PRIOR ART DOCUMENTS

PATENT DOCUMENTS

[0007]

Patent Document 1: Japanese Patent Laid-open Publication No. 2011-169980

Patent Document 2: Japanese Patent Laid-open Publication No. 2010-96927

Patent Document 3: Japanese Patent Laid-open Publication No. 2010-77382

SUMMARY

PROBLEMS TO BE SOLVED

[0008]

However, in a cured film of the photosensitive resin composition in which a copper discoloration inhibitor is added to a photosensitive resin and a cured film of the photosensitive resin composition in which a heterocyclic compound is added to a polybenzoxazole having an aliphatic group, a crosslinking agent and an antioxidizing agent are not appropriately combined for use, and therefore, these cured films have problems of being poor in in-plane uniformity, and being low in extension after reliability evaluation such as a high temperature holding test, a constant temperature high humidity test, or a thermal cycle test. Further, the cured films have a problem of being

peeled off from metal wirings. Also, the resin composition in which an antioxidizing agent and an epoxy resin are added to a polyimide resin is difficult to form a fine pattern because in-plane film thickness and pattern are not uniform due to large shrinkage after curing and decrease in extension occurs because of using no appropriate crosslinking agent.

[0009]

The present disclosure has been devised in view of the problems with the conventional technologies as described above, and provides a resin composition from which a pattern-cured film is obtained that has a fine pattern, that exhibits superior in-plane uniformity while being curable at a low temperature of 250°C or less, and that retains high extension and high adhesion with metal wirings even after a reliability evaluation.

SOLUTIONS TO THE PROBLEMS

[0010]

In order to solve the above problems, the present disclosure is characterized by the following configurations.

[0010a]

In an aspect, there is provided a resin composition comprising:

a resin (a);

an antioxidizing agent (b); and

a crosslinking agent (d),

wherein

the resin (a) contains one or more resins selected from a polyimide precursor, a polyamide, a polyimide, polybenzoxazole, and copolymers thereof, and

the crosslinking agent (d) is a crosslinking agent having a phenolic hydroxyl group in one molecule thereof and having substituents each with a molecular weight of 40 or more at both ortho positions to the phenolic hydroxyl group:

and

the resin (a) contains at least a copolymer of a polyamide and a polyimide, and

a content of a structural unit of the polyimide based on 100% by mole of structural units of the polyamide and the polyimide in total is in a range of 2 to 50% by mole.

[0010b]

In another aspect, there is provided a resin sheet formed from the resin composition as defined above.

[0010c]

In another aspect, there is provided a cured film obtained by curing the resin composition as defined above.

[0010d]

In another aspect, there is provided a method for producing a relief pattern of a cured film, comprising the steps of:

applying the resin composition as defiend above onto a substrate or laminating the resin sheet as defined above onto a substrate, followed by drying to form a resin film;

applying light via a mask;

eluting or removing an irradiated part with an alkaline solution to perform development; and

heat treating the resin film after the development.

[0010e]

In another aspect, there is provided a semiconductor electronic component or semiconductor device, comprising the cured film as defined above disposed as an interlayer insulating film between rewirings of copper metal.

[0010f]

In another aspect, there is provided a semiconductor electronic component or semiconductor device, comprising the cured film as defined above disposed as an interlayer insulating film between rewirings on a sealing resin substrate on which a silicon chip is disposed.

[0010g]

In another aspect, there is provided an organic EL display device comprising the cured film as defined above.

[0010h]

In another aspect, there is provided a method for producing a semiconductor electronic component or semiconductor device, comprising the steps of:

disposing the cured film as defined above as an interlayer insulating film between rewirings on a support substrate on which a temporary sticking material is disposed;

disposing a silicon chip and a sealing resin on the support substrate; and

then peeling off the rewirings from the support substrate on which the temporary sticking material is disposed.

[0011]

[1] A resin composition comprising a resin (a), an antioxidizing agent (b), and a crosslinking agent (d), wherein

sheet as defined above onto a substrate, followed by drying to form a resin film;

applying light via a mask; eluting or removing an irradiated part with an alkaline solution to perform development; and

heat treating the resin film after the development.

[0030]

[16] The method for producing a relief pattern of a cured film according to [15], wherein the step of applying the resin composition onto a substrate, followed by drying to form a resin film includes a step of applying the resin composition onto the substrate using a slit nozzle.

