 1-methylethylamino-2-ethyl-1,1,3,3,3-pentamethyldisilazane, 1-pyrrolidino-2-ethyl-1,1,3,3,3-pentamethyldisilazane, 1-(2-methylpyrrolidino)-2-ethyl-1,1,3,3,3-pentamethyldisilazane, 1-2,5-dimethylpyrrolidino-2-ethyl-1,1,3,3,3-pentamethyldisilazane, 1-piperidino-2-ethyl--1,1,3,3,3-pentamethyldisilazane, 1-(2,6-dimethylpiperidino)-2-ethyl-1,1,3,3,3-pentamethyldisilazane, 1-pyrrolyl-2-ethyl-1,1,3,3,3-pentamethyldisilazane, 1-imidazolyl-2-ethyl-1,1,3,3,3-pentamethyldisilazane, and combinations thereof.

~~14.~~13. The composition of claim 12 wherein the at least one silicon precursor is substantially free of one or more impurities selected from the group consisting of a halide, metal ions, metal, and combinations thereof.

~~15.~~14. The composition of claim ~~14~~13 wherein the composition is substantially free of one or more impurities selected from the group consisting of halide compounds, metal ions, metal, and combinations thereof.

~~16.~~15. The composition of claim ~~15~~14, wherein the halide compounds comprise chloride-containing species.

~~17.~~16. The composition of claim ~~16~~15, wherein the chloride concentration is less than 50 ppm measured by IC.

~~18.~~17. The composition of claim ~~16~~15, wherein the chloride concentration is less than 10 ppm measured by IC.

~~19.~~18. The composition of claim ~~16~~15, wherein the chloride concentration is less than 5 ppm measured by IC.

~~20.~~19. A film obtained by the method of claim 1.

~~21.~~20. The film of claim ~~20~~19 comprising at least one of the following characteristics: a density of at least ~~about~~ 2.0 g/cm^3; a wet etch rate that is less than ~~about~~ 2.5 Å/s as measured in a solution of 1:100 of HF to water (0.5 wt. % dHF) acid; an electrical leakage of less than ~~about~~ 1 x 10^{-8} A/cm~~2~~^{2} up to 6 MV/cm; and a hydrogen impurity of less than ~~about~~ 4 x 10^{21} at/cc as measured by SIMS.