SPECIFICATION

COMPOSITION FOR REMOVING PHOTORESIST RESIDUE AND/OR POLYMER RESIDUE

[Technical Field]

[0001]

The present invention relates to a composition for removing photoresist residue and/or polymer residue remaining after dry etching or wet etching or after ashing in a process for producing a semiconductor circuit element having metal wiring, and to a method for removing residue using the same.

[Background Art]

[0002]

In a process for producing a semiconductor circuit element having metal wiring, a composition containing an inorganic alkali, an organic alkali, an inorganic acid, an organic acid, an inorganic acid salt, an organic acid salt, etc. as a main material that is mixed with water, a water-soluble solvent, a complexing agent, a chelating agent, a surfactant, etc. is used as a composition for removing photoresist residue and/or polymer residue remaining after dry etching and after ashing.

[0003]

As the composition for removing photoresist residue and/or polymer residue remaining after dry etching or after ashing, a composition containing an amine-based compound is often used. However, when the content of an amine-based compound or water is high, corrosion of metal wiring or a metal thin film of aluminum, tungsten, etc. on a substrate easily occurs, and there is the problem that a metal surface is corroded. Furthermore, when washing with water is carried out immediately after treatment with a chemical, the action between an amine-based compound and water produces a strong

alkali, and a metal wiring material is sometimes corroded. This can be dealt with by carrying out intermediate rinsing with isopropyl alcohol, etc. prior to washing with water, but the operating steps increase in number and become complicated.

[0004]

As a composition that can solve these drawbacks, Patent Document 1 reports an aqueous solution composition in which an alkanolamine and an organic acid are mixed, Patent Document 2 reports an aqueous solution composition containing phosphoric acid and a primary to quaternary amine, Patent Documents 3 and 4 report an aqueous solution composition containing an amine that have a chelating effect and an acid and a salt thereof, and Patent Document 5 reports a composition containing piperazine.

[0005]

Other than the above, Patent Document 6 reports an aqueous solution composition containing at least one type selected from an aliphatic polycarboxylic acid, a salt thereof, an aminopolycarboxylic acid, and a salt thereof, Patent Document 7 reports an aqueous solution composition containing a polycarboxylate and glycol ether, and Patent Document 8 reports an aqueous solution composition containing an organic acid and/or a salt thereof and an organic solvent. Patent Document 9 reports an aqueous solution composition containing ammonium phosphate.

[0006]

A composition containing a fluoride such as hydrofluoric acid or ammonium fluoride has excellent removability for residue containing a metal oxide. With regard to the composition containing a fluoride, Patent Document 10 reports an aqueous solution composition containing ammonium fluoride, a polar solvent, and an acidic compound corrosion inhibitor, Patent Document 11 reports a composition containing a fluorine compound and an ether solvent, and Patent Document 12 reports

a composition containing a fluorine compound, a hydroxycarboxylic acid ester, and water.

On the other hand, Patent Document 13 describes a highly alkaline microelectronics substrate cleaning composition with a pH exceeding 11.5 that contains saccharin as a bath stabilizer.

Furthermore, Patent Documents 14 and 15 describe a semiconductor substrate cleaning liquid containing a fluoride, saccharin acid being described as one example of a possible chelating agent that promotes dissolution of a metal residue.

Patent Document 16 describes a microelectronics cleaning liquid having as essential components at least one type of ammonium and quaternary ammonium ion, hypophosphorous acid, and a phosphorous acid ion, with saccharin acid being described as one example of a corrosion inhibitor. However, neither of the publications examine compositions containing saccharin acid in detail.

[Prior Art Documents]

[Patent Documents]

[0007]

[Patent Document 1] JP, A, 11-174690
[Patent Document 2] JP, A, 2002-176041
[Patent Document 3] JP, A, 2003-223010
[Patent Document 4] JP, A, 2001-51429
[Patent Document 5] JP, A, 2004-205674
[Patent Document 6] JP, A, 11-316464
[Patent Document 7] JP, A, 2004-94034
[Patent Document 8] JP, A, 2000-206709
[Patent Document 9] JP, A, 2000-232063
[Patent Document 10] JP, A, 2000-260761
[Patent Document 11] JP, A, 2001-100436
[Patent Document 12] JP, A, 2004-239966
[Patent Document 13] JP, A, 2014-84464
[Patent Document 14] JP, A (PCT) 2004-511917

[Patent Document 15] JP, A, 2008-198994
[Patent Document 16] JP, A (PCT) 2007-503115

[Summary of the Invention]
[Problems to be Solved by the Invention]
[0008]

In the conventional techniques described above, there are the problems that residue removability is sometimes not sufficient and metal wiring is corroded, and a fully satisfactory composition has not yet been obtained when focusing on residue removability and inhibiting corrosion of each material.

For example, the composition described in Patent Document 1 is insufficient in terms of inhibiting corrosion of metal wiring, the compositions described in Patent Documents 2 to 5 are insufficient in terms of residue removability and inhibiting corrosion of metal wiring, and the compositions described in Patent Documents 6 to 8 are insufficient in terms of residue removability. The composition described in Patent Document 9 is desirable in terms of workability since it does not contain a hazardous substance or a toxic substance and does not fall under the category of hazardous materials, but when focusing on residue removability and inhibiting corrosion of metal wiring its properties are not sufficient. The compositions described in Patent Documents 10 to 12 are also not satisfactory in terms of inhibiting corrosion of metal wiring.
[0009]

Therefore, it is an object of the present invention to solve the above problems and provide a composition for removing photoresist residue and/or polymer residue formed in a process for producing a semiconductor circuit element having metal wiring, a method for removing photoresist residue and/or polymer residue using the composition, a method for producing a semiconductor circuit element having metal wiring that

includes a step in which the removal method is employed, and a semiconductor circuit element produced by the production method.

[Means for Solving the Problems]

[0010]

While carrying out an intensive investigation in order to solve the above problems, the present inventors have confronted the problem that, although a composition containing an appropriate combination of water, a water-soluble solvent, an acid, and a dissociable nitrogen-containing compound is effective for removing photoresist residue and/or polymer residue remaining after forming wiring of various types of metal, the residue removability can be insufficient or the metal wiring material might be corroded.

As a measure therefor, the present inventors have found that adding saccharin to a solution, in particular at a pH of no greater than 9.7, enables the removability of photoresist residue and/or polymer residue to be greatly improved without corroding a metal wiring material, and as a result of further investigation the present invention has been accomplished.

[0011]

That is, the present invention relates to the following.

[1] A composition for removing photoresist residue and/or polymer residue, the composition comprising saccharin and water, and the pH being no greater than 9.7.

