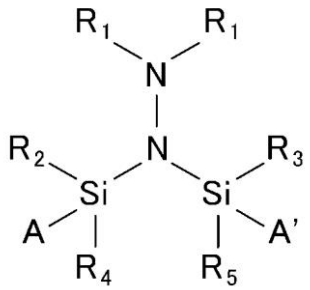
Claims

[Claim 1] A silicon precursor compound represented by the following Formula 1:

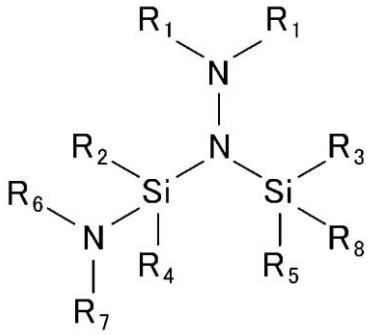
[Formula 1]



in Formula 1, R_1 is each independently a linear or branched, saturated or unsaturated hydrocarbon group having 1 to 4 carbon atoms, or an isomer thereof; R_2 to R_5 are each independently hydrogen (H), halogen, or a linear or branched, saturated or unsaturated hydrocarbon group having 1 to 4 carbon atoms; A and A' are each independently NR_6R_7 or R_8, provided that at least one of A and A' is NR_6R_7; R_6 and R_7 are each independently a methyl group or an ethyl group; and R_8 is hydrogen (H), halogen, or a linear or branched, saturated or unsaturated hydrocarbon group having 1 to 4 carbon atoms.

[Claim 2] The silicon precursor compound of claim 1, wherein the silicon precursor compound has an asymmetric structure represented by the following Formula 2:

[Formula 2]

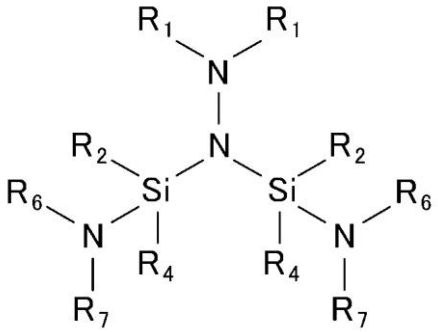


in Formula 2, R_1 is each independently a linear or branched, saturated or unsaturated hydrocarbon group having 1 to 4 carbon atoms, or an isomer thereof; R_2 to R_5 are each independently hydrogen (H), halogen, or a linear or branched, saturated or unsaturated hydrocarbon group having 1 to 4 carbon atoms; R_6

and R_7 are each independently a methyl group or an ethyl group; and R_8 is hydrogen (H), halogen, or a linear or branched, saturated or unsaturated hydrocarbon group having 1 to 4 carbon atoms; or

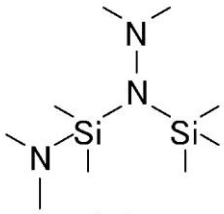
a symmetric structure represented by the following Formula 3:

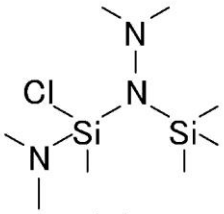
[Formula 3]

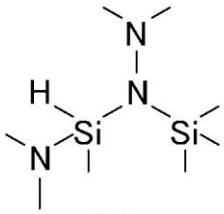


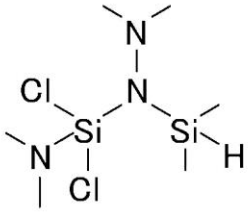
in Formula 3, R_1 is each independently a linear or branched, saturated or unsaturated hydrocarbon group having 1 to 4 carbon atoms, or an isomer thereof; R_2 and R_4 are each independently hydrogen (H), halogen, or a linear or branched, saturated or unsaturated hydrocarbon group having 1 to 4 carbon atoms; and R_6 and R_7 are each independently a methyl group or an ethyl group.

