partition formation.

Means for Solving the Problems

[0009]

In order to solve the problems as described above, the present disclosure has the constitution as described below, namely, a negative photosensitive resin composition comprising the following (a) to (d):

(a) metallic compound particles,

(b) a polysiloxane compound,

(c) a compound having at least 1 group containing an α,β-unsaturated carboxylate ester structure, and

(d) a photopolymerization initiator, the composition further comprising

(e) a compound containing maleimide group.

[0009a] In an aspect, there is provided a negative photosensitive resin composition comprising the following (a) to (d):

(a) metallic compound particles,

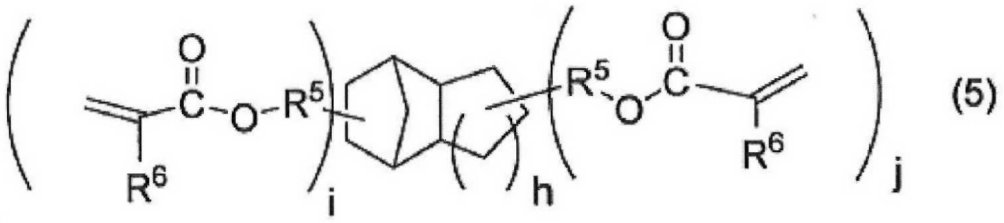
(b) a polysiloxane compound,

(c) a compound having at least 1 group containing an α,β-unsaturated carboxylate ester structure, and

(d) a photopolymerization initiator, the composition further comprising

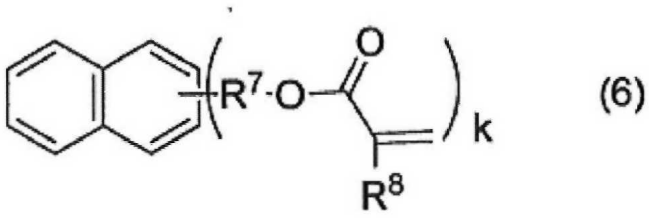
(e) a compound containing maleimide group,

wherein the compound (c) having at least 1 group containing an α,β-unsaturated carboxylate ester structure is a compound selected from general formulae (5) to (10):



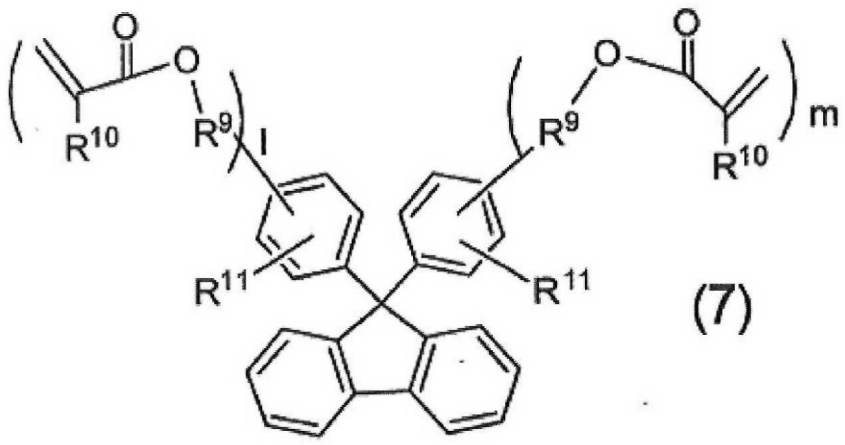
(5)

wherein in general formula (5), R^5 is single bond, a chain aliphatic group containing 1 to 10 carbon atoms and 1 to 3 oxygen atoms, or a cyclic aliphatic hydrocarbon group containing 3 to 16 carbon atoms; the plurality of R^5 being independently the same or different; R^6 is hydrogen or methyl group, the plurality of R^6 being independently the same or different; h is an integer of 0 to 3; i and j are integer of 0 to 2, i+j being 1 to 2,



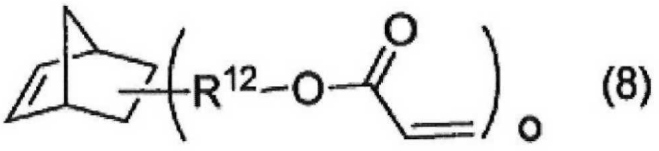
(6)

in general formula (6), R^7 is single bond, a chain aliphatic group containing 1 to 10 carbon atoms and 1 to 3 oxygen atoms, or a cyclic aliphatic hydrocarbon group containing 3 to 16 carbon atoms, the plurality of R^7 being independently the same or different, R^8 is hydrogen or methyl group, the plurality of R^8 being independently the same or different; and k is an integer of 1 to 2,