[2] The composition according to [1], wherein it further comprises one or more types of substance selected from the group consisting of (A) a water-soluble solvent, (B) an acid, and (C) a dissociable nitrogen-containing compound.

[3] The composition according to [1] or [2], wherein the content of saccharin is at least 0.01 mass%.

[0012]

[4] A method for removing photoresist residue and/or polymer residue, the method employing the composition according to any one of [1] to [3].

[5] A method for producing a semiconductor circuit element having metal wiring,

the method comprising a step of removing photoresist residue and/or polymer residue remaining on a metal wiring-forming structure using the composition according to any one of [1] to [3].

[6] A semiconductor circuit element produced by the method according to [5].

[Effects of the Invention]

[0013]

In accordance with the present invention, adding saccharin to a composition for removing photoresist residue and/or polymer residue, in particular at a pH of no greater than 9.7, enables the removability of photoresist residue and/or polymer residue after dry etching or wet etching to be outstandingly improved, and the selectivity between removal of residue and etching of a metal wiring material becomes high. That is, saccharin not only has the ability to remove photoresist residue and/or polymer residue containing a polymer component as an active ingredient but also suppresses corrosion of Al-Cu, etc. when removing residue, and improves the state of Al-Cu, etc. It is possible, by carrying out a wet treatment using the composition containing saccharin related to the present invention, to easily remove photoresist residue and/or polymer residue on a substrate without corroding a metal wiring material.

[Brief Description of Drawings]

[0014]

[FIG. 1] FIG. 1 is a schematic diagram of a cross section of part of Al-Cu wiring.

[Modes for Carrying Out the Invention]

[0015]

The present invention is explained in detail below by reference to a preferred embodiment of the present invention. In the present specification, the composition for removing photoresist residue and/or polymer residue can be used for removing photoresist residue and/or polymer residue remaining on a semiconductor substrate after carrying out etching using a photoresist as a mask and, furthermore, after carrying out ashing in a process for producing a semiconductor circuit element having metal wiring, or for removing photoresist residue and/or polymer residue remaining on a semiconductor substrate, etc. after carrying out dry etching or wet etching using an inorganic material as a mask.

[0016]

In the present invention, the 'photoresist residue' means a photoresist-derived component that remains after a treatment involving photolithography with a photoresist as a mask, a treatment involving etching, and a treatment involving peeling off a photoresist mask by means of ashing, etc.

The photoresist residue includes a reaction product formed by a reaction of a photoresist due to etching or ion implantation, unreacted photoresist, and ashed photoresist formed by ashing.

Furthermore, the 'polymer residue' means a deposit of the product of a reaction between a material to be etched and an etching gas, the deposit remaining as a by-product on a wall face of a material to be etched when carrying out dry etching. The polymer residue can comprise an organic substance such as a photoresist-derived polymer component, an etching gas-derived component, a material to be etched-derived component, or an inorganic substance such as a metal residue. Specific examples include a side wall polymer (also called a side wall protective film or a rabbit ear) produced when forming metal

wiring, a side wall polymer produced when dry etching an interlayer insulating film, and a polymer containing an organometallic polymer and a metal oxide remaining on a side face and a bottom face of a via hole when forming the via hole.

In the present invention, the 'metal residue' includes a metal wiring material-derived component formed by etching, and examples include metals such as copper, aluminum, titanium, tantalum, tungsten, germanium, antimony, and tellurium, and oxides and halides thereof.

[0017]

The composition for removing photoresist residue and/or polymer residue of the present invention contains saccharin and water and contains, as necessary, at least one type of substance selected from the group consisting of (A) a water-soluble solvent, (B) an acid, and (C) a dissociable nitrogen-containing compound. It may further contain a surfactant.

[0018]

The pH of the composition for removing photoresist residue and/or polymer residue of the present invention is preferably no greater than 9.7, more preferably no greater than 9.0, and particularly preferably at least 0.0 but no greater than 9.0. From the viewpoint of residue removability, inhibition of corrosion of metal wiring material, selectivity between removal of residue and etching of metal wiring material, etc. the pH is yet more preferably at least 1.0 but no greater than 7.0. When the pH exceeds 9.8, corrosion of Al-Cu, which is a metal wiring material, easily occurs, and the residue removability is degraded.

Adjustment of pH may be carried out using ammonia, a primary amine, a secondary amine, a tertiary amine, a quaternary ammonium hydroxide, an inorganic acid, an organic acid, etc.

[0019]

The content of saccharin contained in the composition for removing photoresist residue and/or polymer residue of the

present invention is not particularly limited, but from the viewpoint of removability of photoresist residue and/or polymer residue and inhibition of corrosion of metal wiring material, the content of saccharin is preferably at least 0.01 mass%. For a composition containing saccharin and water, the content of saccharin is preferably 0.01 to 0.40 mass%, and more preferably 0.01 to 0.20 mass%. For a composition containing, in addition to saccharin and water, at least one type selected from the group consisting of (A) a water-soluble solvent, (B) an acid, and (C) a dissociable nitrogen-containing compound, the content of saccharin is preferably 0.01 to 20 mass%, and more preferably 0.05 to 5 mass%. Furthermore, the content of water contained in the composition for removing photoresist residue and/or polymer residue of the present invention is not limited.

[0020]

Examples of the water-soluble solvent used in the composition for removing photoresist residue and/or polymer residue of the present invention include an alcohol, a glycol ether, an ester, an amide, and a lactam. Other than the above, a sulfur-containing compound such as dimethyl sulfoxide or sulfolane can also be cited. One or more types thereof may be used as a mixture.

[0021]

The content of the water-soluble solvent is not particularly limited, but from the viewpoint of removability of photoresist residue and/or polymer residue and inhibition of corrosion of a metal wiring material it is preferably 1 to 99 mass%, and more preferably 1 to 50 mass%.

[0022]

Examples of the alcohol include an ether group-containing alcohol such as furfuryl alcohol or tetrahydrofurfuryl alcohol, and a glycol. Examples of the glycol include ethylene glycol (1,2-ethanediol), propylene glycol (1,2-propanediol), 1,3-propanediol, diethylene glycol (3-oxapentane-1,5-diol),

dipropylene glycol, 1,2-butanediol, 1,3-butanediol, 1,4-butanediol, 2,3-butanediol, glycerol (1,2,3-propanetriol), and hexylene glycol (2-methyl-2,4-pentanediol). One or more types thereof may be used as a mixture.

Among them, tetrahydrofurfuryl alcohol, propylene glycol (1,2-propanediol), hexylene glycol (2-methyl-2,4-pentanediol), or a mixture thereof is preferable.

