aqueous-solution-soluble polymer, a photo-acid generator, and a silane compound containing 4 or more specific functional groups bound directly to an Al atom, a Ti atom, or a Si atom (see Patent Literature 3); and heat-resistant resin precursor compositions composed of a heat resistance resin precursor such as a polyimide precursor and of a specific amino compound or a thiol derivative (see Patent Literature 4).

Citation List

Patent Literature

[0008]

Patent Literature 1: JP 2007-16214 A

Patent Literature 2: JP 2007-240554 A

Patent Literature 3: JP 2008-276190 A

Patent Literature 4: JP 2007-39486 A

Summary

Technical Problem

[0009]

However, these resin compositions require high temperature baking at approximately 350°C for the ring-closing of the heat-resistant resin, and there is a problem in that when baked at a low temperature of 250°C or less, the resin is insufficiently ring-closed, whereby the film is insufficiently cured and fails to achieve sufficient adhesion to a metal material.

[0010]

An object of the embodiments disclosed herein is to provide a photosensitive resin composition which can afford a cured film having an excellent adhesion to a metal material, copper among others, and a high chemical resistance even through low

temperature baking at 250°C or less.

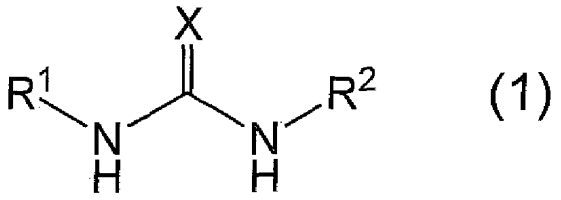
Solution to Problem

[0011]

To solve the aforementioned problem, the photosensitive resin composition according to the present disclosure has the following constitution: in other words, a photosensitive resin composition including: one or more kinds of alkali-soluble resins selected from a polyimide, a polybenzoxazole, a polyimide precursor, a polybenzoxazole precursor, and a copolymer of two or more kinds of polymers selected therefrom; and a photosensitizer; wherein the photosensitive resin composition further includes a compound represented by the following general formula (1):

[0012]

[Chem. 1]



(1)

[0013]

wherein, in the general formula (1), R^1 and R^2 each independently represent a C_1-C_{20} monovalent organic group; and X represents an oxygen atom or a sulfur atom.

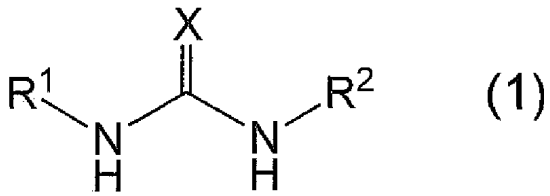
[0013a] In an aspect, there is provided a photosensitive resin composition comprising:

one or more kinds of alkali-soluble resins selected from a polyimide, a polybenzoxazole, a polyimide precursor, a polybenzoxazole precursor, and a copolymer of two or more kinds of polymers selected therefrom; and

a photosensitizer;

wherein the photosensitive resin composition further comprises a compound represented by the following general formula (1):

[Chem. 1]



(1)

wherein, in the general formula (1), R^1 and R^2 each independently represent a C_1-C_{20} monovalent organic group; and

X represents a sulfur atom.

In another aspect, there is provided a method for producing a cured resin film, comprising the steps of: coating a substrate with the photosensitive resin composition as defined above and drying the composition to obtain a resin film; exposing the resin film obtained from the previous step; developing the exposed resin film using an alkali aqueous solution to form a pattern out of the resin film; and heating the developed resin film.

In another aspect, there is provided a method for producing a photosensitive uncured sheet, comprising the steps of: coating a substrate with the photosensitive

resin composition as defined above and drying the composition to obtain a resin film; and releasing the resin film obtained from the previous step.

In another aspect, there is provided a semiconductor device including a semiconductor element, wherein a cured film of the photosensitive resin composition as defined above is formed as an interlayer dielectric film on the semiconductor element, wherein wiring is formed on the cured film.

In another aspect, there is provided a semiconductor device including a substrate constituted of two or more kinds of materials, wherein a cured film of the photosensitive resin composition as defined above is formed as an interlayer dielectric film on the substrate, wherein wiring is formed on the cured film.

Advantageous Effects

[0014]

The photosensitive resin composition according to the present disclosure can afford a cured film having an excellent adhesion to a metal material, copper among others, and a high chemical resistance even during low temperature baking.

Brief Description of Drawings

[0015]

Fig. 1 is a view depicting an enlarged cross-section of a pad portion of a semiconductor device having a bump.

Fig. 2 is a detailed view depicting a method for producing a semiconductor device having a bump.

Description of Embodiments

[0016]

The photosensitive resin composition according to the present invention includes: one or more kinds of alkali-soluble resins selected from a polyimide, a

CLAIMS

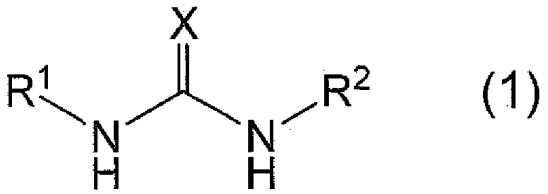
1. A photosensitive resin composition comprising:

one or more kinds of alkali-soluble resins selected from a polyimide, a polybenzoxazole, a polyimide precursor, a polybenzoxazole precursor, and a copolymer of two or more kinds of polymers selected therefrom; and

a photosensitizer;

wherein the photosensitive resin composition further comprises a compound represented by the following general formula (1):

[Chem. 1]



(1)

wherein, in the general formula (1), R^1 and R^2 each independently represent a C_1-C_{20} monovalent organic group; and

X represents a sulfur atom.

