CLAIMS

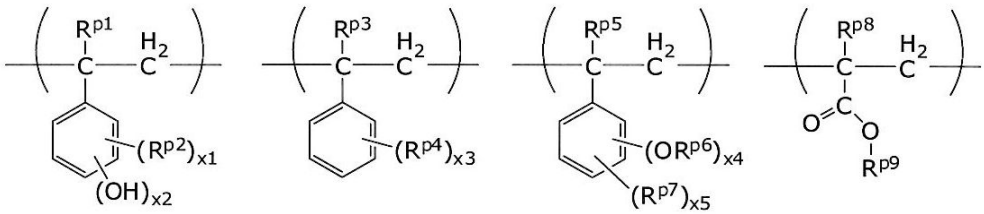
1. A method for manufacturing a metal pattern comprising the following processes:

(a) manufacturing a resist pattern comprising the following processes:

(1) applying a positive type resist composition comprising:

(A) at least one polymer selected from the group consisting of:

polymer P comprising a repeating unit selected from the group consisting of the formulae (P-1) to (P-4):



(P-1) (P-2) (P-3) (P-4)

(wherein,

R^{p1}, R^{p3}, R^{p5} and R^{p8} are each independently C_{1-5} alkyl, C_{1-5} alkoxy or -COOH,

R^{p2}, R^{p4} and R^{p7} are each independently C_{1-5} alkyl (where $-CH_2-$ in alkyl can be replaced with -O-),

R^{p6} and R^{p9} are each independently C_{1-5} alkyl (where $-CH_2-$ in alkyl can be replaced with -O-),

x1 is 0 to 4,

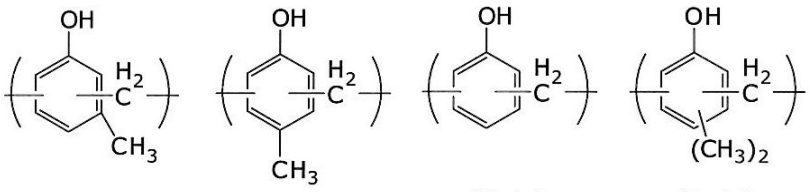
x2 is 1 to 2, provided that x1 + x2 ≤ 5,

x3 is 0 to 5,

x4 is 1 to 2,

x5 is 0 to 4, provided that x4 + x5 ≤ 5), and

polymer Q comprising a repeating unit selected from the group consisting of the formulae (Q-1a) to (Q-1d):



(Q-1a) (Q-1b) (Q-1c) (Q-1d)

wherein,

N_{qa} that is the number of the repeating unit of (Q-1a), N_{qb} that is the number of the repeating unit of (Q-1b), N_{qc} that is the number of the repeating

unit of (Q-1c), and N_{qd} that is the number of the repeating unit of (Q-1d) satisfy the following formulae:

$30\% \leq N_{qa} / (N_{qa} + N_{qb} + N_{qc} + N_{qd}) \leq 100\%$;

$0\% \leq N_{qb} / (N_{qa} + N_{qb} + N_{qc} + N_{qd}) \leq 70\%$;

$0\% \leq N_{qc} / (N_{qa} + N_{qb} + N_{qc} + N_{qd}) \leq 50\%$; and

$0\% \leq N_{qd} / (N_{qa} + N_{qb} + N_{qc} + N_{qd}) \leq 70\%$;

provided that the total mass of the polymer P (M_p) and the total mass of the polymer Q (M_q) in the positive type resist composition satisfy the formulae: $0 < M_p / (M_p + M_q) \leq 100\%$ and $0 \leq M_q / (M_p + M_q) < 70\%$;

(B) an acid generator having an imide group;

(C) a dissolution rate modifier, which is a compound in which two or more phenol structures are bonded by a hydrocarbon group optionally substituted by oxy; and

(D) a solvent;

(2) heating the positive type resist composition to form a resist layer;

(3) exposing the resist layer;

(4) subjecting the resist layer to post exposure bake; and

(5) developing the resist layer;

(b) depositing metal above a substrate by sputtering using the resist pattern as a mask; and

(c) removing the resist pattern with a remover.