(7)

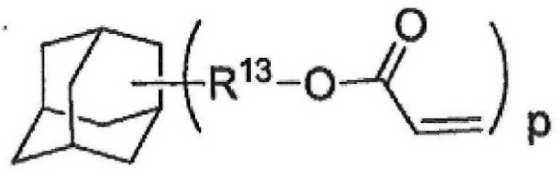
in general formula (7), R^9 is single bond, a chain aliphatic group containing 1 to 10 carbon atoms and 1 to 3 oxygen atoms, or a cyclic aliphatic hydrocarbon group containing 3 to 16 carbon atoms, the plurality of R^9 being independently the same or different; R^{10} is hydrogen or methyl group, the plurality R^{10} being independently the same or different; R^{11} is hydrogen or a chain aliphatic group containing 1 to 10 carbon atoms and 1 to 3 oxygen atoms, or a cyclic aliphatic hydrocarbon group containing 3 to 16 carbon atoms, the plurality of R^{11} being independently the same or different; and l and m are an integer of 0 to 2, l+m being 1 to 2,



(8)

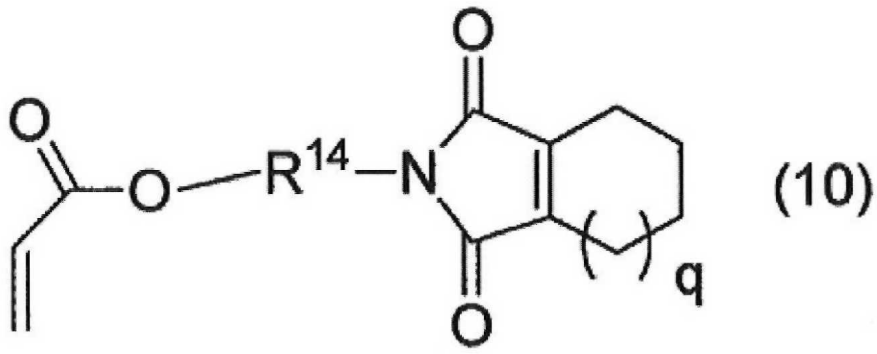
in general formula (8), R^{12} is single bond, a chain aliphatic group containing 1 to 10 carbon atoms and 1 to 3 oxygen atoms, or a cyclic aliphatic hydrocarbon group containing 3 to 16

carbon atoms, the plurality of R^{12} being independently the same or different; and o is an integer of 1 to 2,



(9)

in general formula (9), R^{13} is single bond, a chain aliphatic group containing 1 to 10 carbon atoms and 1 to 3 oxygen atoms, or a cyclic aliphatic hydrocarbon group containing 3 to 16 carbon atoms, the plurality of R^{13} being independently the same or different; and p is an integer of 1 to 2,



(10)

and wherein in general formula (10), q is an integer of 0 to 3 and R^{14} is a chain aliphatic group containing 1 to 10 carbon atoms and 1 to 3 oxygen atoms.

[0009b] In another aspect, there is provided a cured film prepared by curing the negative photosensitive resin composition as defined above.

[0009c] In another aspect, there is provided a method for producing a cured film comprising the steps of coating the negative photosensitive resin composition as defined above on a substrate, developing the coating after exposure, and curing the coating by heat.

[0009d] In another aspect, there is provided an LED luminaire having the cured film as defined above.
[0009e] In another aspect, there is provided an image sensor having the cured film as defined above.
[0009f] In another aspect, there is provided a backside illuminated CMOS image sensor comprising at least a photoelectric conversion layer, a color filter, and a flattening layer in this order, wherein the color filter has colored pixels divided by the pattern obtained by using the negative photosensitive resin composition as defined above, and wherein refractive index of the flattening layer is smaller than the refractive index the pattern.