[0023]

Examples of the glycol ether include ethylene glycol monomethyl ether, ethylene glycol monoethyl ether, ethylene glycol monopropyl ether, ethylene glycol monobutyl ether, ethylene glycol dimethyl ether, ethylene glycol diethyl ether, diethylene glycol monomethyl ether, diethylene glycol monoethyl ether, diethylene glycol monopropyl ether, diethylene glycol monobutyl ether, diethylene glycol dimethyl ether, diethylene glycol diethyl ether, triethylene glycol monomethyl ether, triethylene glycol dimethyl ether, triethylene glycol monobutyl ether, propylene glycol monomethyl ether, propylene glycol monoethyl ether, propylene glycol monopropyl ether, propylene glycol monobutyl ether, dipropylene glycol monomethyl ether, dipropylene glycol monoethyl ether, dipropylene glycol monopropyl ether, dipropylene glycol monobutyl ether, dipropylene glycol dimethyl ether, and tripropylene glycol monomethyl ether. One or more types thereof may be used as a mixture. Among them, diethylene glycol monomethyl ether, diethylene glycol monobutyl ether, or a mixture thereof is preferable.

[0024]

Examples of the ester include a carboxylic acid ester, a carbonic acid ester, a lactone, a phosphoric acid ester, and a sulfuric acid ester. One or more types thereof may be used as a mixture.

[0025]

Examples of the carboxylic acid ester include methyl formate, ethyl formate, methyl acetate, ethyl acetate, methyl

lactate, ethyl lactate, propyl lactate, ethyl 2-hydroxybutyrate, dimethyl malate, diethyl malate, dimethyl tartrate, diethyl tartrate, diisopropyl tartrate, and propyl tartrate. Among them, ethyl lactate is preferable.

[0026]

Examples of the carbonic acid ester include dimethyl carbonate, diethyl carbonate, ethyl methyl carbonate, ethylene carbonate, and propylene carbonate. Among them, ethylene carbonate and propylene carbonate are preferable.

[0027]

Examples of the lactone include γ-butyrolactone, γ-valerolactone, and δ-valerolactone. Among them, γ-butyrolactone is preferable.

[0028]

Examples of the amide include acetamide, *N*-methylacetamide, isobutyramide, propionamide, *N*-ethylacetamide, malonamide, nicotinamide, and *N*,*N*-dimethylacetamide. Among them, *N*,*N*-dimethylacetamide is preferable.

[0029]

Examples of the lactam include *N*-methyl-2-pyrrolidone and 1,3-dimethyl-2-imidazolidinone. Among them 1,3-dimethyl-2-imidazolidinone is preferable.

[0030]

Examples of the acid used in the composition for removing photoresist residue and/or polymer residue of the present invention include an inorganic acid and an organic acid.

[0031]

The content of the acid is not particularly limited, but from the viewpoint of the removability by the composition for removing photoresist residue and/or polymer residue and inhibition of corrosion of wiring material, it is preferably 0.001 to 90 mass%, and more preferably 0.002 to 30 mass%.

[0032]

Specific examples of the inorganic acid include hydrofluoric acid, hydrochloric acid, hydrobromic acid,

hydrosulfuric acid, phosphoric acid, diphosphoric acid, tripolyphosphoric acid, boric acid, iodic acid, sulfuric acid, sulfurous acid, hypochlorous acid, chlorous acid, perchloric acid, nitric acid, nitrous acid, peroxonitric acid, peroxophosphoric acid, peroxodiphosphoric acid, peroxosulfuric acid, peroxodisulfuric acid, and hydrogen peroxide. One or more types thereof may be used as a mixture. Hydrofluoric acid, phosphoric acid, diphosphoric acid, boric acid, or a mixture thereof is preferable, and hydrofluoric acid, phosphoric acid, or a mixture thereof is particularly preferable.

[0033]

Specific examples of the organic acid include a carboxylic acid and a phenol. Other than the above, examples include a sulfonic acid such as methanesulfonic acid and a phosphonic acid such as nitrilotris(methylenephosphonic acid). One or more types thereof may be used as a mixture.

[0034]

Specific examples of the carboxylic acid include formic acid, acetic acid, methoxyacetic acid, trifluoroacetic acid, propionic acid, butyric acid, lactic acid, malic acid, citric acid, glycolic acid, glyoxylic acid, oxalic acid, malonic acid, succinic acid, and maleic acid. One or more types thereof may be used as a mixture. Acetic acid, lactic acid, malonic acid, methoxyacetic acid, or a mixture thereof is preferable, and acetic acid, lactic acid, malonic acid, or a mixture thereof is particularly preferable.

[0035]

Examples of the phenol include phenol, catechol, pyrogallol, salicylic acid, guaiacol, and gallic acid. One or more types thereof may be used as a mixture. Among them, catechol, gallic acid, or a mixture thereof is preferable.

[0036]

Examples of the dissociable nitrogen-containing compound used in the composition for removing photoresist residue

and/or polymer residue of the present invention include ammonia, an ammonium salt, an amine, an amine salt, a quaternary ammonium salt, and an amino acid. One or more types thereof may be used as a mixture.

[0037]

The content of the dissociable nitrogen-containing compound is not particularly limited, but from the viewpoint of removability of photoresist residue and/or polymer residue and inhibition of corrosion of a wiring material, it is preferably 0.005 to 50 mass%, and more preferably 0.005 to 35 mass%.

[0038]

Examples of the ammonium salt include an organic ammonium salt and an inorganic ammonium salt. Examples of the organic ammonium salt include an ammonium salt of a carboxylic acid, such as ammonium acetate, ammonium oxalate, ammonium citrate, or ammonium tartrate. Examples of the inorganic ammonium salt include ammonium sulfate, triammonium phosphate, diammonium hydrogenphosphate, ammonium dihydrogenphosphate, ammonium chloride, and ammonium fluoride. One or more types thereof may be used as a mixture. Among them, ammonium oxalate, diammonium hydrogenphosphate, ammonium fluoride, or a mixture thereof is preferable.

[0039]

Examples of the amine include hydroxylamine, an alkanolamine, an alkylamine, and a cyclic amine. One or more types thereof may be used as a mixture.

[0040]

Examples of the alkanolamine include monoethanolamine, isopropanolamine, diethanolamine, triethanolamine, *N*-methylethanolamine, *N*-methyldiethanolamine, *N*-ethyldiethanolamine, and *N*,*N*-dimethylmonoethanolamine. Among them, monoethanolamine is preferable.

