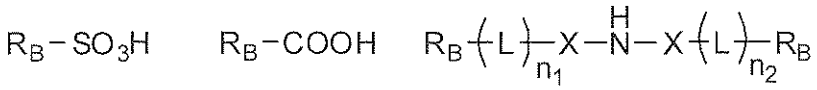
provide an actinic-ray- or radiation-sensitive resin composition and a method of forming a pattern using the same, ensuring excellent the etching resistivity and the stability during a post-exposure delay (PED) period.

Some ~~aspects~~embodiments of the present ~~invention~~disclosure are as follows.

[1] An actinic-ray- or radiation-sensitive resin composition comprising: a resin containing a repeating unit containing a group that is decomposed when acted on by an acid to thereby produce an alcoholic hydroxyl group; and a compound that generates an acid of pKa≥-1.5 when exposed to actinic rays or radiation.

[2] The composition according to [1], wherein the acid generated by the compound is at least one member selected from the group consisting of a sulfonic acid, a carboxylic acid, an imidic acid, and a methide acid.

[3] The composition according to [1] or [2], wherein the acid generated by the compound is expressed by any one of general formulae (B-1) to (B-3) below:



(B-1) (B-2) (B-3)

in which

R_B, or each of R_Bs independently, represents a monovalent organic group, provided that in general formula (B-3), two R_Bs may be bonded to each other to

according to any of [7] to [10].

[12] A semiconductor device manufactured by the method according to [11].

The present ~~invention~~disclosure has made it feasible to provide an actinic-ray- or radiation-sensitive resin composition and a method of forming a pattern using the same, ensuring excellent the etching resistivity and the stability during a post-exposure delay (PED) period.

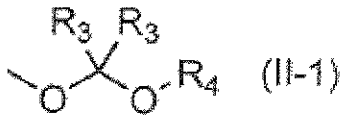
One aspect of the invention relates to an actinic-ray- or radiation-sensitive resin composition comprising:

a resin containing a repeating unit containing a group that is decomposed when acted on by an acid to thereby produce an alcoholic hydroxyl group; and

a compound that generates an acid of pKa≥-1.5 when exposed to actinic rays or radiation, wherein the acid generated by the compound is at least one member selected from the group consisting of a carboxylic acid, an imidic acid, and a methide acid.

In another aspect, there is provided an actinic-ray- or radiation-sensitive resin composition comprising:

a resin containing a repeating unit containing a group that is decomposed when acted on by an acid to thereby produce an alcoholic hydroxyl group, wherein the resin contains no fluorine atom and no silicon atom, and the group that is decomposed when acted on by an acid to thereby produce an alcoholic hydroxyl group is expressed by general formulae (II-1) below:



(II-1)

in which

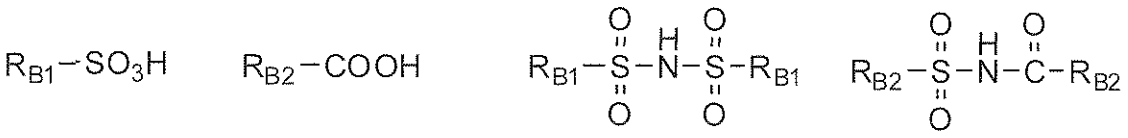
each of R_3s independently, represents a hydrogen atom or a monovalent organic group, provided that two R_3s may be bonded to each other to thereby form a ring;

R_4 represents a monovalent organic group, provided that at least two R_4s may be bonded to each other to thereby form a ring and that R_3 and R_4 may be bonded to each other to thereby form a ring.