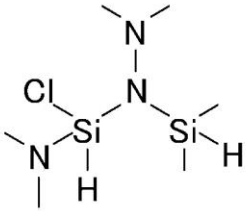
[Claim 3] The silicon precursor compound of claim 1, wherein the silicon precursor compound is at least one selected from the following compounds (1) to (25).

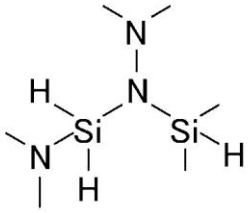

(1)

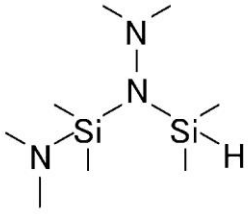

(2)

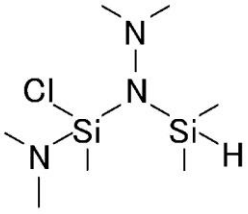

(3)

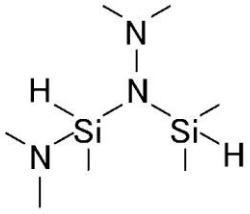

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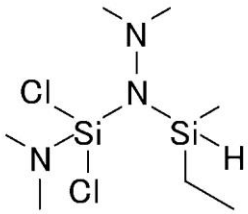

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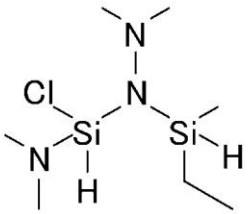

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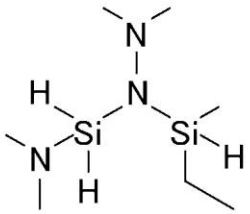

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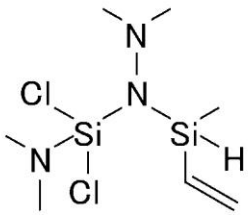

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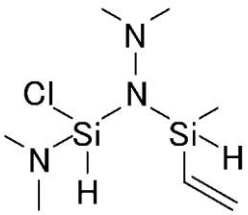

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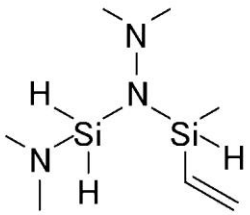

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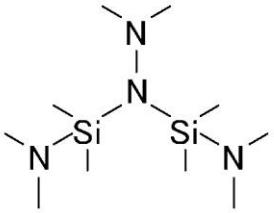

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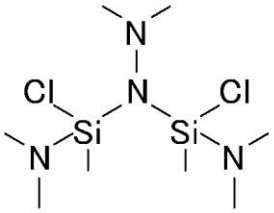

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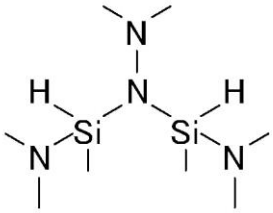

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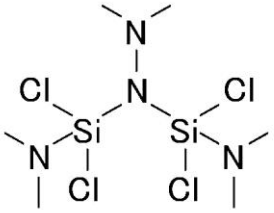

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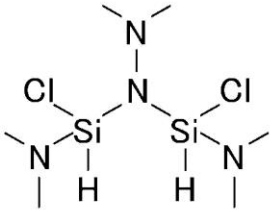

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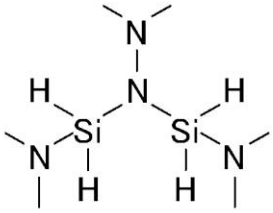

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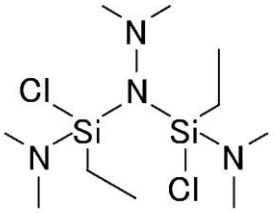

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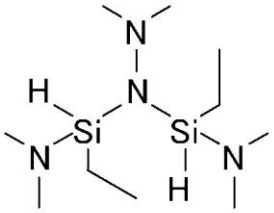

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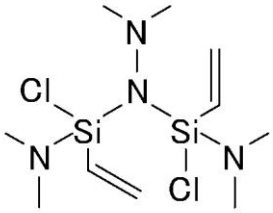

