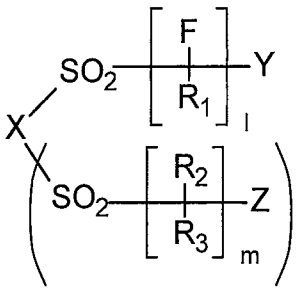
Claims

1. A rinse composition comprising a surfactant represented by below formula (I), a C_2-C_{16} diol derivative represented by below formula (II), and water,



formula (I)

wherein X is an oxygen, nitrogen or carbon,

R_1, R_2 and R_3 are independently hydrogen, fluorine or C_1-$_5$ alkyl,

Y is a hydrogen, fluorine, or C_1-$_5$ alkyl,

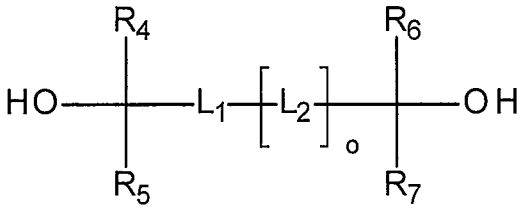
each Z is independently hydrogen, fluorine, or C_1-$_5$ alkyl,

or Y and Z are taken together to form a single bond,

l is 1,2,3,4 or 5,

m is 0,1,2,3,4 or 5, and

n is 0, 1 or 2.



formula (II)

wherein R_4, R_5 R_6 and R_7 are independently hydrogen, fluorine or C_1-$_5$ alkyl,

L_1 and L_2 are independently C_1-$_5$ alkane linker, C_2-$_4$ alkene linker or C_2-$_4$ alkyne linker,

L_1 and L_2 are independently unsubstituted, or substituted by fluorine, C_1-$_5$ alkyl, or hydroxyl, and

o is 0, 1 or 2.

2. The rinse composition according to claim 1, wherein the content ratio of the surfactant represented by formula (I) is on or more than 0.01 and on or less than 0.5 mass% in the rinse composition.

3. The rinse composition according to claim 1 or 2, wherein the content ratio of the diol derivative is on or more than 0.01 and on or less than 0.5 mass% in the rinse composition.

4. The rinse composition according to at least one of claims of 1 to 3, wherein the rinse composition further comprises at least one additional component selected from acids, bases, surfactants other than the surfactant represented by formula (I) and an organic solvent other than the diol derivative represented by formula (II).

5. The rinse composition according to at least one of claims of 1 to 4, wherein the rinse composition further comprises at least one additional component selected from fungicides, antimicrobial agents, preservatives and antifungal agents.

6. The rinse composition according to at least one of claims of 1 to 5, wherein
in formula (I),
X is nitrogen,
all of R_1, R_2 and R_3 are fluorine,
Y is fluorine and each Z is fluorine, or Y and Z are taken together to form a single bond,
l is 3 or 4,
m is 3 or 4,
n is 1, and
in formula (II),
R_4, R_5 R_6 and R_7 are independently hydrogen, methyl or ethyl,
L_1 and L_2 are independently C_2 or C_4 alkane linker, C_2 alkene linker, or C_2

alkyne linker,
L_1 and L_2 are unsubstituted, or substituted by fluorine, and
o is 0.

7. The rinse composition according to at least one of claims of 1 to 6, wherein the surfactant represented by formula (I) is Bis(1,1,2,2,3,3,3-heptafluoro-1-propanesulfonyl)imide, Bis(1,1,2,2,3,3,4,4,4-nonafluoro-1-butanesulfonyl)imide, 1,1,2,2,3,3-Hexafluoropropane-1,3-disulfonylmide, Bis(trifluoromethanesulfonyl)imide, Nonafluoro-1-butanesulfonamide, Nonafluorobutanesulfonic acid, Bis(1,1,2,2,2-pentafluoroethanesulfonyl)imide, or a mixture thereof, and
the diol derivative represented by formula (II) is 3-Hexyn-2,5-diol, 2,5-Dimethyl-3-hexyne-2,5-diol, 3,6-Dimethyl-4-octyne-3,6-diol, 1,4-Butynediol, 2,4-Hexadiyne-1,6-diol, 1,4-Butanediol, 2,2,3,3-Tetrafluoro-1,4-butanediol, 2,2,3,3,4,4,5,5-Octafluoro-1,6-hexanediol, cis-1,4-Dihydroxy-2-butene, or a mixture thereof.

8. A method for forming resist patterns, comprising;
(1) applying a photosensitive resin composition on a substrate or one or more other layers on the substrate to make a photosensitive resin composition layer,
(2) exposing the photosensitive resin composition layer,
(3) developing the exposed photosensitive resin composition layer, and
(4) rinsing the developed layer with the rinse composition according to at least one of claims 1 to 7.

9. The method for forming resist patterns according to claim 8, wherein the photosensitive resin composition is a chemically amplified photosensitive resin composition and the exposure is an exposure with extreme ultra violet radiation.

10. The method for forming resist patterns according to claim 8 or 9, wherein the finest pitch size of the resist pattern on one whole circuit unit is on or more than 10 nm to on or less than 20 nm.

11. A semiconductor device manufacturing method comprising the method for forming resist patterns according to at least one of claims 8 to 10.

12. The semiconductor device manufacturing method according to claim 11, further comprising;
making gaps of the substrate with using the formed resist patterns as a mask.