[0041]

Examples of the alkylamine include methylamine, dimethylamine, trimethylamine, *tert*-butylamine, ethylamine, diethylamine, isopropylamine, diisopropylamine, 1,1-dimethylhydrazine, *N*,*N*-dimethylethylamine, *N*,*N*-diethylmethylamine, *N*,*N*-dimethylisopropylamine, ethylenediamine, ethylmethylamine, 1,2-dimethylpropylamine, butylamine, isobutylamine, propylamine, *N*,*N*,*N'N'*-tetramethylethylenediamine, 1,2-diaminopropane, 1,3-diaminopropane, and *N*,*N*-dimethylethylenediamine. One or more types thereof may be used as a mixture. Among them, diisopropylamine is preferable.

[0042]

Examples of the cyclic amine include imidazole, pyridine, pyrazine, pyrimidine, piperazine, morpholine, purine, and a derivative thereof. One or more types thereof may be used as a mixture. Among them, imidazole, piperazine, or a mixture thereof is preferable.

[0043]

Examples of the amine salt include piperazine sulfate, hydroxylamine sulfate, guanidine phosphate, triethanolamine phosphate, piperazine phosphate, piperazine citrate, phenylhydrazine oxalate, 2-(dimethylamino)ethanol L-tartaric acid, hydrazine L-(+)-L tartrate, piperazine dihydrochloride, hydroxylamine hydrochloride, monoethanolamine hydrochloride, diethanolamine hydrochloride, and triethanolamine hydrochloride. One or more types thereof may be used as a mixture. Among them, hydroxylamine sulfate, guanidine phosphate, piperazine phosphate, or a mixture thereof is preferable.

[0044]

Examples of the quaternary ammonium salt include tetramethylammonium hydroxide, tetramethylammonium fluoride, tetramethylammonium tetrafluoroborate, tetramethylammonium hexafluorophosphate, tetramethylammonium sulfate, tetramethylammonium chloride, tetramethylammonium perchlorate,

tetramethylammonium acetate, tetraethylammonium hydroxide, tetraethylammonium chloride, tetraethylammonium fluoride, choline, choline chloride, choline bitartrate, triethylmethylammonium tetrafluoroborate, tetrapropylammonium hydroxide, tetrapropylammonium chloride, tetrabutylammonium hydroxide, tetrabutylammonium chloride, tetrabutylammonium hexafluorophosphate, and tetrabutylammonium tetrafluoroborate. One or more types thereof may be used as a mixture. Among them, choline bitartrate is preferable.

[0045]

Examples of the amino acid include alanine, arginine, asparagine, aspartic acid, cysteine, glutamine, glutamic acid, glycine, histidine, isoleucine, leucine, lysine, methionine, phenylalanine, proline, serine, threonine, tryptophan, tyrosine, valine, citrulline, bicine, and iminodiacetic acid. One or more types thereof may be used as a mixture. Among them, glycine is preferable.

[0046]

A cationic, anionic, or nonionic surfactant may be added to the composition for removing photoresist residue and/or polymer residue of the present invention. The content of the surfactant is not particularly limited, but is preferably less than 0.3 mass%.

[0047]

When peeling off photoresist residue and/or polymer residue using the composition for removing photoresist residue and/or polymer residue of the present invention, the treatment temperature and the treatment time may be appropriately adjusted. The treatment temperature is adjusted so that it is within 25°C to 70°C, and the treatment time is adjusted so that it is within 10 seconds to 30 minutes.

[0048]

As a rinsing liquid after the composition for removing photoresist residue and/or polymer residue of the present invention is used, ultrapure water, a water-soluble solvent,

or a mixed liquid of ultrapure water and a water-soluble solvent may be used. As the water-soluble solvent, methyl alcohol, ethyl alcohol, or isopropanol is usually used, but a water-soluble solvent other than the above may be used.

[0049]

The composition of the present invention may be used for a usually used photoresist without any particular restrictions.

In one aspect, the present invention relates to a method for removing photoresist residue and/or polymer residue using the composition of the present invention.

It also relates to a method for producing a semiconductor circuit element having metal wiring, employing the above removal method, wherein it includes a step of removing photoresist residue and/or polymer residue remaining on a metal wiring-forming structure by use of the composition of the present invention.

[0050]

In the present invention, the 'metal wiring-forming structure' means a structure in any stage of a metal wiring step in the production process of a semiconductor circuit element having metal wiring.

Examples include a structure in a stage after etching subsequent to photolithography, a structure in a stage after ashing, and a structure in a stage after etching subsequent to ashing. More specific examples include a structure after dry etching an interlayer insulating film, a structure after forming a via hole, and a structure shown in FIG. 1.

[Examples]

[0051]

With regard to the composition for removing photoresist residue and/or polymer residue of the present invention, the present invention is explained in further detail by reference to Examples and Comparative Examples. The present invention should not be construed as being limited to these Examples.

[0052]

Evaluation: residue removability and inhibition of corrosion of Al-Cu

A cross section of a part of Al-Cu wiring formed on a silicon wafer by carrying out dry etching using a photoresist as a mask and removing the resist by oxygen plasma is shown in FIG. 1. The photoresist was a positive type photoresist. Photoresist residue and polymer residue (2) were attached to an upper part and a side face of Al-Cu wiring (1). A barrier metal was formed from titanium (3) and titanium nitride (4), and the substrate was formed from silicon (5) and a silicon oxide film (6). Evaluation of residue removability and inhibition of corrosion of Al-Cu was carried out using this substrate. Evaluation methods were as follows.

The substrate was immersed in the chemical liquid to be evaluated shown in Table 1, Table 2, Table 5, Table 6, Table 9, Table 10, Table 13, Table 14, Table 17, and Table 18, then rinsed with ultrapure water, and dried. It was examined using an electron microscope (SEM), and the state of the Al-Cu wiring was ascertained. Conditions of the treatment with the chemical liquid were made appropriate while taking into consideration the properties of each of the chemical liquids to be evaluated. The treatment temperature was in the range of 25°C to 70°C, and the treatment time was in the range of 10 seconds to 30 minutes. The time for rinsing with ultrapure water was 1 minute. Drying after rinsing was carried out by blowing with nitrogen. The evaluation results are shown in Tables 7 to 12.

[0053]

Compositions formed from water, water and a water-soluble solvent, water and an acid, or water and a dissociable nitrogen-containing compound (Comparative Examples 1 to 32 in Table 2) and compositions formed by adding saccharin thereto (Examples 1 to 32 in Table 1) were subjected to evaluation. In Comparative Examples 1 to 32, removal of residue was sometimes insufficient, and corrosion of an Al-Cu part of the

metal wiring was observed (Table 4). On the other hand, the composition for removing photoresist residue and/or polymer residue (Examples 1 to 32) related to the present invention showed good residue removability, and the state of an Al-Cu part of the metal wiring was also good (Table 3).