In another aspect, there is provided an actinic-ray- or radiation-sensitive resin composition comprising:

a resin containing a repeating unit containing a group that is decomposed when acted on by an acid to thereby produce an alcoholic hydroxyl group, wherein the resin contains no fluorine atom and no silicon atom, and the repeating unit contains no lactone structure; and

a compound that generates an acid of pKa≥-1.5 when exposed to actinic rays or radiation, which is expressed by any one of general formulae (B-4) to (B-7) below:



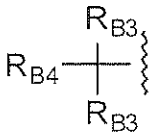
(B-4) (B-5) (B-6) (B-7)

in the general formulae (B-4) to (B-7),

$R_{B1'}$, or each of $R_{B1'}$s independently, represents a cycloalkyl group, OR_{B2}, $N(R_{B2})_2$, an aryl group,

R_{B1}, or each of R_{B1}s independently, represents a cycloalkyl group, OR_{B2}, $N(R_{B2})_2$, an aryl group, or any of the groups of general formula (B-8) below, wherein two R_{B1}s may be bonded to each other to thereby form a ring;

R_{B2}, or each of R_{B2}s independently, represents a monovalent organic group, wherein two or more R_{B2}s exist in a single molecule, at least two thereof may be bonded to each other to thereby form a ring,



(B-8)

in the general formula (B-8),

each of R_{B3}s independently represents a hydrogen atom, $C(R_{B4})_3$, $N(R_{B4})_2$, OR_{B4}, SR_{B4}, $C(R_{B4})=C(R_{B4})_2$, $C\equiv CR_{B4}$, $C(=NR_{B4})R_{B4}$, $C(=O)R_{B4}$, $C(=S)R_{B4}$, $C\equiv N$, NO_2, NO, NCO or $N=C(R_{B4})_2$, wherein two or more R_{B3}s exist in a single molecule, at least two thereof may be bonded to each other to thereby form a ring, and

R_{B4} represents a monovalent organic group, wherein two or more R_{B4}s exist in a single molecule, at least two thereof may be bonded to each other to thereby form a ring.

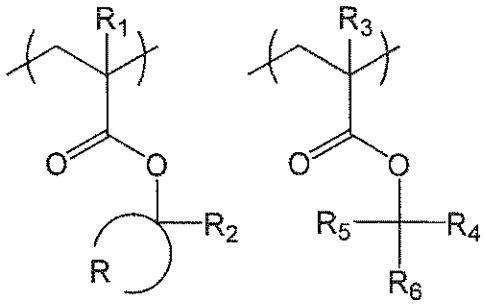
In another aspect, there is provided a method of forming a pattern, comprising:

(A) forming a film from an actinic-ray- or radiation-sensitive resin composition comprising a resin containing a repeating unit containing an acid-decomposable group, and a compound that generates an acid of pKa≥-1.5 when exposed to actinic-rays or radiation;

(B) exposing the film to light; and

(C) developing the exposed film using a developer containing an organic solvent,

wherein the resin contains, as the repeating unit containing an acid-decomposable group, only a repeating unit having a group that is decomposed when acted upon by an acid to thereby produce an alcoholic hydroxyl group containing no lactone structure, and a repeating unit of general formula (I) or (II) below.



(I) (II)

In general formulae (I) and (II),

each of R_1 and R_3 independently represents a hydrogen atom, an optionally substituted methyl group or any of the groups of the formula $-CH_2-R_9$, wherein R_9 represents a monovalent organic group.

each of R_2, R_4, R_5 and R_6 independently represents an alkyl group or a cycloalkyl group, and

R represents an atomic group required for forming an alicyclic structure in cooperation with a carbon atom.

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

In another aspect, there is provided a method of forming a pattern, comprising:

(A) forming a film from the composition as defined above;

(B) exposing the film to light;

(C) developing the exposed film.

Best Mode for Carrying Out the Invention

The present invention will be described below.

Note that, with respect to the expression of a group (or an atomic group) used in this specification, the expression without explicitly referring to whether the group is substituted or unsubstituted encompasses not only groups with no substituents but also groups having one or more substituents. For example, the expression "alkyl group" encompasses not only alkyl groups having no substituents (viz. unsubstituted alkyl groups) but also alkyl groups having one or more substituents (viz. substituted alkyl groups).

<Actinic-ray- or radiation-sensitive resin composition>

First, the composition of the present invention will be described. The composition may be used in negative development and also in positive development. Namely, this composition may be used in development