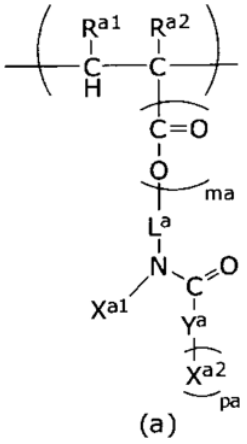
Patent Claims

1. A bottom anti-reflective coating composition consisting of a semiconductor composition comprising a polymer (A) and a solvent (B);

wherein the polymer (A) comprising at least one structural unit selected from the group consisting of the following Units (a), (b), (c) and (d):

Unit (a) represented by the formula (a):



(a)

(wherein,

R^{a1} and R^{a2} are each independently H, C_{1-5} alkyl, C_{1-5} alkoxy or -COOH,

L^a is a single bond, C_{1-5} alkylene, -O- or C_{1-5} alkoxylene,

ma is 0 to 1,

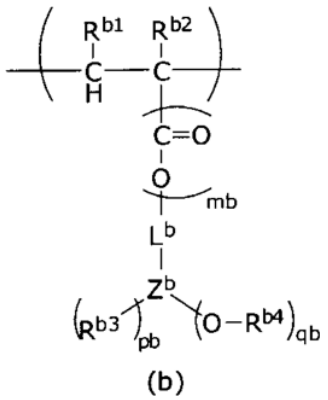
X^{a1} is H or a C_{1-5} hydrocarbon group (one or more of $-CH_2-$ in the C_{1-5} hydrocarbon group can be each independently replaced with -NH-, -C(=O)- and/or -O- and one or more of $-CH_3$ in the C_{1-5} hydrocarbon group can be each independently replaced with $-NH_2$ and/or -COOH),

Y^a is N or O, where when Y^a is N, pa is an integer of 1 or 2, and when Y^a is O, pa is 1,

X^{a2} is H or a C_{1-5} hydrocarbon group (one or more of $-CH_2-$ in the C_{1-5} hydrocarbon group can be each independently replaced with -NH-, -C(=O)- and/or -O- and one or more of $-CH_3$ in the C_{1-5} hydrocarbon group can be each independently replaced with $-NH_2$

and/or -COOH), and when pa is 2, two X^{a2} can be identical or different,
where, X^{a1} and X^{a2} can be bonded and/or two X^{a2} can be bonded when pa is 2, to form a saturated or unsaturated ring);

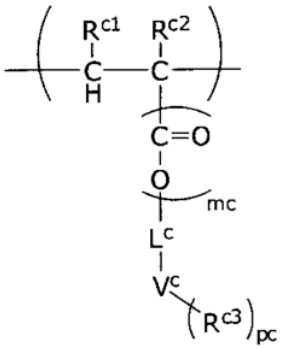
Unit (b) represented by the formula (b):



(b)

(wherein,
R^{b1} and R^{b2} are each independently H, C_{1-5} alkyl, C_{1-5} alkoxy, C_{1-5} alkoxyalkyl or -COOH,
mb is 0 to 1,
L^b is a single bond, C_{1-5} alkylene, C_{6-20} arylene, -O- or C_{1-5} alkoxylene,
Z^b is a C_{6-20} aromatic hydrocarbon or a C_{7-20} aromatic substituted aliphatic hydrocarbon,
pb is 0 to 4,
qb is 1 to 3,
R^{b3} is H, C_{1-5} alkyl, C_{1-5} alkoxy, C_{1-5} alkoxyalkyl or -COOH, and when pb > 1, each R^{b3} can be identical or different,
R^{b4} is H or methyl, and when qb > 1, each R^{b4} can be identical or different,
where, Unit (b) has an aryl having at least one fused structure);

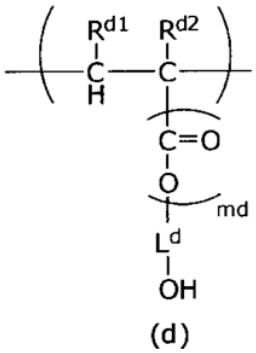
Unit (c) represented by the formula (c):



(c)

(wherein,
R^{c1} and R^{c2} are each independently H, C_{1-5} alkyl, C_{1-5} alkoxy or -COOH,
mc is 0 to 1,
L^c is a single bond, C_{1-5} alkylene, -O- or C_{1-5} alkoxylene,
V^c is a fused aromatic hydrocarbon or a fused heterocyclic ring, and V^c has 3 to 6 rings fused,
pc is 0 to 5,
R^{c3} is C_{1-5} alkyl, C_{1-5} alkoxy or -COOH, and when pc > 1, each R^{c3} can be identical or different); and

Unit (d) represented by the formula (d):



(d)

(wherein,
R^{d1} and R^{d2} are each independently H, C_{1-5} alkyl, C_{1-5} alkoxy or -COOH,
md is 0 to 1,
L^d is a single bond, C_{1-5} alkylene (one or more of $-CH_2-$ in the C_{1-5} alkylene can be replaced with -NH-, -C(=O)- and/or -O- and one

or more of $-CH_3$ in the C_{1-5} alkylene can be replaced with -OH, $-NH_2$ and/or -COOH), -O- or C_{1-5} alkoxylene),

wherein, n_a, n_b, n_c and n_d, which are the numbers of repetition respectively of Units (a), (b), (c) and (d), satisfy the following formulae:

$n_a + n_b > 0$,

$n_d \geq 0$;

$n_a / (n_a + n_b + n_c + n_d)$ is 2 to 80%;

$n_b / (n_a + n_b + n_c + n_d)$ is 10 to 90%;

$n_c / (n_a + n_b + n_c + n_d)$ is 3 to 80%; and

$n_d / (n_a + n_b + n_c + n_d)$ is 0 to 80%.

