CLAIMS

1. A negative type photosensitive resin composition comprising:

an epoxy group-containing resin (A);

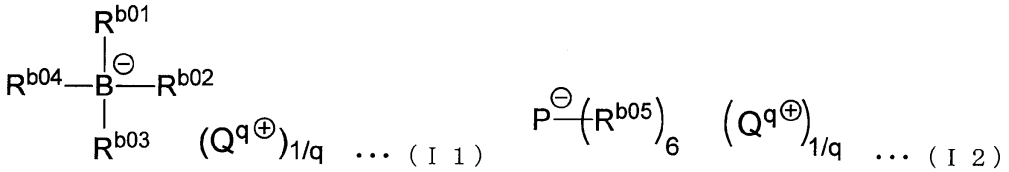
a metal oxide (M); and

a cationic polymerization initiator (I),

wherein, in use, the negative type photosensitive resin composition is developed by an organic developing solution containing an organic solvent to form a negative type pattern,

wherein the content of the epoxy group-containing resin (A) is in a range of 70% to 90% by mass with respect to the total content of the epoxy group-containing resin (A), the cationic polymerization initiator (I), and the metal oxide (M), and

wherein the cationic polymerization initiator (I) contains one or more selected from the group consisting of a compound represented by Formula (I1) and a compound represented by Formula (I2):

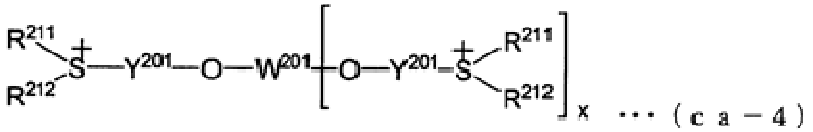


... (I1) ... (I2)

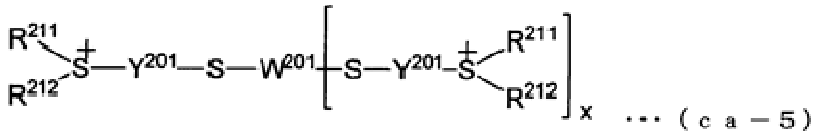
wherein R^{b01} to R^{b04} each independently represent an aryl group which may have a substituent or a fluorine atom, R^{b05} represents a fluorinated alkyl group which may have a substituent or a fluorine atom, a plurality of R^{b05}'s may be the same as or different from one another, q represents an integer of 1 or greater, and Q^{q+}'s each independently represent a q-valent organic cation represented by any one of Formula (Ca-1) to (Ca-5), and q represents 1,



(ca-1) (ca-2) (ca-3)



... (ca-4)



... (ca-5)

wherein R^{201} to R^{207}, and R^{211} and R^{212} each independently represent an aryl group which may have a substituent, a heteroaryl group which may have a substituent, an alkyl group which may have a substituent, or an alkenyl group which may have a substituent, R^{201} to R^{203}, R^{206} and R^{207}, and R^{211} and R^{212} may be bonded to one another to form a ring together with a sulfur atom in the formulae, R^{208} and R^{209} each independently represent a hydrogen atom or an alkyl group having 1 to 5 carbon atoms, R^{210} represents an aryl group which may have a substituent, an alkyl group which may have a substituent, an alkenyl group which may have a substituent, or a -SO2-containing cyclic group which may have a substituent, L^{201} represents -C(=O)- or -C(=O)-O-, Y^{201}'s each independently represent an arylene group, an alkylene group, or an alkenylene group, x represents 1 or 2, and W^{201} represents an (x+1)-valent linking group.

