CLAIMS

1. A method for forming a siliceous film comprising the steps of

(a) forming a siliceous film on a substrate by applying a polysilazane solution on the substrate and curing it in an oxidation atmosphere or by applying a silica solution prepared by a sol-gel method; and

(b) heating and annealing the siliceous film in an inert atmosphere containing a nitrogen-containing compound having the base dissociation constant (pKb) of 4.5 or less ~~or a halogen-containing compound having the binding energy of a halogen atom of 60 kcal/mol or less.~~ ,

wherein the annealing is performed at 400 to 1,200 ℃ in a dry atmosphere, and

the nitrogen-containing compound having the base dissociation constant (pKb) of 4.5 or less is amines represented by the formula (II):

$R^4R^5R^6N$ (II)

wherein R^4 represents an alkyl group which may be branched, an alkenyl group, a cycloalkyl group or an aryl group, and R^5 and R^6 each independently represents a hydrogen atom, an alkyl group which may be branched, an alkenyl group, a cycloalkyl group or an aryl group, DBU (1,8-diazabicyclo[5,4,0]undecene) or DBN (1,5-diazabicyclo[4,3,0]5-nonene).

~~2. The method for forming a siliceous film according to claim 1, wherein the nitrogen-containing compound having the base dissociation constant (pKb) of 4.5 or less is amines represented by the formula (II):~~

~~$R^4R^5R^6N$ (II)~~

~~wherein R^4 represents an alkyl group which may be branched, an alkenyl group, a~~

~~cycloalkyl group or an aryl group, and R^5 and R^6 each independently represents a hydrogen atom, an alkyl group which may be branched, an alkenyl group, a cycloalkyl group or an aryl group,~~

~~DBU (1,8-diazabicyclo[5,4,0]undecene) or DBN (1,5-diazabicyclo[4,3,0]5-nonene).~~

~~3. The method for forming a siliceous film according to claim 2, wherein the annealing is performed at 400 to 1,200 ℃ in a dry atmosphere.~~

~~4. The method for forming a siliceous film according to claim 1, wherein the halogen-containing compound having the binding energy of a halogen atom of 60 kcal/mol or less is Br_2, F_2 or NF_3.~~

~~5 The method for forming a siliceous film according to claim 4~~ 1, ~~wherein the annealing is performed at 200 to 500 ℃ in a dry atmosphere.~~

~~6~~ 2. The method for forming a siliceous film according to ~~any one of claims 1 to 5~~ claim 1, wherein the polysilazane solution is perhydropolysilazane and the ~~cure~~ curing is performed at 200 to 500 ℃ in a water vapor atmosphere.

~~7~~ 3. A method for forming a trench isolation structure, wherein a substrate has a groove for forming a trench isolation structure and the groove is buried and sealed by the method for forming a siliceous film according to any one of claims 1 to ~~6~~ 2.

~~8~~ 4. A siliceous film which is formed by the method for forming a siliceous film according to any one of claims 1 to ~~6~~ 3.