[0031]

[17] A semiconductor electronic component or semiconductor device, comprising the cured film according to any one of [12] to [14] disposed as an interlayer insulating film between rewirings of copper metal.

[0032]

[18] The semiconductor electronic component or semiconductor device according to [17], wherein the rewirings are composed of oxidized copper metal wirings.

[0033]

[19] The semiconductor electronic component or semiconductor device according to [17] or [18], wherein the rewirings are copper metal wirings, and a line width of the

semiconductor chip.

[0038]

[24] An organic EL display device comprising the cured film according to any one of [12] to [14].

[0039]

[25] A method for producing a semiconductor electronic component or semiconductor device, comprising the steps of:

disposing the cured film according to any one of [12] to [14] as an interlayer insulating film between rewirings on a support substrate on which a temporary sticking material is disposed;

disposing a silicon chip and a sealing resin on the support substrate; and

then peeling off the rewirings from the support substrate on which a temporary sticking material is disposed.

EFFECTS

[0040]

Provided is a resin composition from which a fine pattern is obtained and a pattern-cured film is obtained that exhibits superior in-plane uniformity while being curable at a low temperature of 250°C or less, and that retains high extension and high adhesion with metal wirings

CLAIMS

1. A resin composition comprising:

a resin (a);

an antioxidizing agent (b); and

a crosslinking agent (d),

wherein

the resin (a) contains one or more resins selected from a polyimide precursor, a polyamide, a polyimide, polybenzoxazole, and copolymers thereof, and

the crosslinking agent (d) is a crosslinking agent having a phenolic hydroxyl group in one molecule thereof and having substituents each with a molecular weight of 40 or more at both ortho positions to the phenolic hydroxyl group:

and

the resin (a) contains at least a copolymer of a polyamide and a polyimide, and

a content of a structural unit of the polyimide based on 100% by mole of structural units of the polyamide and the polyimide in total is in a range of 2 to 50% by mole.

2. The resin composition according to claim 1, wherein the resin (a) is an alkali-soluble resin having a phenolic hydroxyl group, and the resin composition further contains

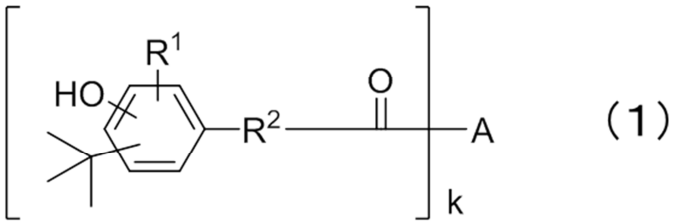
a naphthoquinonediazide compound (c).

3. The resin composition according to claim 1 or 2, wherein the crosslinking agent (d) is a crosslinking agent having three or more phenolic hydroxyl groups in one molecule.

4. The resin composition according to any one of claims 1 to 3, wherein the antioxidizing agent (b) is an antioxidizing agent having a hindered phenol structure.

5. The resin composition according to any one of claims 1 to 4, wherein the antioxidizing agent (b) contains a compound represented by a general formula (1):

[Chemical Formula 1]



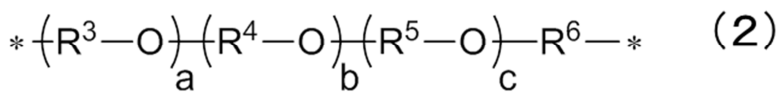
(1)

in the general formula (1), R^1 represents a hydrogen atom or an alkyl group having 2 or more carbon atoms; R^2 represents an alkylene group having 2 or more carbon atoms; A represents a monovalent to tetravalent organic group containing at least one of an alkylene group having 2 or more carbon atoms, an O atom, and an N atom; and k

represents an integer of 1 to 4.

6. The resin composition according to any one of claims 1 to 5, wherein the resin (a) has a structural unit represented by a general formula (2):

[Chemical Formula 2]



in the general formula (2), R^3 to R^6 each independently represent an alkylene group having 2 to 10 carbon atoms; a, b and c each represent an integer within ranges of $1 \leq a \leq 20$, $0 \leq b \leq 20$ and $0 \leq c \leq 20$, and arrangement of repeating units may be either in a block manner or in a random manner; and in the general formula (2), * represents a chemical bond.