2. The negative type photosensitive resin composition according to claim 1,

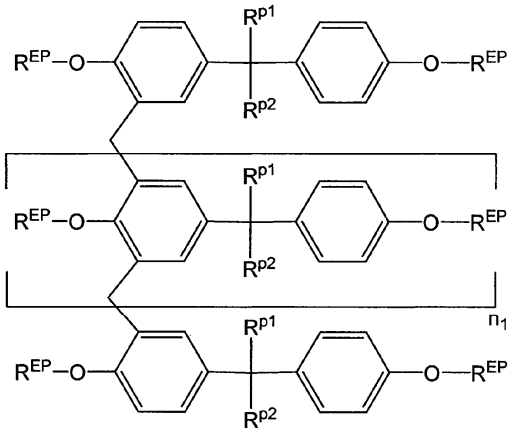
wherein a content of the cationic polymerization initiator (I) is in a range of 1 to 5 parts by mass with respect to 100 parts by mass which is a total amount of the epoxy group-containing resin (A) and the metal oxide (M).

3. The negative type photosensitive resin composition according to claim 1 or 2,

wherein a content of the metal oxide (M) is in a range of 10 to 30 parts by mass with respect to 100 parts by mass of the epoxy group-containing resin (A).

4. The negative type photosensitive resin composition according to any one of claims 1 to 3,

wherein the epoxy group-containing resin (A) contains a resin represented by Formula (A1):



・・・(A1)

wherein R^{p1} and R^{p2} each independently represent a hydrogen atom or an alkyl group having 1 to 5 carbon atoms, a plurality of R^{p1}'s may be the same as or different from one another, a plurality of R^{p2}'s may be the same as or different from one another,

n_1 represents an integer of 1 to 5, R^{EP} represents an epoxy group-containing group, and a plurality of R^{EP}'s may be the same as or different from one another.

5. The negative type photosensitive resin composition according to any one of claims 1 to 4,

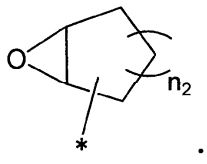
wherein the metal oxide (M) consists of particles having a volume average particle diameter of 5 to 40 nm.

6. The negative type photosensitive resin composition according to any one of claims 1 to 5, further comprising:

a silane coupling agent.

7. The negative type photosensitive resin composition according to any one of claims 1 to 6,

wherein the epoxy group-containing resin (A) contains a compound having a partial structure represented by Formula (m1):

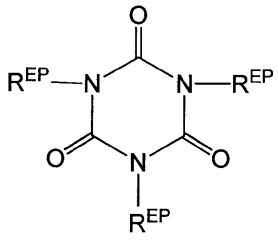


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wherein n_2 represents an integer of 1 to 4, and the symbol "*" represents a bonding site.

8. The negative type photosensitive resin composition according to any one of claims 1 to 7,

wherein the epoxy group-containing resin (A) contains a compound represented by Formula (m2):



... (m 2)

wherein R^{EP} represents an epoxy group-containing group, and a plurality of R^{EP}'s may be the same as or different from one another.

9. A photosensitive resist film which is obtained by laminating a base film, a photosensitive resin film formed using the negative type photosensitive resin composition according to any one of claims 1 to 8, and a cover film in that order.

10. A pattern forming method comprising:

a step of forming a photosensitive resin film on a support using the negative type photosensitive resin composition according to any one of claims 1 to 8;

a step of exposing the photosensitive resin film; and

a step of developing the exposed photosensitive resin film by an organic developing solution containing an organic solvent to form a negative type pattern.

11. A pattern forming method comprising:

a step of forming a photosensitive resin film on a support using the photosensitive resist film according to claim 9;

a step of exposing the photosensitive resin film; and

a step of developing the exposed photosensitive resin film to form a negative type pattern.

12. A cured film which is obtained by curing the negative type photosensitive resin composition according to any one of claims 1 to 8.

13. A method of producing a cured film, comprising:

a step of forming a photosensitive resin film on a support using the negative type photosensitive resin composition according to any one of claims 1 to 8; and

a step of curing the photosensitive resin film to obtain a cured film.

14. A method of producing a cured film, comprising:

a step of forming a photosensitive resin film on a support using the photosensitive resist film according to claim 9; and

a step of curing the photosensitive resin film to obtain a cured film.