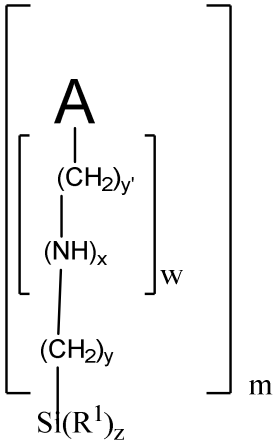
Claims

1. A composition comprising the reaction product of:

(a)

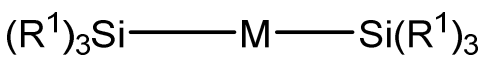
(i) a compound of Formula(I)



(I),

wherein A is an aromatic ring or a heteroaromatic ring, and wherein each R^1 is the same or different and is chosen from hydrogen, hydroxy, amino, halo, pseudohalo, C_1-C_{20} alkyl, C_1-C_{20} alkylamino, phenyl, benzyl, and C_1-C_{20} alkoxy, phenoxy, and C_3-C_8 cycloalkyl; x is 0 or 1; each y and y' may be the same or different and is zero or is chosen from an integer of from 1 to 5; z is an integer chosen from 1, 2, or 3; m is an integer chosen from 1, 2, or 3; w is zero or an integer chosen from 1, 2, 3, or 4 and m + z = 4; or

(ii) a compound of Formula (II)



(II)

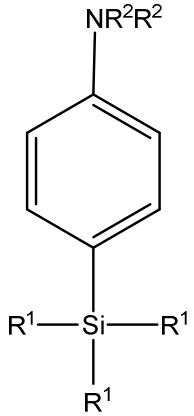
wherein each R^1 is the same or different and is as defined above, and -M- is chosen from -NH- or -O-;

(b) greater than 60 weight percent concentrated phosphoric acid; and

(c) a solvent comprising water;

wherein the composition is a selective etching composition having a silicon nitride to silicon oxide selectivity in a range of from about 10:1 to about 7000:1.

2. The composition of claim 1, wherein the compound of Formula (I) has the following structure:



wherein R^1 is as defined in claim 1, and each R^2 is the same or different and is chosen from H and C_1-C_{20} alkyl.

3. The composition of claim 1, wherein component (a) is triphenylsilanol.

4. The composition of claim 1, wherein component (a) is p-aminophenyl trimethoxysilane.

5. The composition of claim 1, wherein each R^1 is the same or different and is chosen from hydroxy, C_1-C_{20} alkoxy, and C_1-C_{20} alkylamino, and y, y', and x are zero.

6. The composition of claim 1, wherein component (a) is a compound of Formula (I), further comprising a compound of Formula (II), wherein R^1 is C_1-C_{20} alkyl.

7. The composition of claim 1, further comprising a fluoride compound.

8. The composition of claim 1, further comprising a primary, secondary, or tertiary amine, C_1-C_6 alkanolamine, or dihydrogen phosphate salt thereof, or a nitrogen-containing heterocyclic ring, optionally substituted by with one to three groups chosen from C_1-C_{20} alkyl, C_1-C_{20} alkoxy, -CN, -NO_2, C_1-C_{20} alkoxycarbonyl, C_1-C_{20} alkanoyloxy, C_1-C_{20} alkylsulfonyl, hydroxyl, carboxyl, halo, phenyl, benzyl, amino-C_1-C_{20} alkyl, --C_1-C_{20} alkyl-SO_3H, --C_1-C_{20} alkyl-PO_3H_2, and groups of the formula -$N(R^1)_2$, wherein R^1 is as defined in claim 1.

9. The composition of claim 1, wherein the compound of Formula (I) is chosen from p-aminophenyl trimethoxysilane, triphenyl silanol, and 2-(4-pyridylethyl)triethoxysilane.

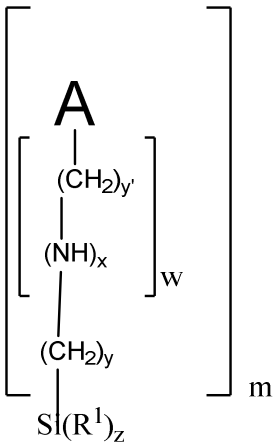
10. The composition of claim 1, wherein the compound of Formula (II) is hexamethyldisiloxane.

11. The composition of claim 1 further comprising 3-aminopropylsilane triol and/or tetramethylammonium silicate.

12. A method for removing silicon nitride from a microelectronic device, said method comprising:

contacting the microelectronic device with a composition comprising:

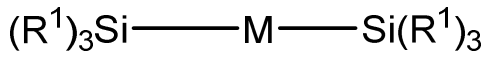
(i) a compound of Formula(I)



(I),

wherein A is an aromatic ring or a heteroaromatic ring, and wherein each R^1 is the same or different and is chosen from hydrogen, hydroxy, amino, halo, pseudohalo, C_1-C_{20} alkyl, C_1-C_{20} alkylamino, phenyl, benzyl, and C_1-C_{20} alkoxy, phenoxy, and C_3-C_8 cycloalkyl; x is 0 or 1; each y and y' may be the same or different and is zero or is chosen from an integer of from 1 to 5; z is an integer chosen from 1, 2, or 3; m is an integer chosen from 1, 2, or 3; w is zero or an integer chosen from 1, 2, 3, or 4 and m + z = 4; or

(ii) a compound of Formula (II)



(II)

wherein each R^1 is the same or different and is as defined above, and -M- is chosen from -NH- or -O-;

(b) greater than 60 weight percent concentrated phosphoric acid; and

(c) a solvent comprising water;

and selectively removing said silicon nitride material relative to silicon oxide from the microelectronic device with a selectivity in a range of from about 10:1 to about 7000:1.

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