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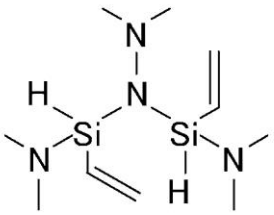

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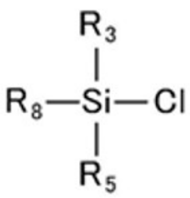

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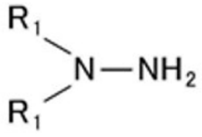
[Claim 4] A method for preparing a silicon precursor compound, which comprises:

a first step of reacting a chlorosilane derivative represented by the following Formula 7 with a hydrocarbyl hydrazine compound represented by the following Formula 8 to form a first compound represented by the following Formula 9:

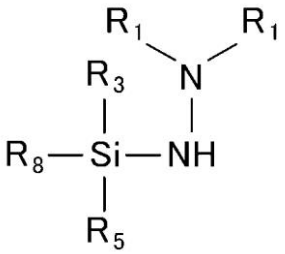
[Formula 7]



[Formula 8]



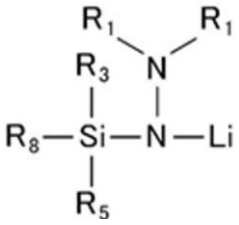
[Formula 9]



;

a second step of reacting the first compound of Formula 9 with an alkyl-lithium (alkyl-Li) to form a second compound containing lithium represented by the following Formula 10:

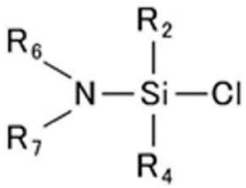
[Formula 10]



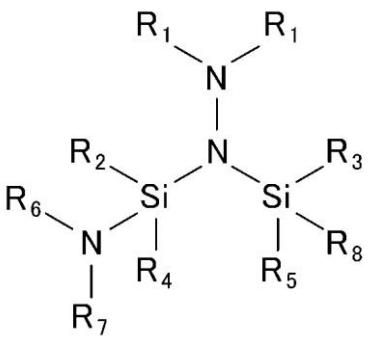
; and

a third step of reacting the second compound of Formula 9 with a silane compound represented by the following Formula 6 to prepare the silicon precursor compound represented by the following Formula 2:

[Formula 6]



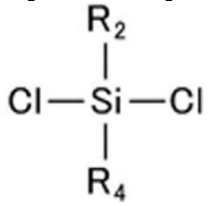
[Formula 2]



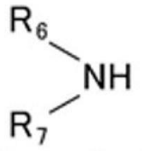
wherein in Formulas 2, 6, 7, 8, 9, and 10, R_1 is each independently a linear or branched, saturated or unsaturated hydrocarbon group having 1 to 4 carbon atoms, or an isomer thereof; R_2 to R_5 are each independently hydrogen (H), halogen, or a linear or branched, saturated or unsaturated hydrocarbon group having 1 to 4 carbon atoms; R_6
and R_7 are each independently a methyl group or an ethyl group; and R_8 is hydrogen (H), halogen, or a linear or branched, saturated or unsaturated hydrocarbon group having 1 to 4 carbon atoms; and, optionally,
a fourth step of reacting the silicon precursor compound represented by Formula 2 with a metal hydride as a reducing agent, wherein, preferably, at least one of R_2 and R_4 are halogen.

[Claim 5] The method for preparing a silicon precursor compound of claim 4, wherein the silane compound of Formula 6 is produced by reacting a chlorosilane derivative represented by the following Formula 4 with a secondary amine represented by the following Formula 5:

[Formula 4]



[Formula 5]

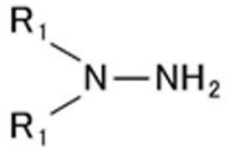


wherein in Formulas 4 and 5, R_2 and R_4 are each independently hydrogen (H), halogen, or a linear or branched, saturated or unsaturated hydrocarbon group having 1 to 4 carbon atoms; and R_6 and R_7 are each independently a methyl group or an ethyl group.