Advantageous Effect
[0010]

The present disclosure provides a photosensitive composition which is a negative photosensitive resin composition that exhibits a high index of refraction, high transparency properties with no additional post-exposure process, high sensitivity in the exposure even if stored for prolonged period at room temperature, and high resolution and solvent resistance after the pattern formation, and that provides a pattern having a rectangular cross section adapted for the pixel formation and partition formation. In addition, the present disclosure does not require the patterning by etching method, and production by a simple procedure is thereby enabled, and deterioration of the wiring by chemical solution or plasma in the etching is also avoided.
Description of Preferred Embodiments
[0011]

The negative photosensitive resin composition of the present invention is a negative photosensitive composition comprising the following (a) to (d):

(a) metallic compound particles,

Claims

[Claim 1]

A negative photosensitive resin composition comprising the following (a) to (d):

(a) metallic compound particles,

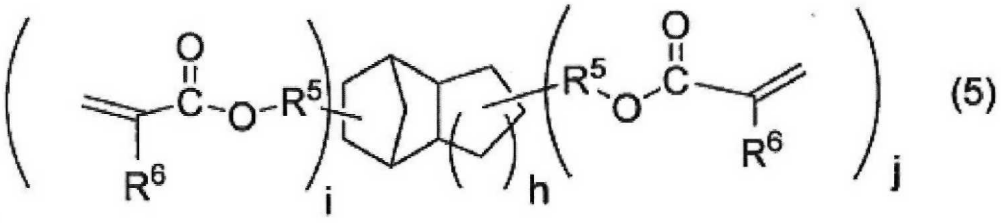
(b) a polysiloxane compound,

(c) a compound having at least 1 group containing an α,β-unsaturated carboxylate ester structure, and

(d) a photopolymerization initiator, the composition further comprising

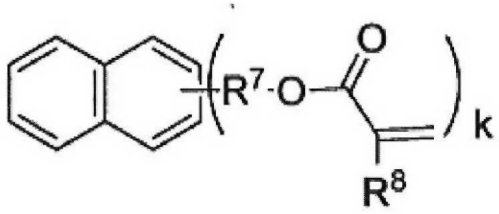
(e) a compound containing maleimide group,

wherein the compound (c) having at least 1 group containing an α,β-unsaturated carboxylate ester structure is a compound selected from general formulae (5) to (10):



(5)

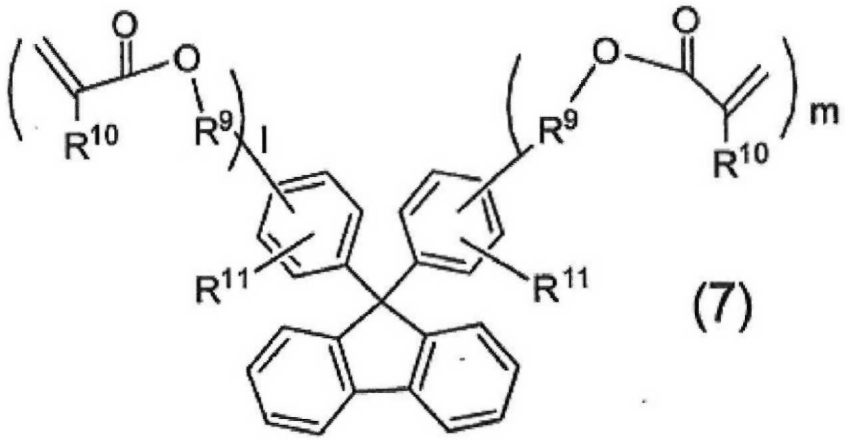
wherein in general formula (5), R^5 is single bond, a chain aliphatic group containing 1 to 10 carbon atoms and 1 to 3 oxygen atoms, or a cyclic aliphatic hydrocarbon group containing 3 to 16 carbon atoms; the plurality of R^5 being independently the same or different; R^6 is hydrogen or methyl group, the plurality of R^6 being independently the same or different; h is an integer of 0 to 3; i and j are integer of 0 to 2, i+j being 1 to 2,



(6)

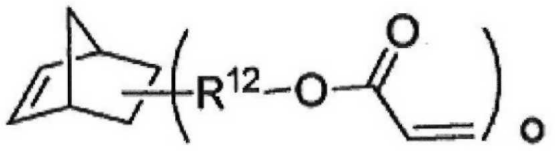
in general formula (6), R^7 is single bond, a chain aliphatic group containing 1 to 10 carbon atoms and 1 to 3 oxygen atoms,

or a cyclic aliphatic hydrocarbon group containing 3 to 16 carbon atoms, the plurality of R^7 being independently the same or different, R^8 is hydrogen or methyl group, the plurality of R^8 being independently the same or different; and k is an integer of 1 to 2,