2. The bottom anti-reflective coating composition according to claim 1, wherein polymer (A)
satisfies the following formulae:

$5\% \leq n_a / (n_a + n_b + n_c + n_d) \leq 50\%$,

$30\% \leq n_b / (n_a + n_b + n_c + n_d) \leq 80\%$,

$5\% \leq n_c / (n_a + n_b + n_c + n_d) \leq 40\%$, and/or

$0\% \leq n_d / (n_a + n_b + n_c + n_d) \leq 40\%$.

3. The bottom anti-reflective coating composition according to claim 1 or 2, wherein the total number (n_{total}) of all repeating units contained in the
polymer (A) satisfies the following formula:

$80\% \leq (n_a + n_b + n_c + n_d) / n_{total} \leq 100\%$.

4. The bottom anti-reflective coating composition according to one or more of claims 1 to 3, wherein the solvent (B) comprises water, a hydrocarbon solvent, an ether solvent, an ester solvent, an alcohol solvent or a ketone solvent.

5. The bottom anti-reflective coating composition according to one or more of claims 1 to 4, which further comprises a crosslinker (C), where the content of the crosslinker (C) is preferably 0 to 5% by mass based on the totalmass of the polymer (A) in the semiconductor composition.

6. The bottom anti-reflective coating composition according to one or more of claim 1 to 5, whichfurther comprises an acid generator (D), where the content of the
acid generator (D) is preferably 0.01 to 10% by mass based on the total mass of the polymer (A) in the semiconductor composition, and which preferably further comprises a surfactant (E), where the content of the surfactant (E) is preferably 0.001 to 5% by mass based on the total mass of the polymer (A) in the semiconductor composition.

7. The bottom anti-reflective coating composition according to one or more of claims 1 to 6, whichfurther comprises other additive (F), where the additive (F) is
preferably at least one selected from the group consisting of a base generator, a smoothing agent, a monomeric dye, a lower alcohol (C_{1-6} alcohol), a surface leveling agent, a substrate adhesion agent, an antifoaming agent and an antiseptic, where the content of the additive (F) is preferably 0 to 10% by mass based on the total mass of the polymer (A) in the semiconductor composition.

8. The bottom anti-reflective coating composition according to one or more of claims 1 to 7, wherein
the content of the polymer (A) is 1 to 30% by mass and the content of the solvent (B) is preferably 50 to 99% by mass, based on the total mass of the semiconductor composition.

9. The bottom anti-reflective coating composition according to one or more of claims 1 to 8, wherein the mass average molecular weight of the polymer (A) is 1,000 to50,000.

10. A method for manufacturing a film comprising the following processes:

(1) applying the bottom anti-reflective coating composition according to one or moreof claims 1 to 9 above a substrate; and

(2) heating said semiconductor composition to form a film, wherein,

preferably, the heating in said (2) is performed at 100 to 250°C and/or for 30 to 300 seconds,

preferably, the heating in said (2) is performed in an air or nitrogen gas atmosphere, and

preferably, the thickness of the formed film is 10 to 1,000 nm.

11. A method for manufacturing a resist film comprising the following processes:

manufacturing a film by the method according to claim 10,

(3) applying a resist composition above the film according to claim 10, and

(4) heating said resist composition to form a resist film,
wherein,

preferably, the heating in said (4) is performed at 80 to 250°C and/or for 30 to 600 seconds,

preferably, the heating in said (4) is performed in an air or nitrogen gas atmosphere, and

preferably, the thickness of the formed resist film is 100 to 50,000 nm.

12. A method for manufacturing a resist pattern comprisingthe following processes:

manufacturing a resist film by the method according to claim 11,

(5) exposing said resist film, and

(6) developing said resist film,

wherein,

preferably, the exposure in said (5) is performed using a light source of 248 nm ± 1% or 193 nm ± 1%,

preferably, said resist composition is a chemically amplified resist composition,

preferably, said resist composition is a positive resist composition or a negative resist composition, and

preferably, said resist composition comprises an acid generator or a base generator.

13. A method for manufacturing a processed substrate comprising the following processes:

manufacturing a resist pattern by the method according to claim 12; and

(7) etching with the resist pattern as a mask,

wherein,

preferably, said (7) is to etch the film in said (2), or the substrate.

14. A method for manufacturing a device comprising the method according to any one of claims 10 to 13.