CLAIMS

[1] A method for producing silicic dense film comprising:

(1) a composition preparing step, in which a composition for a coating film comprising a polymer having a silazane bond and a solvent is prepared;

(2) a coating step, in which a coated film is formed by coating said composition for a coating film on a substrate;

(3) the first irradiating step, in which said coated film is irradiated with light having a maximal peak in the range of 160-179 nm wavelength; and

(4) the second irradiating step, in which the coated film after the first irradiating step is irradiated with light having 10-70 nm wavelength longer maximal peak wavelength than the light used in the first irradiating step,

wherein each irradiating step being carried out in an inert gas atmosphere in which oxygen concentration is equal to or less than 1000 ppm.

[2] The method according to claim 1, wherein oxygen concentration in said inert gas atmosphere is equal to or less than 100 ppm.

[~~2~~3] The method according to claim 1 or 2, wherein irradiation light, which has a maximal peak in the range of 180-230 nm wavelength, is used at said second irradiating step(4).

[~~3~~4] The method according to ~~claim 1 or 2~~ any of claims 1 to 3, wherein irradiation light, which has a maximal peak in the range of 165-175 nm wavelength, is used at said first irradiating step.

[~~4~~5] The method according to any of claims 1 to ~~3~~4, further comprising (5) the third irradiating step, in which the coated film after the second irradiating step is irradiated with light having 10-60 nm wavelength longer maximal peak wavelength than the light used in the second irradiating step.

[~~5~~6] The method according to claim ~~4~~5, wherein irradiation light, which has a maximal peak in the range of 180-230 nm wavelength, is used at the third irradiating step.

[~~6~~7] The method according to any of claims 1 to ~~5~~6, wherein said polymer having a silazane bond is a polysilazane.

[~~7~~8] The method according to claim ~~6~~7, wherein the polysilazane is a perhydropolysilazane.

[~~8~~9] The method according to claim ~~6~~7, wherein the polysilazane is an organopolysilazane.

[~~9~~10] The method according to any of claims 1 to ~~5~~9, wherein the composition for coating film further comprises an additive.

[~~10~~11] The method according to claim ~~9~~10, wherein said additive is an amine compound.

[~~11~~12] The method according to claim ~~10~~11, wherein said amine compound is selected from the group consisting of monoamine compounds, diamine compounds, allylamine compounds, benzylamine compounds, pyrrole compounds, pyridine compounds, pyrazine compounds, alkoxyalkylamine compounds, aminoalkylether compounds, and disilazane compounds.

[~~12~~13] The method according to claim ~~9~~10, wherein said additive is a metal complex compound.

[~~13~~14] The method according to claim ~~12~~13, wherein said metal complex compound contains metal selected from the group consisting of nickel, titanium, platinum, rhodium, cobalt, iron, cobalt, iridium, aluminum, ruthenium, palladium, rhenium and tungsten.

[~~14~~15] The method according to claim ~~12~~13, wherein said metal complex compound has an acetylacetonato group, a carbonyl group or a carboxylate group.

[~~15~~16] The method according to claim ~~14~~15, wherein said carboxylate group is a residue of carboxylic acid selected from the group consisting of formic acid, acetic acid, propionic acid, butyric acid, octane acid, lauric acid, stearic acid, oleic acid, lactic acid, succinic acid and citric acid.

[~~16~~17] The method according to any of claims 1 to ~~15~~16, wherein said inert gas atmosphere is nitrogen gas atmosphere, argon gas atmosphere, helium gas atmosphere or mixture thereof.

~~[17] The method according to claim 17, wherein oxygen concentration in said inert gas atmosphere is equal to or less than 1000 ppm.~~

[18] The method according to ~~claim 16 or 17~~ any of claims 1 to 17, wherein said inert gas atmosphere is nitrogen gas atmosphere.

~~[19] A dense silicic film produced by the method according to any of claims 1 to 18.~~