photosensitive resin composition containing a novolac resin which has a crosslinking group have been proposed (Patent Document 4).

PRIOR ART REFERENCES

PATENT DOCUMENTS

[0006]

PATENT DOCUMENT 1	JP H11-199557A
PATENT DOCUMENT 2	JP H11-24271A
PATENT DOCUMENT 3	JP2008-224984A
PATENT DOCUMENT 4	JP2011-197362A

SUMMARY

PROBLEMS TO BE SOLVED

[0007]

However, the polybenzoxazole precursor having an aliphatic group, especially the polybenzoxazole precursor with a lower curing temperature had a problem of a poor chemical resistance. The photosensitive resin composition containing a novolac resin having a crosslinking group also had a problem of a poor degree of elongation.

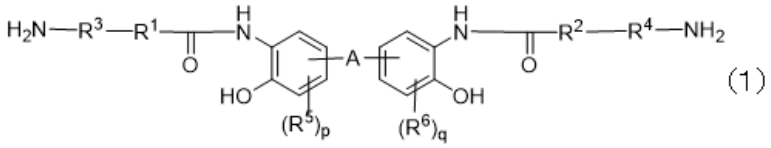
[0008]

The present disclosure has been achieved in view of the problems accompanying the prior art as described above and provides a resin composition capable of providing a cured film which is excellent in chemical resistance and film properties even by a thermal treatment at a low temperature of 200°C or less, a heat-resistant resin used in the resin composition, and further a di-amine compound which is a raw material thereof.

MEANS FOR SOLVING THE PROBLEMS

[0008a]

In an aspect, there is provided a di-amine compound represented by the general formula (1):



(1)

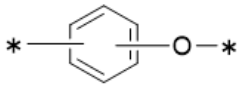
wherein in the general formula (1), R^1 and R^2 each are a divalent aliphatic group;

R^3 is a divalent organic group represented by formula (4) and R^4 is a divalent organic group represented by formula (5),

R^5 and R^6 each are a hydrogen atom, a halogen atom, a hydroxyl group, a nitro group, a cyano group, an aliphatic group, an aromatic group, an acetyl group, a carboxyl group, or an organic group having any of an ester group, an amide group, an imide group, and a urea group;

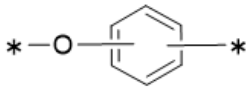
A is -O-, $-SO_2-$, $-CH_2-$, $-C(CH_3)_2-$ or $-C(CF_3)_2-$, wherein F is fluorine;

p and q each are an integer number in the range of 0 to 3,



(4)

wherein in the general formula (4), * indicates a chemical bond,



(5)

wherein in the general formula (5), * indicates a chemical bond.

[0008b]

In another aspect, there is provided a heat-resistant resin having a

structure derived from said di-amine compound as defined above.

[0008c]

In another aspect, there is provided a resin composition comprising said heat-resistant resin as defined above, (b) a photosensitive compound and (c) a solvent.

[0008d]

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

[0008e]

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

[0008f]

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

[0008g]

In another aspect, there is provided a method of producing a relief pattern of a cured film, comprising the steps of coating said resin composition as defined above on a substrate or laminating said resin sheet as defined above on a substrate, and drying said resin composition or said resin sheet to form a resin film;

exposing said resin film through a mask;

eluting or removing irradiated portion by an alkali solution to develop said resin film; and

and heat-treating said resin film after the development.

[0008h]

In another aspect, there is provided an organic EL display device, wherein said cured film as defined above which is patterned or not patterned is arranged in one or both of a planarizing layer and a dielectric layer of a first electrode of a driving circuit.

[0008i]

In another aspect, there is provided an electronic component or a semiconductor apparatus, wherein said cured film as defined above patterned or not pattered is arranged between rewires as an interlayer dielectric film.

[0008j]

In another aspect, there is provided an electronic component or a semiconductor apparatus, wherein said cured film as defined above patterned or not patterned is arranged between rewires as an interlayer dielectric film on an encapsulation resin substrate on which a silicon chip has been arranged.

[0008k]

In another aspect, there is provided a method of producing an electronic component or a semiconductor apparatus, comprising the steps of arranging said cured film as defined above on a support substrate on which a temporary attachment material has been arranged as an interlayer dielectric film between rewires;

arranging a silicon chip and an encapsulation resin thereon; and,

detaching said support substrate on which said temporary attachment material has been arranged and said rewires.