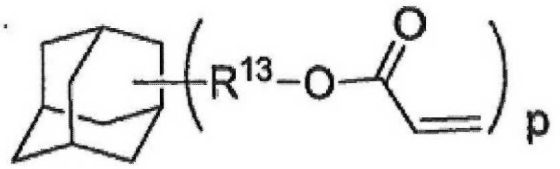
(7)

in general formula (7), R^9 is single bond, a chain aliphatic group containing 1 to 10 carbon atoms and 1 to 3 oxygen atoms, or a cyclic aliphatic hydrocarbon group containing 3 to 16 carbon atoms, the plurality of R^9 being independently the same or different; R^{10} is hydrogen or methyl group, the plurality R^{10} being independently the same or different; R^{11} is hydrogen or a chain aliphatic group containing 1 to 10 carbon atoms and 1 to 3 oxygen atoms, or a cyclic aliphatic hydrocarbon group containing 3 to 16 carbon atoms, the plurality of R^{11} being independently the same or different; and l and m are an integer of 0 to 2, l+m being 1 to 2,



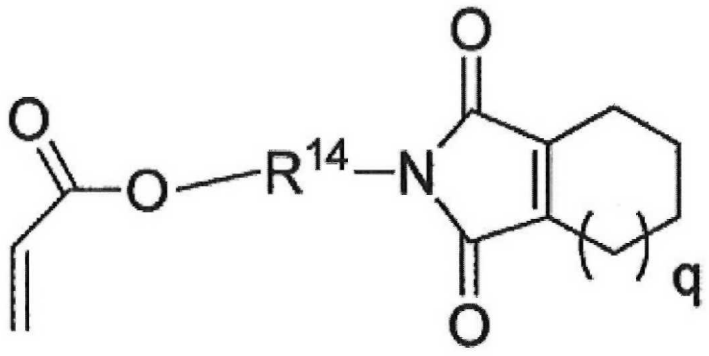
(8)

in general formula (8), R^{12} is single bond, a chain aliphatic group containing 1 to 10 carbon atoms and 1 to 3 oxygen atoms, or a cyclic aliphatic hydrocarbon group containing 3 to 16 carbon atoms, the plurality of R^{12} being independently the same or different; and o is an integer of 1 to 2,



(9)

in general formula (9), R^{13} is single bond, a chain aliphatic group containing 1 to 10 carbon atoms and 1 to 3 oxygen atoms, or a cyclic aliphatic hydrocarbon group containing 3 to 16 carbon atoms, the plurality of R^{13} being independently the same or different; and p is an integer of 1 to 2,

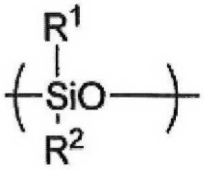


(10)

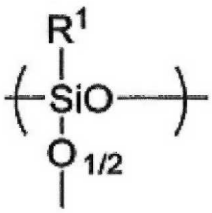
and wherein in general formula (10), q is an integer of 0 to 3 and R^{14} is a chain aliphatic group containing 1 to 10 carbon atoms and 1 to 3 oxygen atoms.

[Claim 2]

A negative photosensitive resin composition according to claim 1 wherein the polysiloxane compound (b) is a polysiloxane compound containing the structural unit represented by general formula (1) and/or (2):



(1)



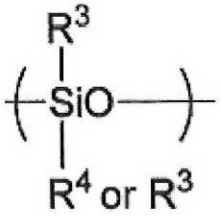
(2)

wherein R^1 is an organic group containing carboxyl group and/or a dicarboxylic anhydride structure, R^2 is hydrogen, an alkyl group containing 1 to 6 carbon atoms, an acyl group

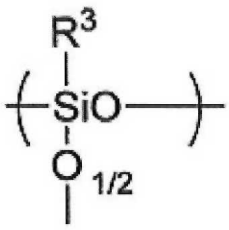
containing 2 to 6 carbon atoms, or an aryl group containing 6 to 16 carbon atoms.