It was confirmed that adding saccharin to the compositions formed from water, water and a water-soluble solvent, water and an acid, or water and a dissociable nitrogen-containing compound improved the residue removability and enhanced selectivity between removal of residue and etching of Al-Cu.

[0054]

[Table 1]

Table 1 Example compositions 1

Example	Saccharin mass%	Water mass%	(A) Water-soluble solvent		(B) Acid		(C) Dissociable nitrogen-containing compound	
			Compound	Mass%	Compound	Mass%	Compound	Mass%
1	0.01	99.99						
2	0.3	79.7	Hexylene glycol	20.0				
3	0.3	79.7	Diethylene glycol monomethyl ether	20.0				
4	0.3	94.7	Ethyl lactate	5.0				
5	0.5	74.5	Tetrahydrofurfuryl alcohol	25.0				
6	0.5	49.5	Dimethyl sulfoxide	50.0				
7	0.3	79.7	*N*,*N*-Dimethylacetamide	20.0				
8	0.3	79.7	*N*-Methylpyrrolidone	20.0				
9	0.3	79.7	Sulfolane	20.0				
10	0.3	79.7	1,3-dimethyl-2-imidazolidinone	20.0				
11	0.20	99.798			Hydrofluoric acid	0.002		
12	0.2	98.8			Phosphoric acid	1.0		
13	0.1	89.9			Malonic acid	10. 0		
14	0.2	94.8			Lactic acid	5.0		
15	14.0	84.9					Ammonia	1.1
16	0.05	99.945					Ammonium fluoride	0.005
17	0.50	98.28					Ammonium oxalate	1.22
18	1	94					Ammonium tartrate	5
19	0.5	94.5					Ammonium sulfate	5.0
20	1.45	97.03					Triammonium phosphate	1.52
21	3	93					Diammonium hydrogenphosphate	4
22	1	94					Ammonium dihydrogenphosphate	5
23	2.2	97.3					Piperazine	0.5
24	2.9	96.07					Imidazole	1.03
25	3.2	95.8					Monoethanolamine	1.0
26	5.0	92.4					Diisopropylamine	2.6
27	3.5	92.5					Guanidine phosphate	4.0
28	0.5	94.5					Triethanolamine phosphate	5.0
29	1.0	98.1					Piperazine phosphate	0.9
30	0.3	94.7					Hydroxylamine sulfate	5.0
31	3	90					Choline bitartrate	7
32	0.01	94.99					Glycine	5.00

[0055]

[Table 2]

Table 2 Comparative example compositions 1

Comp.Ex.	Saccharin mass%	Water mass%	(A) Water-soluble solvent		(B) Acid		(C) Dissociable nitrogen-containing compound	
			Compound	Mass%	Compound	Mass%	Compound	Mass%
1		100						
2		80	Hexylene glycol	20				
3		80	Diethylene glycol monomethyl ether	20				
4		95	Ethyl lactate	5				
5		75	Tetrahydrofurfuryl alcohol	25				
6		50	Dimethyl sulfoxide	50				
7		80	*N*,*N*-Dimethylacetamide	20				
8		80	*N*-Methyl-2-pyrrolidone	20				
9		80	Sulfolane	20				
10		80	1,3-Dimethyl-2-imidazolidinone	20				
11		99.998			Hydrofluoric acid	0.002		
12		99			Phosphoric acid	1		
13		90			Malonic acid	10		
14		95			Lactic acid	5		
15		98.9					Ammonia	1.1
16		99.995					Ammonium fluoride	0.005
17		98.78					Ammonium oxalate	1.22
18		95					Ammonium tartrate	5
19		95.0					Ammonium sulfate	5.0
20		98.48					Triammonium phosphate	1.52
21		96					Diammonium hydrogenphosphate	4
22		95					Ammonium dihydrogenphosphate	5
23		99.5					Piperazine	0.5
24		98.97					Imidazole	1.03
25		99					Monoethanolamine	1
26		97.4					Diisopropylamine	2.6
27		96					Guanidine phosphate	4
28		95					Triethanolamine phosphate	5
29		99.1					Piperazine phosphate	0.9
30		95					Hydroxylamine sulfate	5
31		93					Choline bitartrate	7
32		95					Glycine	5

[0056]

[Table 3]

Table 3 Example composition evaluation results 1

Example	Evaluation results						
	Compo-sition pH	Al-Cu solid film		Al-Cu wiring pattern			
		Treatment temperature (°C)	Etching rate (nm/min)	Treatment temperature (°C)	Treatment time (min)	Residue removability	Al-Cu state
1	3.3	55	0.21	55	25	○	○
2	2.0	50	0.63	50	20	○	○
3	2.0	50	0.54	50	20	○	○
4	1.9	50	0.05	50	30	◎	○
5	1.8	50	0.51	50	20	◎	○
6	2.1	70	0.45	70	30	◎	◎
7	2.3	50	0.47	50	30	◎	○
8	2.2	50	0.43	50	30	◎	◎
9	1.9	50	0.79	50	30	○	◎
10	2.0	50	0.62	50	25	◎	◎
11	2.0	25	1.16	25	1	◎	○
12	1.6	25	1.20	25	10	◎	◎
13	1.3	40	0.24	40	30	○	◎
14	1.8	60	0.36	60	30	◎	○
15	3.4	70	0.19	70	30	○	◎
16	2.8	25	1.04	25	1	◎	○
17	4.2	40	0.22	40	25	◎	◎
18	4.6	70	0.36	70	20	◎	○
19	2.4	40	0.28	40	30	◎	◎
20	8.0	45	0.11	45	20	◎	○
21	6.3	30	0.40	30	20	◎	◎
22	2.8	25	0.35	25	15	◎	○
23	3.1	70	0.66	70	25	○	◎
24	3.0	70	0.88	70	30	○	○
25	3.0	65	0.41	65	30	◎	○
26	2.8	70	1.00	70	15	○	○
27	3.6	30	0.50	30	30	◎	◎
28	2.8	30	0.68	30	10	◎	◎
29	3.2	35	0.32	35	20	◎	◎
30	2.4	45	0.32	45	20	◎	◎
31	2.7	70	0.38	70	10	○	◎
32	5.6	70	0.41	70	30	○	◎

Residue removability

◎ No residue remaining at all

○ Slight amount of particulate residue remaining

△ Some residue remaining

× Residue largely remaining

◎, ○ Pass

△, × Fail

Al-Cu state

◎ No Al-Cu corrosion

○ Slight amount of pitting in Al-Cu

△ Slight amount of corrosion in Al-Cu

× Al-Cu entirely corroded

◎, ○ Pass

△, × Fail

[0057]