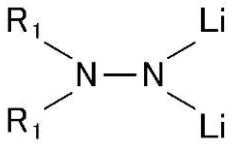
[Claim 6] A method for preparing a silicon precursor compound, which comprises:

a first step of reacting a hydrocarbyl hydrazine compound represented by the following Formula 8 with an alkyl-lithium (alkyl-Li) to form a third compound containing lithium represented by the following Formula 11:

[Formula 8]



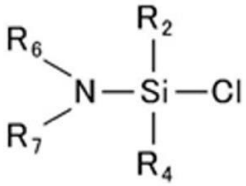
[Formula 11]



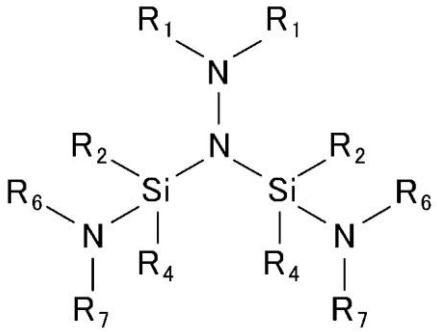
and

a second step of reacting the third compound with a silane compound represented by the following Formula 6 to prepare a silicon precursor compound represented by the following Formula 3:

[Formula 6]



[Formula 3]

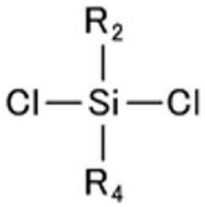


wherein in Formulas 3, 6, 8, and 11, R_1 is each independently a linear or branched, saturated or unsaturated hydrocarbon group having 1 to 4 carbon atoms, or an isomer thereof; R_2 and R_4 are each independently hydrogen (H), halogen, or a linear or

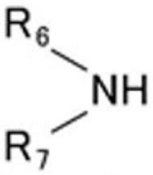
branched, saturated or unsaturated hydrocarbon group having 1 to 4 carbon atoms; and R_6 and R_7 are each independently a methyl group or an ethyl group; and, optionally,
a third step of reacting it with a metal hydride as a reducing agent, wherein, at least one of R_2 and R_4 in the silicon precursor compound represented by Formula 3 are preferably halogen.

[Claim 7] The method for preparing a silicon precursor compound of claim 6, wherein the silane compound is produced by reacting a chlorosilane derivative represented by the following Formula 4 with a secondary amine represented by the following Formula 5:

[Formula 4]



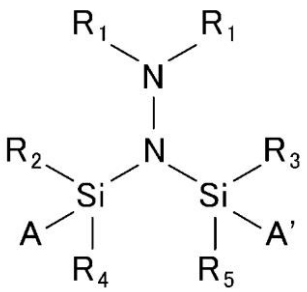
[Formula 5]



wherein in Formulas 4 and 5, R_2 and R_4 are each independently hydrogen (H), halogen, or a linear or branched, saturated or unsaturated hydrocarbon group having 1 to 4 carbon atoms; and R_6 and R_7 are each independently a methyl group or an ethyl group.

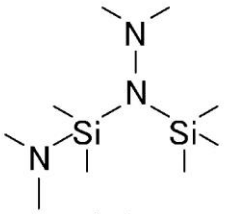
[Claim 8] A method for preparing a silicon-containing thin film, which comprises forming a silicon-containing thin film using a silicon precursor compound represented by the following Formula 1:

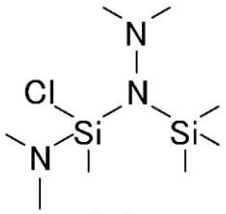
[Formula 1]