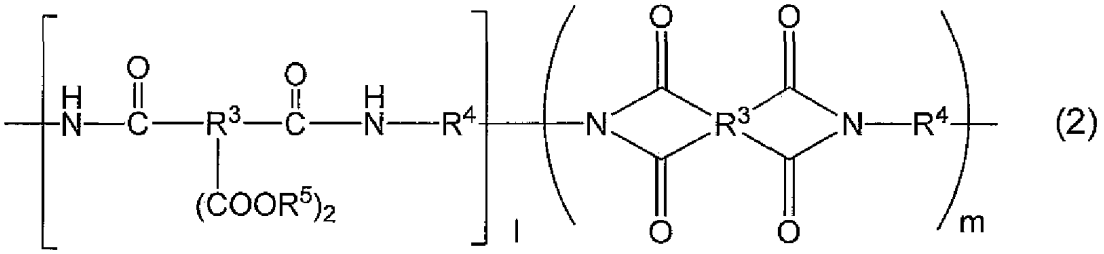
2. The photosensitive resin composition according to claim 1, comprising 0.1 to 5.0 parts by weight of the compound represented by the general formula (1) relative to 100 parts by weight of the alkali-soluble resin.

3. The photosensitive resin composition according to any one of claims 1 or 2, wherein at least one of R^1 and R^2 in the compound represented by the general formula (1) is an organic group containing an alkoxysilyl group.

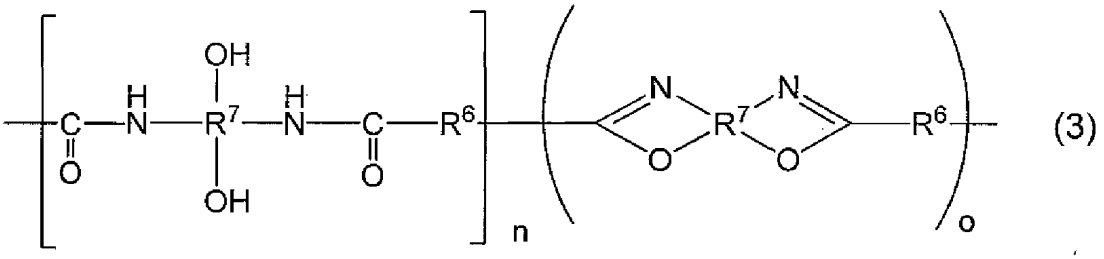
4. The photosensitive resin composition according to any one of claims 1 to 3, wherein the

alkali-soluble resin comprises a structure represented by the following general formula (2) or (3):

[Chem. 2]



(2)



(3)

wherein, in the general formulae (2) and (3), R^3 and R^7 each independently represent a C_6-C_{40} tetravalent organic group;

R^4 and R^6 each independently represent a C_2-C_{40} bivalent organic group;

R^5 represents hydrogen or a C_1-C_{20} monovalent organic group;

l, m, n, and o each independently represent an integer of 0 to 10,000;

$l + m > 1$; and

$n + o > 1$.

5. The photosensitive resin composition according to claim 4, wherein the alkali-soluble resin including the structure represented by the general formula (2) contains a phenolic hydroxyl group.

6. The photosensitive resin composition according to claim 4 or 5, wherein the alkali-soluble resin represented by the general formula (2) contains 30 mol% or more organic groups containing a fluorine atom relative to the total amount of the organic groups of both R^3 and R^4 as 100 mol%.

7. The photosensitive resin composition according to claim 4 or 5, wherein the alkali-soluble resin represented by the general formula (3) contains 30 mol% or more organic groups containing a fluorine atom relative to the total amount of the organic groups of both R^6 and R^7 as 100 mol%.

8. The photosensitive resin composition according to any one of claims 1 to 7, wherein the photosensitive resin composition further comprises a crosslinking agent.

9. The photosensitive resin composition according to claim 8, wherein the crosslinking agent is a compound containing at least 4 alkoxymethyl groups or methylol groups, and the content of the crosslinking agent is 24 to 150 parts by mass relative to 100 parts by mass of the alkali-soluble resin.

10. A method for producing a cured resin film, comprising the steps of:

coating a substrate with the photosensitive resin composition according to any one of claims 1 to 9 and drying the composition to obtain a resin film;

exposing the resin film obtained from the previous step;

developing the exposed resin film using an alkali aqueous solution to form a pattern out of the resin film; and

heating the developed resin film.

11. The method for producing a cured resin film according to claim 10, wherein the substrate is a substrate on which metal wiring is formed.

12. The method for producing a cured resin film according to claim 10 or 11, further comprising the step of releasing the dried resin film to obtain a photosensitive uncured sheet.

13. A method for producing a photosensitive uncured sheet, comprising the steps of:

coating a substrate with the photosensitive resin composition according to any one of claims 1 to 9 and drying the composition to obtain a resin film; and

releasing the resin film obtained from the previous step.

14. A semiconductor device comprising a semiconductor element, wherein a cured film of the photosensitive resin composition according to any one of claims 1 to 9 is formed as an interlayer dielectric film on the semiconductor element, wherein wiring is formed on the cured film.

15. A semiconductor device comprising a substrate constituted of two or more kinds of materials, wherein a cured film of the photosensitive resin composition according to any one of claims 1 to 9 is formed as an interlayer dielectric film on the substrate, wherein wiring is formed on the cured film.