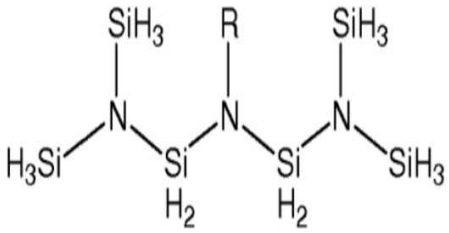
CLAIMS

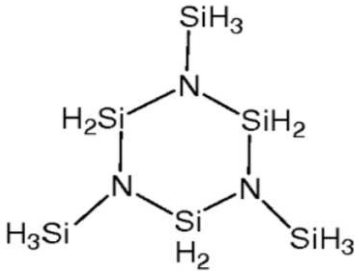
What is claimed is:

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

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



IIA



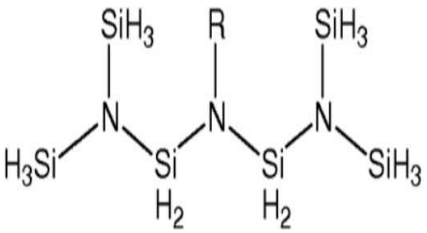
IID

,

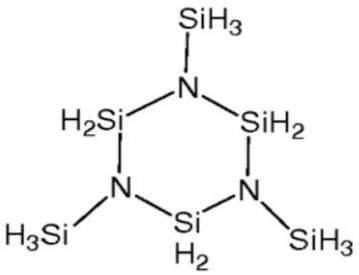
wherein substituent R is independently selected from a hydrogen, a halide atom, a C_1 to C_{10} alkyl group, a branched C_3 to C_{10} alkyl group, a linear or branched C_3 to C_{12} alkenyl group, a linear or branched C_3 to C_{12} alkynyl group, a C_4 to C_{10} cyclic alkyl group, and a C_6 to C_{10} aryl group.

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

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



IIA



IID

,

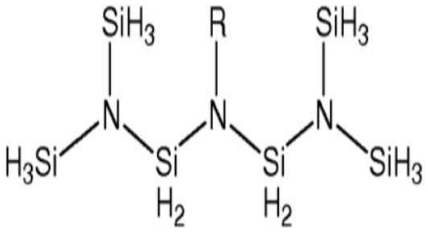
wherein substituent R is independently selected from a hydrogen, a halide atom, a C_1 to C_{10} alkyl group, a branched C_3 to C_{10} alkyl group, a linear or branched C_3 to C_{12} alkenyl group, a linear or branched C_3 to C_{12} alkynyl group, a C_4 to C_{10} cyclic alkyl group, and a C_6 to C_{10} 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.

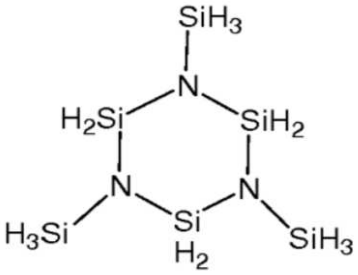
3. A method for depositing a silicon nitride film on at least a portion of a surface of a substrate, the method comprising:

(a) placing the substrate into a reactor;

(b) introducing into the reactor an at least one silicon precursor compound having the following Formulae IIA or IID:



IIA



IID

wherein substituent R is independently selected from a hydrogen, a halide atom, a C_1 to C_{10} alkyl group, a branched C_3 to C_{10} alkyl group, a linear or branched C_3 to C_{12} alkenyl group, a linear or branched C_3 to C_{12} alkynyl group, a C_4 to C_{10} cyclic alkyl group, and a C_6 to C_{10} 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.

4. The method of claim 3 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.

5. The method of claim 3 wherein the plasma in step (d) is generated at a power density ranging from about 0.01 to about 1.5 W/cm^2.