[Table 4]

Table 4 Comparative example composition evaluation results 1

Comp. Ex.	Evaluation results						
		Al-Cu solid film		Al-Cu wiring pattern			
	Composition pH	Treatment temperature (°C)	Etching rate (nm/min)	Treatment temperature (°C)	Treatment time (min)	Residue removability	Al-Cu state
1	7.0	55	≤0.05	55	25	×	◎
2	5.6	50	0.32	50	20	×	◎
3	5.6	50	0.08	50	20	×	◎
4	4.0	50	0.62	50	30	○	×
5	4.0	50	0.18	50	20	×	◎
6	6.8	70	0.43	70	30	×	◎
7	5.8	50	0.15	50	30	×	◎
8	4.5	50	0.05	50	30	×	◎
9	3.5	50	≤0.05	50	30	×	◎
10	6.5	50	≤0.05	50	25	×	◎
11	3.1	25	0.86	25	1	△	○
12	1.6	25	1.32	25	10	△	◎
13	1.3	40	0.36	40	30	△	◎
14	1.9	60	0.49	60	30	◎	△
15	11.7	70	≥50	70	30	◎	×
16	5.7	25	0.19	25	1	×	◎
17	6.2	40	0.28	40	25	×	◎
18	6.7	70	1.10	70	20	×	×
19	5.2	40	≤0.05	40	30	×	◎
20	9.1	45	0.44	45	20	△	×
21	7.9	30	0.28	30	20	△	◎
22	4.2	25	0.10	25	15	△	○
23	11.2	70	≥20	70	25	◎	×
24	9.7	70	8.84	70	30	×	×
25	11.3	65	≥50	65	30	◎	×
26	12.1	70	≥50	70	15	◎	×
27	8.7	30	0.09	30	30	×	◎
28	4.3	30	0.22	30	10	△	◎
29	6.3	35	≤0.05	35	20	×	◎
30	3.6	45	0.28	45	20	△	◎
31	3.5	70	0.36	70	10	△	◎
32	6.2	70	0.17	70	30	○	△

[0058]

Compositions formed from water, a water-soluble solvent, and an acid, water, a water-soluble solvent, and a dissociable nitrogen-containing compound, water, an acid, and a dissociable nitrogen-containing compound, and water, a water-soluble solvent, an acid, and a dissociable nitrogen-containing compound (Comparative Example 33 to Comparative Example 45 in Table 6) and compositions formed by adding

saccharin thereto (Example 33 to Example 45 in Table 5) were subjected to evaluation. In the Comparative Examples, removal of residue was sometimes insufficient, and corrosion of an Al-Cu part of the metal wiring was observed. On the other hand, the composition for removing photoresist residue and/or polymer residue related to the present invention showed good residue removability as shown in each of the Examples, and the state of an Al-Cu part of the metal wiring was also good (Table 7 and Table 8).

[0059]

[Table 5]

Table 5 Example compositions 2

Example	Saccharin mass%	Water mass%	(A) Water-soluble solvent		(B) Acid		(C) Dissociable nitrogen-containing compound	
			Compound	Mass%	Compound	Mass%	Compound	Mass%
33	0.5	64.5	*N*-Methyl-2-pyrrolidone	24.0	Malonic acid	10.0	Iminodiacetic acid	1.0
34	0.10	84.89	Tripropylene glycol monomethyl ether	15.00			Ammonium fluoride	0.01
35	0.10	89.89	Ethyl lactate	10.00			Ammonium fluoride	0.01
36	0.10	69.89	Propylene glycol	30.00			Ammonium fluoride	0.01
37	0.10	69.79	Propylene glycol	30.00			Ammonium fluoride Glycine	0.01 0.1
38	0.8	60.0	Diethylene glycol monobutyl ether	30.0	Oxalic acid D-Sorbitol	0.2 5.0	Ammonium sulfate	4.0
39	0.5	79.5	Propylene glycol	15.0			Ammonium sulfate	5.0
40	0.4	89.4	Diethylene glycol monomethyl ether	9.0			Ammonium oxalate	1.2
41	0.6	96.4					Ammonium oxalate Glycine	2 1
42	0.6	87.4	Diethylene glycol monobutyl ether	9.0			Ammonium oxalate Glycine	2.0 1.0
43	0.50	96.28					Ammonium oxalate Dihydroxyethylglycine	1.22 2.00
44	0.50	93.28	Diethylene glycol monobutyl ether	3.00			Ammonium oxalate Imidazole	1.22 2.00
45	1.60	91.88	*N,N*-Dimethylacetamide	5.00			Triammonium phosphate	1.52

[0060]

[Table 6]

Table 6 Comparative example compositions 2

Comp. Ex.	Saccharin mass%	Water mass%	(A)Water-soluble solvent		(B) Acid		(C) Dissociable nitrogen-containing compound	
			Compound	Mass%	Compound	Mass%	Compound	Mass%
33		65	*N*-Methyl-2-pyrrolidone	24	Malonic acid	10	Iminodiacetic acid	1
34		84.99	Tripropylene glycol monomethyl ether	15.00			Ammonium fluoride	0.01
35		89.99	Ethyl lactate	10.00			Ammonium fluoride	0.01
36		69.99	Propylene glycol	30.00			Ammonium fluoride	0.01
37		69.89	Propylene glycol	30.00			Ammonium fluoride Glycine	0.01 0.1
38		60.8	Diethylene glycol monobutyl ether	30.0	Oxalic acid D-Sorbitol	0.2 5.0	Ammonium sulfate	4.0
39		80	Propylene glycol	15			Ammonium sulfate	5
40		89.8	Diethylene glycol monomethyl ether	9.0			Ammonium oxalate	1.2
41		97					Ammonium oxalate Glycine	2 1
42		88	Diethylene glycol monobutyl ether	9			Ammonium oxalate Glycine	2 1
43		96.78					Ammonium oxalate Dihydroxyethyl glycine	1.22 2.00
44		93.78	Diethylene glycol monobutyl ether	3.00			Ammonium oxalate Imidazole	1.22 2.00
45		93.48	*N,N*-Dimethylacetamide	5.00			Triammonium phosphate	1.52

[0061]

[Table 7]

