NON-PATENT DOCUMENT

[0006]

Non-patent Document 1: Seiichi Denda, "TSV Technique for Three-dimensional Mounting" (2009)

SUMMARY ~~OF THE INVENTION~~

PROBLEMS TO BE SOLVED ~~BY THE INVENTION~~

[0007]

In the resin design described in Patent Document 3, however, an alkali-soluble polyimide has high thermal stress, and exhibits an insufficient thermocompression property to a support substrate such as a silicon wafer or a glass substrate in some cases. Further, the material is a negative tone photosensitive material, and the pattern shape tends to be an inverse tapered shape. Thus, there is such a problem that defects such as collapse of a pattern occurs, or it is difficult to form a sputtered film for the purpose of formation of wiring on the side wall of the pattern. On the other hand, the positive tone photosensitive materials described in Patent Documents 4 and 5 do not have a sufficient adhesion function, and are difficult to be formed into a B stage sheet and used because a film after drying off a solvent is fragile.

[0008]

An object of the embodiments disclosed herein~~present invention~~ is to provide a positive tone photosensitive resin composition and

photosensitive resin composition film, each of which has small stress after curing and exhibits excellent adhesion.

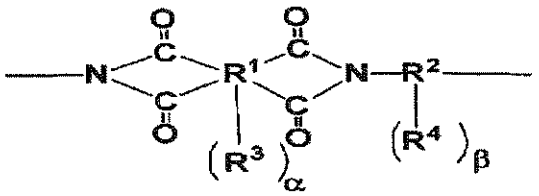
SOLUTIONS TO THE PROBLEMS

[0009]

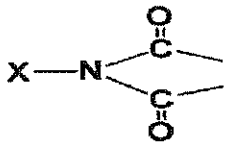
The present disclosure~~invention~~ is a photosensitive resin composition containing: (a) an alkali-soluble polyimide which has a structural unit represented by general formula (1), while having a structure represented by general formula (2) and/or (3) at at least one end of the main chain; (b) a compound which has two or more epoxy groups and/or oxetanyl groups in each molecule; and (c) a naphthoquinonediazide compound, wherein the content of the compound (b) is not less than 20 parts by weight per 100 parts by weight of the polyimide (a).

In a first aspect, there is provided a photosensitive resin composition comprising: (a) an alkali-soluble polyimide which has a structural unit represented by general formula (1), while having a structure represented by general formula (2) and/or (3) at at least one end of the main chain; (b) a compound which has two or more epoxy groups and/or oxetanyl groups in each molecule; and (c) a quinonediazide compound, wherein the content of the compound (b) is not less than 20 parts by weight per 100 parts by weight of the polyimide (a).

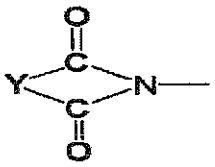
[Chemical Formula 1]



(1)



(2)



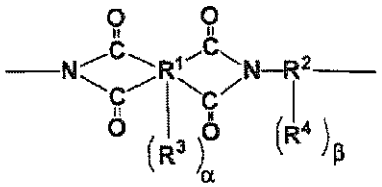
(3)

In the formula, X represents a monovalent organic group having at least one selected from the group consisting of a carboxyl group, a phenolic hydroxyl group, a sulfonic acid group and a thiol group, and Y represents a divalent organic group having at least one selected from the group consisting of a carboxyl group, a phenolic hydroxyl group, a sulfonic acid group and a thiol group.

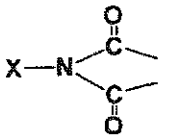
R^1 represents a tera- to tetradeca-valent organic group, R^2 represents a di - to dodeca-valent organic group, and R^3 and R^4 each independently represent at least one group selected from the group consisting of a carboxyl group, a phenolic hydroxyl group, a sulfonic acid group and a thiol group. α and β each indepently represent an integer of 0 to 10.

In a second aspect, there is provided a photosensitive resin composition film comprising: (a) an alkali-soluble polyimide which has a structural unit represented by general formula (1), while having a structure represented by general formula (2) and/or (3) at at least one end of the main chain; (b) a compound which has two or more epoxy groups and/or oxetanyl groups in each molecule; and (c) a quinonediazide compound, wherein the content of the compound (b) is not less than 20 parts by weight per 100 parts by weight of the polyimide (a).

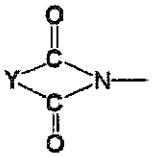
[Chemical Formula 2]



(1)



(2)



(3)

In the formula, X represents a monovalent organic group having at least one selected from the group consisting of a carboxyl group, a phenolic hydroxyl group, a sulfonic acid group and a thiol group, and Y represents a divalent organic group having at least one selected from the group consisting of a carboxyl group, a phenolic hydroxyl group, a sulfonic acid group and a thiol group.

R^1 represents a tera- to tetradeca-valent organic group, R^2 represents a di - to dodeca-valent organic group, and R^3 and R^4 each independently represent at least one group selected from the group consisting of a carboxyl group, a phenolic hydroxyl group, a sulfonic acid group and a thiol group. α and β each indepently represent an integer of 0 to 10.

In a third aspect, there is provided a laminate comprising a support, the photosensitive resin composition film as defined above, and a cover film in this order.

In a fourth aspect, there is provided a cured product of the photosensitive resin composition as defined above or of the photosensitive resin composition film as defined above.

In a fifth aspect, there is provided a semiconductor device comprising a cured product of the photosensitive resin composition as defined above or of the photosensitive resin composition film as defined above.

In a sixth aspect, there is provided a semiconductor device comprising a cured product of the photosensitive resin composition as defined above or of the photosensitive resin composition film as defined above between circuit members, wherein the edge of the cured product is located at the inner side as compared to the edge of a circuit member.

In a seventh aspect, there is provided a semiconductor device obtained by interposing the photosensitive resin composition as defined above or the photosensitive resin composition film as defined above between a first circuit member and a second circuit member, opening a desired area by patterning, and then electrically connecting the first circuit member and the second circuit member by heating and compression, wherein the edge of the photosensitive resin composition or the photosensitive resin composition film is located at the inner side as compared to the edges of the first circuit member and the second circuit member.

In an eighth aspect, there is provided a method for producing a semiconductor device, wherein the photosensitive resin composition as defined above or the photosensitive resin composition film as defined above is interposed between a first circuit member and a second circuit member, and the first circuit member and the second circuit member are electrically connected by heating and compression.

EFFECTS ~~OF THE INVENTION~~

[0010]

According to the present disclosure~~invention~~, there is obtained a photosensitive resin composition and a photosensitive resin composition film, each of which is capable of forming a positive tone pattern by photolithography, has small stress after curing, and exhibits a high strength of adhesion with a semiconductor element and a support member.

BRIEF DESCRIPTION OF THE DRAWINGS

[0011]

Fig. 1 shows a multilayer wiring substrate prepared using a photosensitive resin composition of the present invention.