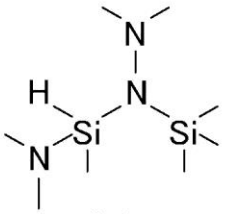


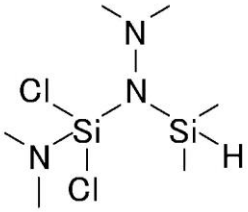
wherein in Formula 1, R_1 is each independently a linear or branched, saturated or unsaturated hydrocarbon group having 1 to 4 carbon atoms, or an isomer thereof; R_2 to R_5 are each independently hydrogen (H), halogen, or a linear or branched, saturated or unsaturated hydrocarbon group having 1 to 4 carbon atoms; A and A' are each independently NR_6R_7 or R_8, provided that at least one of A and A' is NR_6R_7; R_6 and R_7 are each independently a methyl group or an ethyl group; and R_8 is hydrogen (H), halogen, or a linear or branched, saturated or unsaturated hydrocarbon group having 1 to 4 carbon atoms, wherein the silicon-containing thin film is preferably deposited by chemical vapor deposition or atomic layer deposition; and wherein the silicon-containing thin film is preferably any one selected from a silicon oxide film (SiO_2), a silicon oxycarbide film (SiOC), a silicon nitride film (SiN), a silicon oxynitride film (SiON), a silicon carbonitride film (SiCN), and silicon carbonized film (SiC).

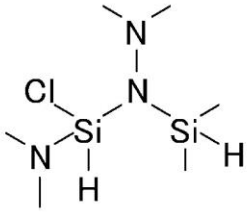
[Claim 9] The method for preparing a silicon-containing thin film of claim 8, wherein the silicon precursor compound is at least one selected from the following compounds (1) to (25):

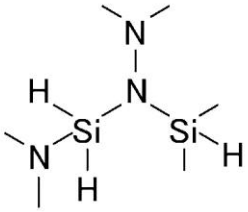

(1)

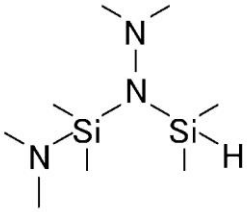

(2)

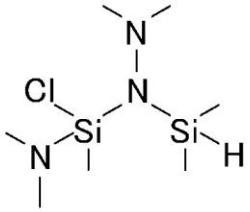

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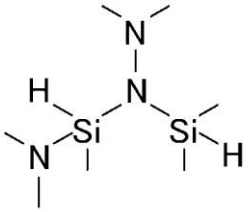

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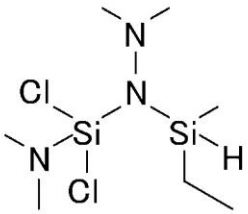

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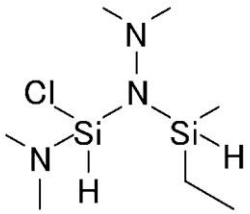

(6)

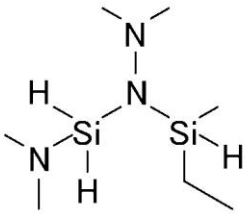

(7)

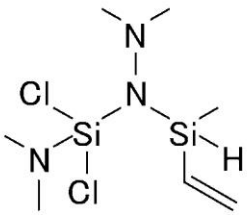

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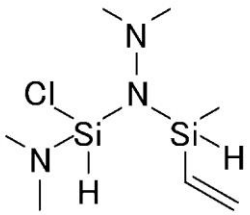

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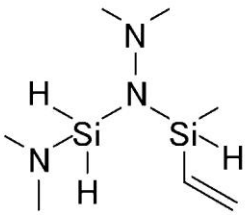

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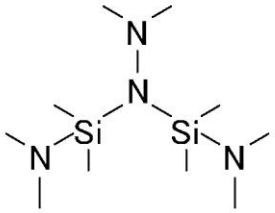

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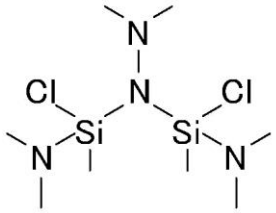