Table 7 Example composition evaluation results 2

Example	Evaluation results						
		Al-Cu solid film		Al-Cu wiring pattern			
	Composition pH	Treatment temperature (°C)	Etching rate (nm/min)	Treatment temperature (°C)	Treatment time (min)	Residue removability	Al-Cu state
33	1.7	50	0.23	50	30	◎	◎
34	2.6	25	1.15	25	0.5	◎	○
35	2.2	25	1.96	25	0.5	◎	○
36	2.5	25	1.03	25	0.5	◎	◎
37	3.1	25	0.87	25	0.5	◎	◎
38	2.2	35	≤0.05	35	30	◎	◎
39	2.6	45	0.63	45	30	◎	○
40	4.5	45	0.44	45	25	◎	◎
41	4.3	45	0.21	45	25	◎	◎
42	4.5	45	0.18	45	25	◎	◎
43	4.2	40	0.13	40	25	◎	◎
44	8.1	35	0.98	35	15	◎	◎
45	7.8	45	0.09	45	20	◎	◎

[0062]

[Table 8]

Table 8 Comparative example composition evaluation results 2

Comp. Ex.	Evaluation results						
		Al-Cu solid film		Al-Cu wiring pattern			
	Composition pH	Treatment temperature (°C)	Etching rate (nm/min)	Treatment temperature (°C)	Treatment time (min)	Residue removability	Al-Cu state
33	1.8	50	0.24	50	30	△	△
34	4.1	25	0.56	25	0.5	×	○
35	3.3	25	0.93	25	0.5	×	○
36	6.1	25	0.08	25	0.5	×	◎
37	6.1	25	0.14	25	0.5	×	◎
38	2.6	35	≤0.05	35	30	△	◎
39	5.3	45	≤0.05	45	30	×	◎
40	6.3	45	0.57	45	25	△	◎
41	6.1	45	0.34	45	25	△	◎
42	6.3	45	0.33	45	25	△	○
43	5.6	40	0.12	40	25	△	◎
44	8.4	35	1.84	35	15	◎	×
45	9.0	45	0.39	45	20	◎	×

[0063]

As an active ingredient of a conventional composition for removing photoresist residue and/or polymer residue there can be cited a fluorine compound such as hydrofluoric acid or ammonium fluoride, a phenol represented by catechol, an amino acid such as glycine or iminodiacetic acid, an amine such as triethanolamine, phosphoric acid, and an organic acid such as acetic acid. Conventional compositions for removing photoresist residue and/or polymer residue containing the above active ingredients (Comparative Examples 46 to 63 in Table 10) and compositions formed by adding saccharin instead of the active ingredient to the conventional compositions for removing photoresist residue and/or polymer residue (Examples 46 to 56 in Table 9) were subjected to evaluation, and the effect of the active ingredient in the conventional compositions and the effect of saccharin were compared. In Comparative Examples 46 to 63, removal of residue was sometimes insufficient, and corrosion of an Al-Cu part of metal wiring was observed (Table 12). On the other hand, the

compositions for removing photoresist residue and/or polymer residue related to the present invention (Examples 46 to 56) showed good residue removability, and the state of an Al-Cu part the metal wiring was also good (Table 11). It was confirmed that saccharin exhibited superior effects to those of the active ingredient for the conventional compositions for removing photoresist residue and/or polymer residue.

[0064]

[Table 9]

Table 9 Example compositions 3

Example	Saccharin mass%	Water mass%	(A) Water-soluble solvent		(B) Acid		(C) Dissociable nitrogen-containing compound	
			Compound	Mass%	Compound	Mass%	Compound	Mass%
46	0.3	79.7	Hexylene glycol	20.0				
47	0.3	79.7	Diethylene glycol monomethyl ether	20.0				
48	0.3	94.7	Ethyl lactate	5.0				
49	0.5	74.5	Tetrahydrofurfuryl alcohol	25.0				
50	0.1	89.9			Malonic acid	10.0		
51	0.10	99.89					Ammonium fluoride	0.01
52	1.45	97.03					Triammonium phosphate	1.52
53	2.00	96.48					Triammonium phosphate	1.52
54	3.42	95.06					Triammonium phosphate	1.52
55	12	80					Triammonium phosphate	8
56	3.2	95.8					Monoethanolamine	1.0

[0065]

[Table 10]

Table 10 Comparative example compositions 3

Comp. Ex.	Saccharin mass%	Water mass%	(A) Water-soluble solvent		(B) Acid		(C) Dissociable nitrogen-containing compound	
			Compound	Mass%	Compound	Mass%	Compound	Mass%
46		79.7	Hexylene glycol	20.0	Hydrofluoric acid	0.3		
47		79.7	Diethylene glycol monomethyl ether	20.0	Catechol	0.3		
48		79.7	Diethylene glycol monomethyl ether	20.0			Ammonium fluoride	0.3
49		79.7	Ethyl lactate	20.0	Phosphoric acid	0.3		
50		94.7	Ethyl lactate	5.0			Ammonium fluoride	0.3
51		74.5	Tetrahydrofurfuryl alcohol	25.0			Glycine	0.5
52		89.9			Malonic acid	10.0	Iminodiacetic acid	0.1
53		89.9			Malonic acid	10.0	Glycine	0.1
54		99.89			Catechol	0.10	Ammonium fluoride	0.01
55		99.89					Ammonium fluoride Glycine	0.01 0.10
56		99.89					Ammonium fluoride Triethanolamine	0.01 0.10
57		98.01			Phosphoric acid	0.47	Triammonium phosphate	1.52
58		97.75			Phosphoric acid	0.73	Triammonium phosphate	1.52
59		96.69			Phosphoric acid	1.79	Triammonium phosphate	1.52
60		80			Nitrotri(methylene) trisphosphonic acid	12	Triammonium phosphate	8
61		98.5			Acetic acid	0.5	Monoethanolamine	1.0
62		95.8			Acetic acid	3.2	Monoethanolamine	1.0
63		95.8			Phosphoric acid	3.2	Monoethanolamine	1.0

[0066]

[Table 11]

Table 11 Example composition evaluation results 3

Example	Evaluation results						
		Al-Cu solid film		Al-Cu wiring pattern			
	Composition pH	Treatment temperature (°C)	Etching rate (nm/min)	Treatment temperature (°C)	Treatment time (min)	Residue removability	Al-Cu state
46	2.0	50	0.63	50	20	○	○
47	2.0	50	0.54	50	20	○	○
48	1.9	50	0.05	50	30	◎	○
49	1.8	50	0.51	50	20	◎	○
50	1.3	40	0.24	40	30	○	◎
51	2.6	25	2.54	25	0.5	◎	◎
52	8.0	45	0.11	45	20	◎	○
53	7.0	45	0.13	45	20	◎	◎
54	4.5	45	0.06	45	20	◎	◎
55	6.6	30	0.89	30	10	◎	◎
56	3.0	65	0.41	65	30	◎	○

[0067]

[Table 12]

