There are no particular limitations on these other structural units, provided they cannot be classified as one of the above structural units (a1) to (a4), and any of the multitude of conventional structural units used within resist resins designed for use with ArF excimer lasers, KrF excimer lasers, EB or EUV or the like can be used.

The component (A1) is preferably a polymer that includes the structural unit (a1), and is more preferably a copolymer containing the structural unit (a1), and at least one structural unit selected from among the structural units (a2) and (a3). Among such copolymers, a copolymer that includes the structural units (a1) and (a2) is preferable, and a copolymer containing the structural unit (a1), the structural unit (a2) and the structural unit (a3) is particularly desirable.

Examples of these polymers and copolymers include copolymers consisting of the structural units (a1) and (a2), copolymers consisting of the structural units (a1) and (a3), copolymers consisting of the structural units (a1), (a2) and (a3), and copolymers consisting of the structural units (a1), (a2), (a3) and (a4).

The structural units (a1), (a2), (a3) and (a4) within these polymers and copolymers may each include a single type of structural unit or a combination of two or more types.

The weight-average molecular weight (Mw) (the polystyrene equivalent value determined by gel permeation chromatography (GPC)) of the component (A1) is not particularly limited, but is preferably within a range from 1,000 to 50,000, more preferably from 1,500 to 30,000, and most preferably from 2,000 to 20,000. When the weight-average molecular weight is not more than the upper limit of the above range, the component (A1) exhibits satisfactory solubility in a resist solvent when used as a resist. On the other hand, when the weight-average molecular weight is at least as large as the lower limit of the above range, the dry etching resistance and the cross-sectional shape of the resist pattern are improved.

Further, although there are no particular limitations on the dispersity (Mw/Mn) of the component (A1), the dispersity is preferably from 1.0 to 5.0, more preferably from 1.0 to 3.0, and most preferably from 1.0 to 2.5. Here, Mn represents the number-average molecular weight.

A single component (A1) may be used alone, or a combination of two or more types of the component (A1) may be used.

The component (A1) can be obtained, for example, by a conventional radical polymerization or the like of the monomers corresponding with each of the structural units, using a radical polymerization initiator such as azobisisobutyronitrile (AIBN).

Furthermore, by using a chain transfer agent such as $HS—CH_2—CH_2—CH_2—C(CF_3)_2—OH$ during the above polymerization, a $—C(CF_3)_2—OH$ group can be introduced at the terminals of the component (A1). Such a copolymer having an introduced hydroxyalkyl group in which some of the hydrogen atoms of the alkyl group have been substituted with fluorine atoms is effective in reducing developing defects and line edge roughness (LER: unevenness in the side walls of a line pattern).

In terms of the monomers used for forming each of the structural units, either commercially available monomers may be used, or the monomers may be synthesized using conventional methods.

{Component (A2)}

The component (A2) is preferably a low molecular weight compound having a molecular weight of at least 500 but less than 4,000, containing a hydrophilic group and an acid-dissociable group such as those mentioned above in the description of the component (A1). Specific examples of the component (A2) include compounds containing a plurality of phenol structures in which a portion of the hydrogen atoms of the hydroxyl groups have each been substituted with an aforementioned acid-dissociable, group.

Examples of the component (A2) include low molecular weight phenolic compounds in which a portion of the hydroxyl group hydrogen atoms have each been substituted with an aforementioned acid-dissociable group. These types of compounds are known, for example, as sensitizers or heat resistance improvers for use in non-chemically amplified g-line or i-line resists, and any of these compounds may be used.

Examples of these low molecular weight phenolic compounds include bis(4-hydroxyphenyl)methane, bis(2,3,4-trihydroxyphenyl)methane, 2-(4-hydroxyphenyl)-2-(4'-hydroxyphenyl)propane, 2-(2,3,4-trihydroxyphenyl)-2-(2',3',4'-trihydroxyphenyl)propane, tris(4-hydroxyphenyl)methane, bis(4-hydroxy-3,5-dimethylphenyl)-2-hydroxyphenylmethane, bis(4-hydroxy-2,5-dimethylphenyl)-2-hydroxyphenylmethane, bis(4-hydroxy-3,5-dimethylphenyl)-3,4-dihydroxyphenylmethane, bis(4-hydroxy-2,5-dimethylphenyl)-3,4-dihydroxyphenylmethane, bis(4-hydroxy-3-methylphenyl)-3,4-dihydroxyphenylmethane, bis(3-cyclohexyl-4-hydroxy-6-methylphenyl)-4-hydroxyphenylmethane, bis(3-cyclohexyl-4-hydroxy-6-methylphenyl)-3,4-dihydroxyphenylmethane, 1-[1-(4-hydroxyphenyl)isopropyl]-4-[1,1-bis(4-hydroxyphenyl)ethyl]benzene, and dimers, trimers, tetramers, pentamers and hexamers of formalin condensation products of phenols such as phenol, m-cresol, p-cresol and xylenol. Needless to say, the low molecular weight phenol compound is not limited to these examples.

In particular, a phenolic compound having 2 to 6 triphenylmethane structures is preferable as the low molecular weight phenolic compound, as such compounds yield superior levels of resolution and line width roughness (LWR).

There are no particular limitations on the acid-dissociable group, and examples include the same groups as those described above within the description relating to the component (A1).

A single component (A2) may be used alone, or a combination of two or more types of the component (A2) may be used.

In the resist composition of the present invention, a single component (A) may be used alone, or a combination of two or more types of the component (A) may be used.

Among the various possibilities described above, the component (A) preferably includes the component (A1).

The amount of the component (A1) within the component (A), based on the total weight of the component (A), is preferably at least 25% by weight, more preferably 50% by weight or more, still more preferably 75% by weight or more, and may even be 100% by weight. When this amount is at least 25% by weight, lithography properties such as the mask error factor (MEF) and the circularity are improved, and roughness can be further reduced.

There amount of the component (A) within the resist composition of the present aspect may be adjusted in accordance with factors such as the thickness of the resist film that is to be formed.

<Component (G)>

The resist composition of the present invention also includes an acid (G) (hereafter referred to as "component (G)") having a pKa of 4 or less.