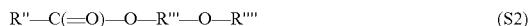


combination is generally 20/80 to 99/1 as mass ratio, preferably 50/50 to 97/3, more preferably 60/40 to 95/5, and most preferably 60/40 to 90/10.



[0150] In formula (S2), each of R'' and R'''' independently represents a hydrogen atom, an alkyl group, a cycloalkyl group, an alkoxy group, an alkoxycarbonyl group, a carboxyl group, a hydroxyl group, a cyano group or a halogen atom, and R'' and R'''' may be bonded to each other to form a ring.

[0151] Each of R'' and R'''' preferably represents a hydrogen atom or an alkyl group. The carbon atom number of the alkyl group, alkoxy group and alkoxycarbonyl group represented by R'' and R'''' is preferably in the range of 1 to 15, and the carbon atom number of the cycloalkyl group is preferably in the range of 3 to 15.

[0152] R''' represents an alkylene group or a cycloalkylene group. R''' preferably represents an alkylene group. The carbon atom number of the alkylene group represented by R''' is preferably in the range of 1 to 10. The carbon atom number of the cycloalkylene group represented by R''' is preferably in the range of 3 to 10.

[0153] The alkyl group, cycloalkyl group, alkoxy group and alkoxycarbonyl group represented by each of R'' and R'''', the alkylene group and cycloalkylene group represented by R''', and the ring formed by bonding of R'' and R'''' to each other may be substituted with a hydroxyl group, a group containing a carbonyl group (e.g., an acyl group, an aldehyde group, an alkoxycarbonyl group or the like), or a cyano group.

[0154] The alkylene group represented by R''' in formula (S2) may have an ether bond in the alkylene chain.

[0155] The examples of the solvents represented by formula (S2) include, for example, propylene glycol monoethyl ether acetate, ethylene glycol monoethyl ether acetate, ethylene glycol monopropyl ether acetate, ethylene glycol monobutyl ether acetate, ethylene glycol monophenyl ether acetate, diethylene glycol monomethyl ether acetate, diethylene glycol monopropyl ether acetate, diethylene glycol monophenyl ether acetate, diethylene glycol monobutyl ether acetate, diethylene glycol monoethyl ether acetate, propylene glycol monoethyl ether acetate, propylene glycol monopropyl ether acetate, methyl-3-methoxy propionate, ethyl-3-methoxy propionate, ethyl-3-ethoxy propionate, propyl-3-methoxy propionate, ethyl methoxyacetate, ethyl ethoxyacetate, 2-methoxybutyl acetate, 3-methoxybutyl acetate, 4-methoxybutyl acetate, 3-methyl-3-methoxybutyl acetate, 3-ethyl-3-methoxybutyl acetate, 2-ethoxybutyl acetate, 4-ethoxybutyl acetate, 4-propoxybutyl acetate, 2-methoxypentyl acetate, 3-methoxypentyl acetate, 4-methoxypentyl acetate, 2-methyl-3-methoxypentyl acetate, 3-methyl-3-methoxypentyl acetate, 3-methyl-4-methoxypentyl acetate, 4-methyl-4-methoxypentyl acetate, etc., and propylene glycol monomethyl ether acetate is preferred.

[0156] Of the above, each of R'' and R'''' preferably represents an unsubstituted alkyl group. R''' preferably represents an unsubstituted alkylene group. Each of R'' and R'''' more preferably represents either a methyl group or an ethyl group. Still more preferably, each of R'' and R'''' represents a methyl group.

[0157] The solvent represented by formula (S2) may be used in combination with one or more other organic solvents. The solvents for use in combination in this case are not especially restricted so long as they can be blended with the solvent represented by formula (S2) without separation. The

solvents represented by formula (S2) may be blended with each other. The solvent represented by formula (S2) may be used as mixture with the solvent selected from other ester solvents, ketone solvents, alcohol solvents, amide solvents, ether solvents and hydrocarbon solvents. One or more solvents may be used in combination, but for obtaining stable performance, the solvent to be used in combination is preferably one kind. When one kind of a solvent is used in combination as mixture, the blending ratio of the solvent represented by formula (S2) and the solvent to be used in combination is generally 20/80 to 99/1 as mass ratio, preferably 50/50 to 97/3, more preferably 60/40 to 95/5, and most preferably 60/40 to 90/10.

[0158] As organic solvents for use as the developer, ether solvents can also be preferably exemplified.

[0159] As ether solvents that can be used, the above-described ether solvents are exemplified. Of the above ether solvents, ether solvents having one or more aromatic rings are preferred, more preferably a solvent represented by the following formula (S3), and most preferably anisole.



[0160] In formula (S3), Rs represents an alkyl group. The alkyl group preferably has 1 to 4 carbon atoms, and is more preferably a methyl group or an ethyl group, and most preferably a methyl group.

[0161] In the invention, the water content of the developer is generally 10% by mass or less, preferably 5% by mass or less, more preferably 1% by mass or less, and it is most preferred not to substantially contain water.

[0162] Surfactant

[0163] To the developer containing an organic solvent may be added an appropriate amount of a surfactant according to necessity.

[0164] As the surfactant, the same surfactants as those for use in the later-described electron beam-sensitive or extreme ultraviolet radiation-sensitive resin composition can be used.

[0165] The amount of the surfactant to be used is generally 0.001% by mass to 5% by mass of the entire amount of the developer, preferably 0.005% by mass to 2% by mass, and more preferably 0.01% by mass to 0.5% by mass.

[0166] Developing Method

[0167] As a developing method, for example, a method of dipping a substrate in a tank filled with a developer for a prescribed time (a dipping method), a developing method by swelling a developer by surface tension to slightly above the surface of a substrate and standing still for a prescribed time (a puddling method), a method of spraying a developer on the surface of a substrate (a spraying method), and a method of continuously ejecting a developer by scanning a developer ejection nozzle at a constant speed on a substrate revolving at a constant speed (a dynamic dispensing method) can be applied.

[0168] After a development step, a step of stopping development while replacing the developer with other solvent may be performed.

[0169] The developing time is not especially restricted so long as it is sufficient for the resin in an unexposed part to be