Table 12 Comparative example composition evaluation results 3

Comp. Ex.	Evaluation results						
		Al-Cu solid film		Al-Cu wiring pattern			
	Composition pH	Treatment temperature (°C)	Etching rate (nm/min)	Treatment temperature (°C)	Treatment time (min)	Residue removability	Al-Cu state
46	2.6	50	≥50	50	20	◎	×
47	5.2	50	0.31	50	20	△	◎
48	6.5	50	22.50	50	20	◎	×
49	2.0	50	4.28	50	30	◎	×
50	5.4	50	17.84	50	30	◎	×
51	4.9	50	0.07	50	20	×	◎
52	1.3	40	0.31	40	30	△	◎
53	1.4	40	0.11	40	30	△	◎
54	5.6	25	1.08	25	0.5	×	◎
55	5.9	25	0.20	25	0.5	×	◎
56	8.8	25	0.78	25	0.5	×	◎
57	8.0	45	0.26	45	20	◎	×
58	7.1	45	0.36	45	20	◎	×
59	4.5	45	0.25	45	20	◎	×
60	3.7	30	0.32	30	10	×	◎
61	9.5	65	≥30	65	30	◎	×
62	4.3	65	1.44	65	30	◎	×
63	1.9	65	14.29	65	30	◎	×

[0068]

An aqueous solution formed from triammonium phosphate and ammonia (Comparative Example 64, pH 9.8), a composition formed from triammonium phosphate, saccharin, and water (Example 57,

pH 8.9), and a composition formed from triammonium phosphate, ammonia, saccharin, and water (Example 58, pH 9.0) were subjected to evaluation. The composition formed from triammonium phosphate, saccharin, and water (Example 57), whose pH was 8.9, gave good results. The composition formed from triammonium phosphate, ammonia, saccharin, and water (Example 58), whose pH was 9.0, gave similarly good results. On the other hand, with the composition formed from triammonium phosphate, ammonia, saccharin, and water (Comparative Example 64), whose pH was 9.8, Al-Cu was corroded, and the residue removability was insufficient.

[0069]

[Table 13]

Table 13 Example composition 4

Example	Saccharin mass%	Water mass%	(A) Water-soluble solvent		(B) Acid		(C) Dissociable nitrogen-containing compound	
			Compound	Mass%	Compound	Mass%	Compound	Mass%
57	0.50	97.98					Triammonium phosphate	1.52
58	0.50	97.96					Triammonium phosphate Ammonia	1.52 0.02

[Table 14]

Table 14 Comparative example compositions 4

Comp. Ex.	Saccharin mass%	Water mass%	A) Water-soluble solvent		(B) Acid		(C) Dissociable nitrogen-containing compound	
			Compound	Mass%	Compound	Mass%	Compound	Mass%
64	0.50	97.41					Triammonium phosphate Ammonia	1.52 0.57

[0070]

[Table 15]

Table 15 Example composition evaluation results 4

Example	Evaluation results							
		Al-Cu solid film		Al-Cu wiring pattern			
	Composition pH	Treatment temperature (°C)	Etching rate (nm/min)	Treatment temperature (°C)	Treatment time (min)	Residue removability	Al-Cu state
57	8.9	40	0.18	40	30	○	◎
58	9.0	40	0.22	40	30	○	◎

[Table 16]

Table 16 Comparative example composition evaluation results 4

Comp. Ex.	Evaluation results							
	Composition pH	Al-Cu solid film		Al-Cu wiring pattern			
		Treatment temperature (°C)	Etching rate (nm/min)	Treatment temperature (°C)	Treatment time (min)	Residue removability	Al-Cu state
64	9.8	40	2.09	40	30	Δ	×

[0071]

An aqueous solution formed from propylene carbonate, hydrofluoric acid, and water (Comparative Example 65) and a composition formed from propylene carbonate, hydrofluoric acid, water, and saccharin (Example 59) were subjected to evaluation at low pH. The actual etching rate of Example 59 was 0.01 to 0.02 nm/min and the actual etching rate of Comparative Example 65 was 0.04 nm/min, and a decrease in the etching rate due to the addition of saccharin, that is, an improvement in the inhibition of corrosion of Al-Cu, was observed. Furthermore, it was observed that the residue removability improved and the selectivity between removal of residue and etching of Al-Cu was improved.

[0072]

[Table 17]

Table 17 Example composition 5

Example	Saccharin mass%	Water mass%	(A) Water-soluble solvent		(B) Acid		(C) Dissociable nitrogen-containing compound	
			Compound	Mass%	Compound	Mass%	Compound	Mass%
59	1	1	Propylene carbonate	97	Hydrofluoric acid	1		

[Table 18]

Table 18 Comparative example composition 5

Comp. Ex.	Saccharin mass%	Water mass%	A) Water-soluble solvent		(B) Acid		(C) Dissociable nitrogen-containing compound	
			Compound	Mass%	Compound	Mass%	Compound	Mass%
65		1	Propylene carbonate	98	Hydrofluoric acid	1		

[0073]

[Table 19]

Table 19 Example composition evaluation results 5

Example	Evaluation results						
		Al-Cu solid film		Al-Cu wiring pattern			
	Composition pH	Treatment temperature (°C)	Etching rate (nm/min)	Treatment temperature (°C)	Treatment time(Sec)	Residue removability	Al-Cu state
59	0.1	25	≤0.05	25	10	○	◎

[Table 20]

Table 20 Comparative example composition evaluation results 5

Comp. Ex.	Evaluation results						
		Al-Cu solid film		Al-Cu wiring pattern			
	Composition pH	Treatment temperature (°C)	Etching rate (nm/min)	Treatment temperature (°C)	Treatment time(Sec)	Residue removability	Al-Cu state
65	0.1	25	≤0.05	25	10	△	◎

CLAIMS

[Claim 1]

A composition for removing photoresist residue and/or polymer residue, the composition comprising saccharin and water, and the pH being no greater than 9.7.

[Claim 2]

The composition according to Claim 1, wherein it further comprises one or more types of substance selected from the group consisting of (A) a water-soluble solvent, (B) an acid, and (C) a dissociable nitrogen-containing compound.

[Claim 3]

The composition according to Claim 1 or 2, wherein the content of saccharin is at least 0.01 mass%.

[Claim 4]

A method for removing photoresist residue and/or polymer residue, the method employing the composition according to any one of Claims 1 to 3.

[Claim 5]

A method for producing a semiconductor circuit element having metal wiring,

the method comprising a step of removing photoresist residue and/or polymer residue remaining on a metal wiring-forming structure using the composition according to any one of Claims 1 to 3.

[Claim 6]

A semiconductor circuit element produced by the method according to Claim 5.