2. The method according to claim 1, wherein $10 \leq M_q / (M_p + M_q) \leq 60\%$.

3. The method according to claim 1 or claim 2, wherein the positive type resist composition further comprises (E) a basic compound, and preferably the positive type resist composition further comprises (F) a plasticizer.

4. The method according to any one of claims 1 to 3, wherein the content of the acid generator (B) is 0.1 to 10.0 mass% based on the total mass of the polymer (A),

preferably, the content of the polymer (A) is 10 to 50 mass% based on the total mass of the positive type resist composition,

preferably, the content of the dissolution rate modifier (C) is 0.1 to 20 mass% based on the total mass of the polymer (A),

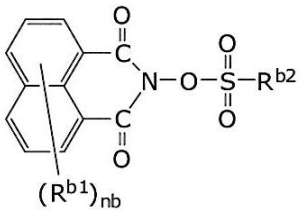
preferably, the content of the solvent (D) is 40 to 90 mass% based on the total mass of the positive type resist composition,

preferably, the content of the basic compound (E) is 0 to 1.0 mass% based on the total mass of the polymer (A), and

preferably, the content of the plasticizer (F) is 0 to 30 mass% based on the total mass of the polymer (A).

5. The method according to any one of claims 1 to 4, wherein,

the acid generator (B) is represented by the formula (b):



(b)

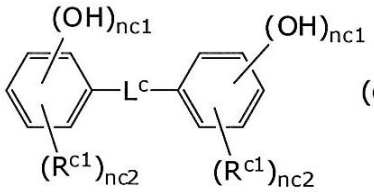
(wherein,

R^{b1} is each independently C_{3-10} alkenyl or alkynyl (where CH_3- in alkenyl and alkynyl can be substituted by phenyl, and -CH_2- in alkenyl and alkynyl can be replaced with at least any one of -C(=O)-, -O- or phenylene), C_{2-10} thioalkyl or C_{5-10} saturated heterocyclic ring,

nb is 0, 1 or 2, and

R^{b2} is C_{1-5} fluorine-substituted alkyl);

the dissolution rate modifier (C) is represented by the formula (c):



(c)

(wherein,

nc1 is each independently 1, 2 or 3,

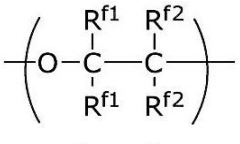
nc2 is each independently 0, 1, 2 or 3,

R^{c1} is each independently C_{1-7} alkyl,

L^c is C_{1-15} divalent alkylene (this can be substituted by aryl which is optionally hydroxy-substituted, and can form a ring with a substituent of the group other than L^c);

the basic compound (E) is selected from a group consisting of ammonia, C_{1-16} primary aliphatic amine, C_{2-32} secondary aliphatic amine, C_{3-48} tertiary aliphatic amine, C_{6-30} aromatic amine, C_{5-30} heterocyclic amine, and any derivatives thereof; and/or

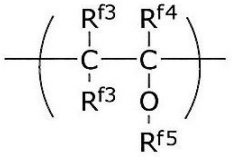
the plasticizer (F) is a compound comprising a structural unit represented by the formula (f-1):



(f-1)

(wherein,

R^{f1} is each independently hydrogen or C_{1-5} alkyl, and R^{f2} is each independently hydrogen or C_{1-5} alkyl), and/or the formula (f-2):



(f-2)

(wherein,

R^{f3} is each independently hydrogen or C_{1-5} alkyl,

R^{f4} is hydrogen or C_{1-5} alkyl, and

R^{f5} is C_{1-5} alkyl.)

6. The method according to any one of claims 1 to 5, wherein the viscosity of the positive type resist composition is 50 to 2,000 cP at 25°C.

7. The method according to any one of claims 1 to 6, wherein the positive type resist composition forms a reverse tapered shape.

8. The method according to any one of claims 1 to 7, wherein the positive type resist composition is a positive type lift-off resist composition.

9. The method according to claim 1, wherein the film thickness of the resist pattern is 1 to 50 μm.

10. The method according to claim 1, wherein the resist pattern has a reverse tapered shape.

11. The method according to claim 1, wherein the film thickness of the metal pattern is 0.01 to 40 μm.

12. A method for manufacturing a device comprising the method according to any one of claims 9 to 11.