[Claim 3]

A negative photosensitive resin composition according to claim 2 wherein the polysiloxane compound (b) further contains a structural unit represented by general formula (3) and/or (4):



(3)



(4)

wherein R^3 is an organic group containing an alkenyl group containing 2 to 10 carbon atoms, R^4 is hydrogen, an alkyl group containing 1 to 6 carbon atoms, an acyl group containing 2 to 6 carbon atoms, an organic group containing an alkenyl group containing 2 to 10 carbon atoms, or an aryl group containing 6 to 16 carbon atoms.

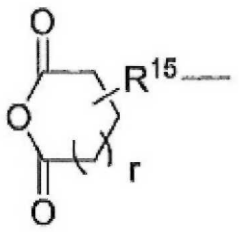
[Claim 4]

A negative photosensitive resin composition according to claim 3 wherein R^3 is an allyl group, a vinyl group, (meth)acryloyl group, or styryl group.

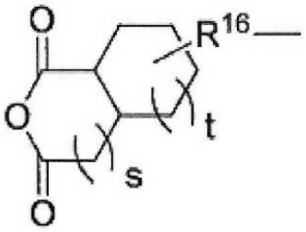
[Claim 5]

A negative photosensitive resin composition according to any one of claims 2 to 4 wherein R^1 of the polysiloxane compound

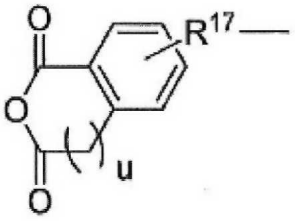
(b) is an organic group having a dicarboxylic anhydride represented by any one of general formula (11) to (13):



(11)



(12)



(13)

wherein in the general formula (11) to (13), R^{15}, R^{16}, and R^{17} are single bond, a chain aliphatic hydrocarbon group containing 1 to 10 carbon atoms, a cyclic aliphatic hydrocarbon group containing 3 to 16 carbon atoms, an alkyl carbonyloxy group containing 2 to 6 carbon atoms, carbonyl group, ether group, ester group, amide group, an aromatic group containing 6 to 16 carbon atoms, or a divalent group having any one of these groups; the hydrogen atom of these groups being optionally substituted with an alkyl group containing 1 to 10 carbon atoms, an alkenyl group containing 2 to 10 carbon atoms, an aryl group containing 6 to 16 carbon atoms, an alkylcarbonyloxy group containing 2 to 6 carbon atoms, hydroxy group, amino group, carboxyl group, or thiol group; and r, s, t, and u represent an integer of 0 to 3.

[Claim 6]

A negative photosensitive resin composition according to any one of claims 1 to 5 wherein ratio of molar amount of the Si atoms in the structural unit represented by the general formula (1) and/or (2) constituting the polysiloxane compound to molar amount of the Si atom of the polysiloxane compound (b) is at least 5 mol% to up to 30 mol%.

[Claim 7]

A negative photosensitive resin composition according to any one of claims 1 to 6 wherein the metallic compound particles (a) is at least one metal compound particles selected from aluminum compound particles, tin compound particles, titanium compound particles, and zirconium compound particles; or a composite particles of at least one metallic compound selected from aluminum compound, tin compound, titanium compound, and zirconium compound with a silicon compound.

[Claim 8]

A negative photosensitive resin composition according to any one of claims 1 to 7 wherein the metallic compound particles (a) and the polysiloxane compound (b) are partially bonded.

[Claim 9]

A negative photosensitive resin composition according to any one of claims 1 to 8 wherein the metallic compound particles (a) have a number average particle diameter of 1 nm to 400 nm.

[Claim 10]

A negative photosensitive resin composition according to any one of claims 1 to 9 wherein at least 10 parts by weight to up to 500 parts by weight of the metallic compound particles (a) is used in relation to 100 parts by weight of the polysiloxane compound (b).

[Claim 11]

A cured film prepared by curing the negative photosensitive resin composition of any one of claims 1 to 10.

[Claim 12]

A method for producing a cured film comprising the steps of coating the negative photosensitive resin composition of any one of claims 1 to 10 on a substrate, developing the coating

after exposure, and curing the coating by heat.

[Claim 13]

An LED luminaire having the cured film of claim 11.

[Claim 14]

An image sensor having the cured film of claim 11.

[Claim 15]

A backside illuminated CMOS image sensor comprising at least a photoelectric conversion layer, a color filter, and a flattening layer in this order, wherein the color filter has colored pixels divided by the pattern obtained by using the negative photosensitive resin composition of any one of claims 1 to 10, and wherein refractive index of the flattening layer is smaller than the refractive index the pattern.