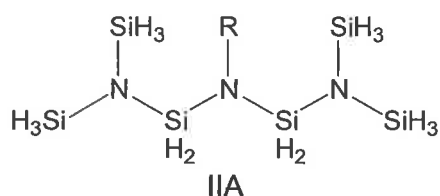
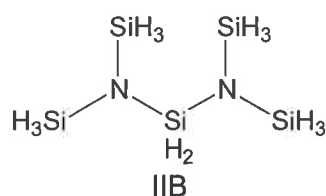
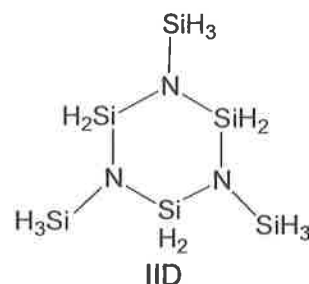


CLAIMS

1. A composition for depositing a silicon nitride or silicon oxide film, the composition comprising:

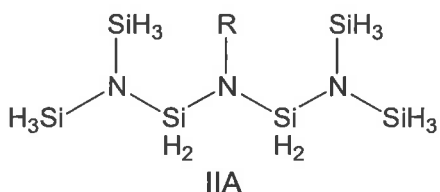
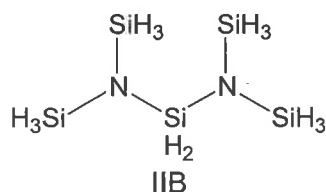
5 at least one silicon precursor compound having the following Formulae IIA, IIB or IID:

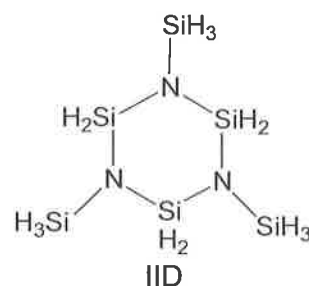


wherein substituent R is independently selected from a hydrogen, a halide atom, a linear C₁ to C₁₀ alkyl group; a branched C₃ to C₁₀ alkyl group; a linear or branched C₃ to C₁₂ alkenyl group; a linear or branched C₃ to C₁₂ alkynyl group; a C₄ to C₁₀ cyclic alkyl group; and a C₆ to C₁₀ aryl group.

2. A composition for forming a silicon-containing material, the composition comprising:

(a) at least one silicon precursor compound having the following Formulae IIA, IIB or IID:





wherein substituent R is independently selected from a hydrogen, a halide atom, a linear C₁ to C₁₀ alkyl group; a branched C₃ to C₁₀ alkyl group; a linear or branched C₃ to C₁₂ alkenyl group; a linear or branched C₃ to C₁₂ alkenyl group; a linear or branched C₃ to C₁₂ alkynyl group; a C₄ to C₁₀ cyclic alkyl group; and a C₆ to C₁₀ aryl group; and

(b) a solvent wherein the solvent has a boiling point and the difference between the boiling point of the solvent and a boiling point of the silicon precursor is 40°C or less.

3. The composition of claim 2 wherein the compound comprises bis(disilylamino)silane.

10

4. The composition of claim 2 comprising at least one solvent selected from the group consisting of ether, tertiary amine, alkyl hydrocarbon, aromatic hydrocarbon, and tertiary aminoether.

15

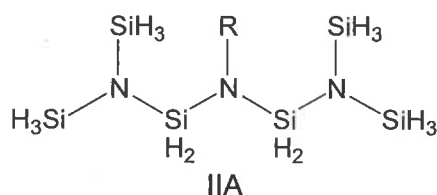
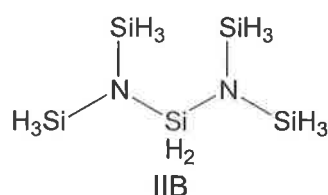
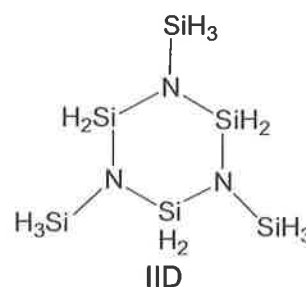
5. The composition of claim 2 wherein the solvent comprises at least one selected from the group consisting of octane, ethylcyclohexane, cyclooctane, and toluene.

6. A method for depositing a silicon nitride film on at least a portion of a surface of a substrate, the method comprising:

20

a. placing the substrate into a reactor;

b. introducing into the reactor an at least one silicon precursor compound having the following Formulae IIA, IIB or IID:



wherein substituent R is independently selected from a hydrogen, a halide atom, a linear C₁ to C₁₀ alkyl group; a branched C₃ to C₁₀ alkyl group; a linear or branched C₃ to C₁₂ alkenyl group; a linear or branched C₃ to C₁₂ alkenyl group; a linear or branched C₃ to C₁₂ alkynyl group; a C₄ to C₁₀ cyclic alkyl group; and a C₆ to C₁₀ aryl group under conditions sufficient to provide a chemisorbed layer;

c. purging the reactor with a purge gas;

d. introducing a plasma source comprising nitrogen into the reactor to react with at least a portion of the chemisorbed layer; and

e. optionally purge the reactor with an inert gas; and wherein the steps b through e are repeated until a desired thickness of the silicon nitride film is obtained.

7. The method of claim 6 wherein the plasma source is selected from the group consisting of nitrogen plasma, nitrogen/helium plasma, nitrogen/argon plasma, ammonia plasma, ammonia/helium plasma, ammonia/argon/plasma, helium plasma, argon plasma, hydrogen plasma, hydrogen/helium plasma, hydrogen/argon plasma, organic amine plasma, and mixtures thereof.

8. The method of claim 6 wherein the at least one silicon precursor compound comprises bis(disilylamino)silane.
 9. The method of claim 6 wherein the plasma in step d is generated at a power density ranging from about 0.01 to about 1.5 W/cm².
- 5