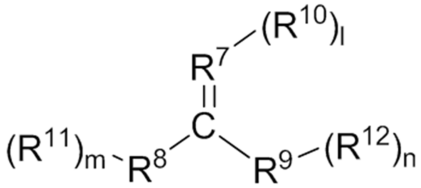
7. The resin composition according to any one of claims 1 to 6, wherein

the resin (a) contains at least a copolymer of a polyamide and a polyimide, and

the polyamide has a structural unit derived from a diamine having an aliphatic group, and a content of the structural unit derived from the diamine having an aliphatic group based on 100% by mole of structural units derived from diamines is in a range of 5 to 40% by mole.

8. The resin composition according to any one of claims 1 to 7, further comprising a compound (e) represented by a general formula (3), wherein a content of the compound (e) represented by the general formula (3) based on 100 parts by mass of the resin (a) is in a range of 0.5 to 15 parts by mass,

[Chemical Formula 3]

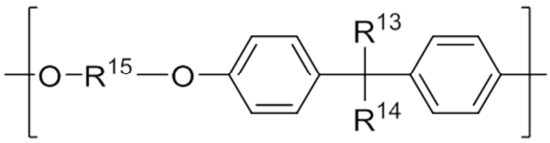


(3)

in the general formula (3), R^7 to R^9 each represent an O atom, an S atom, or an N atom, and at least one of R^7 to R^9 represents an S atom; l represents 0 or 1, and m and n represent an integer of 0 to 2; R^{10} to R^{12} each independently represent a hydrogen atom or an organic group having 1 to 20 carbon atoms.

9. The resin composition according to any one of claims 1 to 8, further comprising a heat-crosslinking agent (f) having a structural unit represented by a general formula (4) below:

[Chemical Formula 4]



(4)

in the general formula (4), R^{13} and R^{14} each independently represent a hydrogen atom or a methyl group; R^{15} is a divalent organic group having an alkylene group having 2 or more carbon atoms and may be any of linear, branched, and cyclic.

10. A resin sheet formed from the resin composition according to any one of claims 1 to 9.

11. A cured film obtained by curing the resin composition according to any one of claims 1 to 9.

12. The cured film according to claim 11, which has an elongation at break of 50% or more.

13. A method for producing a relief pattern of a cured film, comprising the steps of:

applying the resin composition according to any one of claims 2 to 9 onto a substrate or laminating the resin sheet according to claim 10 onto a substrate, followed by drying to form a resin film; applying light via a mask;

eluting or removing an irradiated part with an

alkaline solution to perform development; and

heat treating the resin film after the development.

14. The method for producing a relief pattern of a cured film according to claim 13, wherein the step of applying the resin composition onto a substrate, followed by drying to form a resin film includes a step of applying the resin composition onto the substrate using a slit nozzle.

15. A semiconductor electronic component or semiconductor device, comprising the cured film according to claim 11 or 12 disposed as an interlayer insulating film between rewirings of copper metal.

16. The semiconductor electronic component or semiconductor device according to claim 15, wherein the rewirings are composed of oxidized copper metal wirings.

17. The semiconductor electronic component or semiconductor device according to claim 15 or 16, wherein the rewirings are copper metal wirings, and a line width of the copper metal wirings and an interval between adjacent wirings are 5 μm or less.

18. A semiconductor electronic component or semiconductor

device, comprising the cured film according to claim 11 or 12 disposed as an interlayer insulating film between rewirings on a sealing resin substrate on which a silicon chip is disposed.

19. The semiconductor electronic component or semiconductor device according to claims 15 to 18, wherein the rewirings are copper metal wirings, and a semiconductor chip and each of the copper metal wirings are further connected via a bump.

20. The semiconductor electronic component or semiconductor device according to claims 15 to 19, wherein a line width of metal wirings and an interval between adjacent wirings decrease as a rewiring layer recited in claim 15 approaches the semiconductor chip.

21. An organic EL display device comprising the cured film according to claim 11 or 12.

22. A method for producing a semiconductor electronic component or semiconductor device, comprising the steps of:

disposing the cured film according to claim 11 or 12 as an interlayer insulating film between rewirings on a support substrate on which a temporary sticking material is

disposed;

disposing a silicon chip and a sealing resin on the support substrate; and

then peeling off the rewirings from the support substrate on which the temporary sticking material is disposed.