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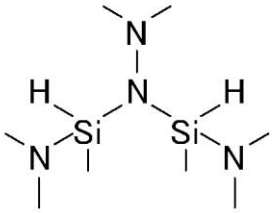

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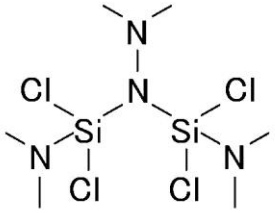

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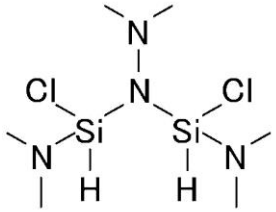

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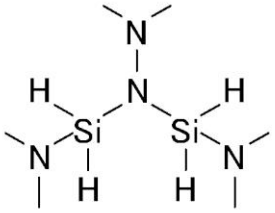

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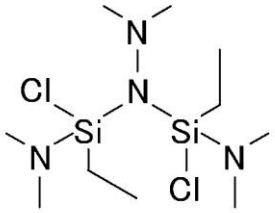

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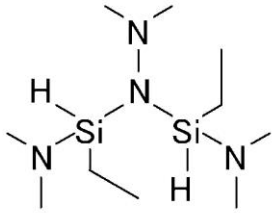

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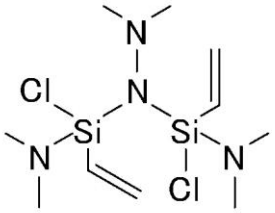

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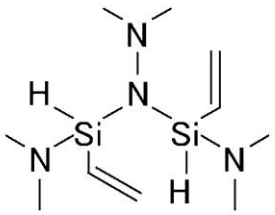

(20)


(21)


(22)


(23)


(24)


(25)

[Claim 10] The method for preparing a silicon-containing thin film of claim 8, wherein the silicon-containing thin film is a silicon oxide film (SiO_2),

the silicon oxide film is deposited by atomic layer deposition, and the atomic layer deposition comprises providing a substrate in a reactor; introducing the silicon precursor compound into the reactor; purging the reactor with a purge gas; introducing an oxygen-containing source into the reactor to react with the silicon precursor compound to form a silicon oxide film; and purging the reactor with the purge gas;

wherein the purge gas is preferably selected from the group consisting of nitrogen, helium, argon, and mixtures thereof, and

the oxygen-containing source is preferably selected from the group consisting of oxygen, peroxide, oxygen plasma, water vapor, water vapor plasma, hydrogen peroxide, ozone source, and mixtures thereof.

[Claim 11] The method for preparing a silicon-containing thin film of claim 10, wherein the oxygen-containing source comprises plasma and the plasma is preferably generated *in situ*.

[Claim 12] The method for preparing a silicon-containing thin film of claim 10, wherein the atomic layer deposition is carried out at one or more temperatures of 500°C or lower.

[Claim 13] The method for preparing a silicon-containing thin film of claim 8, wherein the silicon-containing thin film is a silicon nitride film (SiN),
the silicon nitride film is deposited by plasma-enhanced atomic layer deposition, and
the plasma-enhanced atomic layer deposition comprises providing a substrate in a reactor; introducing the silicon precursor compound into the reactor; purging the reactor with a purge gas; introducing a nitrogen-containing plasma source and an inert gas to the reactor to react with the silicon precursor compound to form a silicon nitride film; and purging the reactor with the purge gas.

[Claim 14] The method for preparing a silicon-containing thin film of claim 13, wherein the nitrogen-containing plasma source is selected from the group consisting of nitrogen plasma, nitrogen and argon mixed plasma, ammonia plasma, nitrogen and ammonia mixed plasma, ammonia and helium mixed plasma, ammonia and argon mixed plasma, ammonia and nitrogen mixed plasma, NF_3 plasma, organic amine plasma, and mixtures thereof.

[Claim 15] The method for preparing a silicon-containing thin film of claim 13, wherein the plasma-enhanced atomic layer deposition is carried out at one or more temperatures of 400°C or lower.