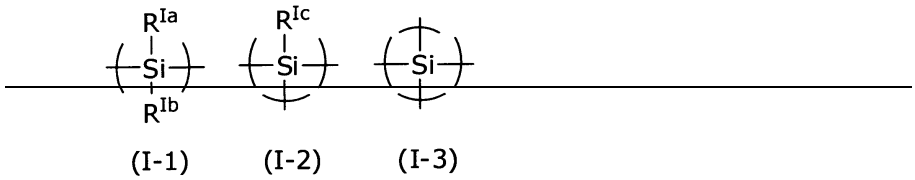
Patent Claims

1.——A method for producing a siliceous film, comprising: applying a siliceous film forming composition comprising:

(a) a block copolymer comprising a linear and/or cyclic block A having a polysilane skeleton comprising 5 or more silicon and a block B having a polysilazane skeleton comprising 20 or more silicon, wherein at least one silicon in the block A and at least one silicon in the block B are connected by a single bond and/or a crosslinking group comprising silicon, and
~~(b) a solvent,~~
~~wherein the content of nitrogen in the block copolymer is 8 to 25 mass% based on the total mass of the block copolymer.~~

(b) a solvent, wherein the content of nitrogen in the block copolymer is 8 to 25 mass % based on the total mass of the block copolymer, onto a substrate to form a coating film, irradiating light having the wavelength of 248 to 436 nm after formation of the coating film, and heating the coating film in an oxidizing atmosphere.

2. The ~~composition~~method according to claim 1, wherein the block A comprises 5 or more repeating units selected from the group consisting of the following formulae (I-1) to (I-3):

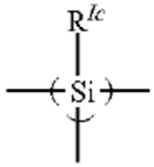


(I-1) (I-2) (I-3)

(I-1)



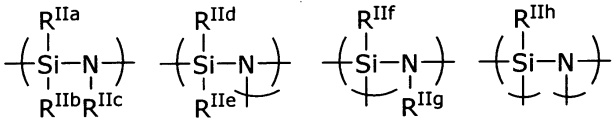
(I-2)



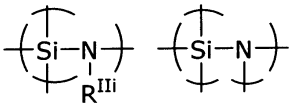
(I-3)



wherein R^{Ia}, R^{Ib}, and R^{Ic} are each independently hydrogen, halogen, C_{1-6} alkyl or C_{6-10} aryl, and the block B comprises 20 or more repeating units selected from the group consisting of the following formulae (II-1) to (II-6):



(II-1) (II-2) (II-3) (II-4)

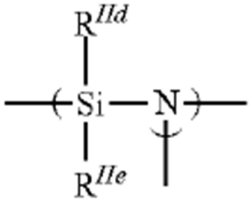


(II-5) (II-6)

(II-1)



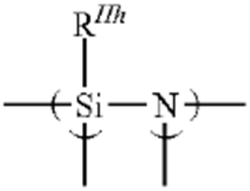
(II-2)



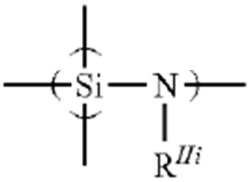
(II-3)



(II-4)



(II-5)



(II-6)



wherein R^{IIa} to R^{IIi} are each independently hydrogen or C_{1-4} alkyl~~).~~.

3. The ~~composition~~method according to claim 1~~ or 2~~, wherein the mass average molecular weight of the block copolymer is 1,100 to 25,000.

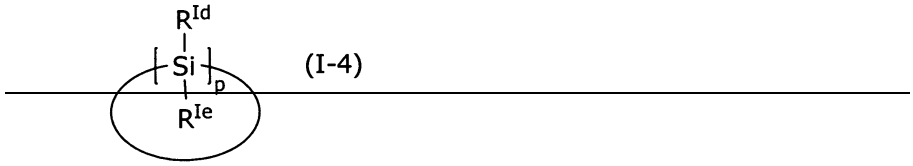
4. The ~~composition according to claim 2, wherein the ratio of the total number of the repeating units of formulae (I-1) to (I-3) to that of the repeating units of the formulae (II-1) to (II-6) containing in the block copolymer is 8 to 100%.~~

~~5. The composition according to claim 2 or 4, wherein~~ method according to claim 2, wherein all of R^{Ia}, R^{Ib} and R^{Ic} in the block A are hydrogen.

~~6.~~ 5. The ~~composition~~method according to claim 2, ~~4, or 5,~~ wherein all of R^{IIa} to R^{IIi} in the block B are hydrogen.

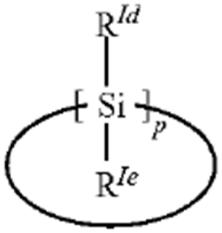
~~7.~~ 6. The ~~composition~~method according to ~~any one of claims~~claim 1~~ to 6~~, wherein the block copolymer comprises a main chain comprising the block B and a side chain comprising the block A.

~~8.~~ 7. The ~~composition~~method according to ~~any one of claims~~claim 1~~ to 7~~, wherein at least one of the block A is represented by the following formula (I-4):



(I-4)

(I-4)



~~(~~

wherein R^{Id} and R^{Ie} are each independently hydrogen, halogen, C_{1-6} alkyl, C_{6-10} aryl or a single bond, provided that at least one of R^{Id} and R^{Ie} is a single bond, and p is an integer of 5 or more.

~~p is an integer of 5 or more).~~

~~9.~~ ~~8.~~ The ~~composition~~method according to ~~any one of claims~~claim 1~~ to 8~~, wherein between the block A and another block A, between the block B and another block B, or between the block A and the block B in the block copolymer is connected by a crosslinking group comprising silicon.

~~10. The composition according to any one of claims 1 to~~ 9. The method according to claim 1, wherein the relative dielectric constant of the solvent is 3.0 or less.

~~11. A method for producing a siliceous film, comprising:~~

~~applying the composition according to any one of claims 1 to 10 above a substrate to form a coating film, and~~

~~heating the coating film in an oxidizing atmosphere.~~

~~12.~~ 10. The method according to claim ~~11~~1, wherein the oxidizing atmosphere comprises oxygen at a pressure of 20 to 101 kPa and water vapor at a pressure of 0.5 to 101 kPa.

~~13.~~ 11. The method according to claim ~~11 or 12, wherein light having the wavelength of 248 to 436 nm is irradiated after formation of the coating film.~~

~~14. The method according to any one of claims 11 to 13~~1, wherein the heating is performed at 200 to 1,000° C.

~~15.~~ 12. An electronic device, comprising the siliceous film produced by the method according to ~~any~~claim 1.

13. The method according to claim 2, wherein the block A in one molecule is 1 to 95 and the number of the repeating units in one ~~of claims 11~~block B is 20 to 330.

14. The method according to ~~14~~claim 2, wherein the block A in one molecule is 3 to 90 and the number of the repeating units in one block B is 20 to 130.

15. The method according to claim 2, wherein the block A is linear, the total number of repeating units of the formulae (I-1) to (I-3) constituting one block A is 5 to 20.

16. The method according to claim 2, wherein the block A is linear, the total number of repeating units of the formulae (I-1) to (I-3) constituting one block A is 5 to 15.

17. The method according to claim 1, wherein the content of nitrogen in the block copolymer is 8 to 25 mass % based on the total mass of the block copolymer.