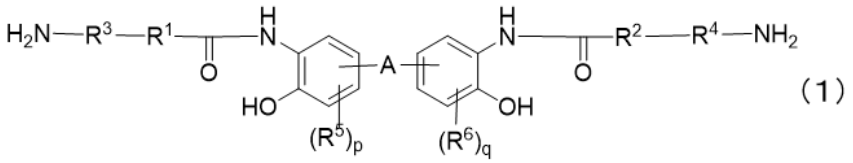
[0009]

In order to solve the above problems, the di-amine compound, the heat-resistant resin and the resin composition of the present disclosure or the application thereof has the following structure.

[1] A di-amine compound represented by the general formula (1).

[0010]

[Chem 1]



(1)

[0011]

(In the general formula (1), R^1 and R^2 each are a divalent aliphatic group.

[0012]

R^3 and R^4 each are a divalent aliphatic group, aliphatic ring group, aromatic group, a divalent organic group in which an aromatic group is bonded by -O-, -CO-, $-SO_2-$, $-CH_2-$, $-C(CH_3)_2-$ or $C(CF_3)_2-$: (wherein F is fluorine), a divalent organic group in which two or more aromatic groups are bonded by a single bond, or a divalent organic group in which two or more aromatic groups are bonded by -O-, -CO-, $-SO_2-$, $-CH_2-$, $-C(CH_3)_2-$ or $-C(CF_3)_2-$ (wherein F is fluorine).

[0013]

R^5 and R^6 each are a hydrogen atom, a halogen atom, a hydroxyl group, a nitro group, a cyano group, an aliphatic group, an aromatic group, an acetyl group, a carboxyl group, or an organic group having any of an ester group, an amide group, an imide group, and a urea group.

[0014]

A is a divalent aliphatic group, aliphatic ring group, aromatic group, a divalent organic group in which two or more aromatic groups are

cured film according to [9] or [10] patterned or not patterned is arranged between rewires as an interlayer dielectric film on an encapsulation resin substrate on which a silicon chip has been arranged.

[17] The semiconductor electronic component or the semiconductor apparatus according to any one of [14] to [16], wherein the rewires are copper metal wires and are connected with a semiconductor chip via a bump.

[18] The semiconductor electronic component or the semiconductor apparatus according to any one of [14] to [17], wherein, for the rewires, the width of metal wires and the distance between adjacent wires get thinner as the wires get closer to the semiconductor chip.

[19] The semiconductor electronic component or the semiconductor apparatus according to any one of [14] to [18], wherein the thickness of the interlayer dielectric film arranged between the rewires gets thinner as the interlayer dielectric film gets closer to the semiconductor chip.

[20] A method of producing an electronic component or a semiconductor apparatus, comprising steps of arranging the cured film according to [9] or [10] on a support substrate on which a temporary attachment material has been arranged as an interlayer dielectric film between rewires, arranging a silicon chip and an encapsulation resin thereon, and detaching the support substrate on which the temporary attachment material has been arranged and the rewires.

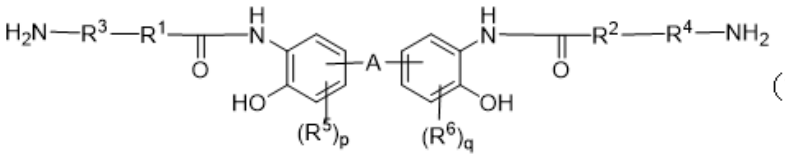
EFFECT

[0031]

Provided is a resin composition capable of providing a cured film which is excellent in chemical resistance and film properties even by a thermal treatment at a low temperature of 200°C or less, a heat-resistant

CLAIMS

1. A di-amine compound represented by the general formula (1):



(1)

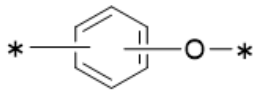
wherein in the general formula (1), R^1 and R^2 each are a divalent aliphatic group;

R^3 is a divalent organic group represented by the formula (4) and R^4 is a divalent organic group represented by the formula (5),

R^5 and R^6 each are a hydrogen atom, a halogen atom, a hydroxyl group, a nitro group, a cyano group, an aliphatic group, an aromatic group, an acetyl group, a carboxyl group, or an organic group having any of an ester group, an amide group, an imide group, and a urea group;

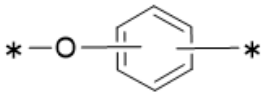
A is -O-, $-SO_2-$, $-CH_2-$, $-C(CH_3)_2-$ or $-C(CF_3)_2-$, wherein F is fluorine;

p and q each are an integer number in the range of 0 to 3,



(4)

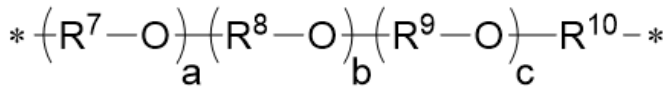
wherein in the general formula (4), * indicates a chemical bond,



(5)

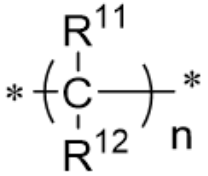
wherein in the general formula (5), * indicates a chemical bond.

2. The di-amine compound according to claim 1, wherein R^1 and R^2 in the general formula (1) each are independently a divalent aliphatic group represented by the general formula (2) or the general formula (3),



(2)

wherein in the general formula (2), R^7 to R^{10} each are independently a C_1-C_{10} alkylene group, and each of a, b and c is an integer number in the range of $1 \leq a \leq 20$, $0 \leq b \leq 20$, and $0 \leq c \leq 20$, and the arrangement of the repeating units may be in a block way or in a random way, and * indicates a chemical bond,



(3)

wherein in the general formula (3), R^{11} and R^{12} each are independently hydrogen, fluorine, or a C_1-C_6 alkyl group, and n is an integer number of 1 to 20, and * indicates a chemical bond.

3. A heat-resistant resin having a structure derived from said di-amine compound according to claim 1 or 2.

4. The heat-resistant resin according to claim 3, comprising at least one kind selected from the group consisting of polyimides, polyamides, polybenzoxazoles, polybenzimidazoles, polybenzothiazoles, precursors thereof, and copolymers thereof.

5. A resin composition comprising said heat-resistant resin according to claim 3 or 4, (b) a photosensitive compound and (c) a solvent.

6. The resin composition according to claim 5, further comprising (d) a compound having two or more of at least one of an alkoxymethyl group and a methylol group.

7. A resin sheet formed of said resin composition according to claim

5 or 6.

8. A cured film obtained by curing said resin composition according to claim 5 or 6.

9. A cured film obtained by curing said resin sheet of claim 7.

10. A method of producing a relief pattern of a cured film, comprising the steps of coating said resin composition according to claim 5 or 6 on a substrate or laminating said resin sheet according to claim 7 on a substrate, and drying said resin composition or said resin sheet to form a resin film;

exposing said resin film through a mask;

eluting or removing irradiated portion by an alkali solution to develop said resin film; and

and heat-treating said resin film after the development.

11. The method of producing a relief pattern of a cured film according to claim 10, wherein said step of coating said resin composition on a substrate and drying said resin composition to form said resin film comprises a step of coating said resin composition on a substrate using a slit nozzle.

12. An organic EL display device, wherein said cured film according to claim 8 or 9 which is patterned or not patterned is arranged in one or both of a planarizing layer and a dielectric layer of a first electrode of a driving circuit.

13. An electronic component or a semiconductor apparatus, wherein said cured film according to claim 8 or 9 patterned or not pattered is arranged between rewires as an interlayer dielectric film.

14. The electronic component or a semiconductor apparatus according to claim 13, wherein said rewires are copper metal wires, and the width of

said copper metal wires and the distance between adjacent wires are 5 μm or less.

15. An electronic component or a semiconductor apparatus, wherein said cured film according to claim 8 or 9 patterned or not patterned is arranged between rewires as an interlayer dielectric film on an encapsulation resin substrate on which a silicon chip has been arranged.

16. The semiconductor electronic component or the semiconductor apparatus according to any one of claims 13 to 15, wherein said rewires are copper metal wires and are connected with a semiconductor chip via a bump.

17. The semiconductor electronic component or the semiconductor apparatus according to any one of claims 13 to 16, wherein, for said rewires, the width of metal wires and the distance between adjacent wires get thinner as the wires get closer to said semiconductor chip.

18. The semiconductor electronic component or the semiconductor apparatus according to any one of claims 13 to 17, wherein the thickness of said interlayer dielectric film arranged between said rewires gets thinner as said interlayer dielectric film gets closer to said semiconductor chip.

19. A method of producing an electronic component or a semiconductor apparatus, comprising the steps of arranging said cured film according to claim 8 or 9 on a support substrate on which a temporary attachment material has been arranged as an interlayer dielectric film between rewires;

arranging a silicon chip and an encapsulation resin thereon; and,

detaching said support substrate on which said temporary attachment material has been arranged and said rewires.