1-pyrazoline, 2-pyrazoline, pyrazolidine, pyralizolidone, 3-pyrazolone, 4-pyrazolone, 5-pyrazolone, 1H-pyrazole-4-carboxylic acid, 1-methyl-1H-pyrazole-5-carboxylic acid, 5-methyl-1H-pyrazole-3-carboxylic acid, 3,5-pyrazole dicarboxylic acid, 3-amino-5-hydroxypyrazole, 1H-imidazole, 2-imidazoline, 3-imidazoline, 4-imidazoline, imidazolidine, imidazolidone, ethylene urea, hydantoin, allantoin, histidine, histidyl, histamine, 1,2,3-triazole, 1,2,4-triazole, 1-hydroxybenzotriazole, 3-amino-1,2,4-triazole, 4-amino-1,2,4-triazole, and 3,5-diamino-1,2,4-triazole. Among them, from the viewpoint of being industrially readily available and having high water solubility, pyrazole, 3,5-pyrazole dicarboxylic acid, 3-amino-5-hydroxypyrazole, imidazole, triazole, 3,5-diamino-1,2,4-triazole, histidine, and histamine are preferable, and histidine, histamine, and 3,5-diamino-1,2,4-triazole are particularly preferable.

[0037]

Among the nitrogen atom-containing heteromonocyclic aromatic compounds, examples of six-membered ring compounds include, but are not limited to, ~~piperidine,~~ pyridine, pyrazine, ~~piperazine,~~ pyrimidine, pyridazine, ~~morpholine,~~ and derivatives thereof, and specific examples include ~~piperidine,~~ piperidyl, piperidylidene, piperidylene, pipecoline, lupetidine, coniine, piperidone, pipecolic acid, pipecoloyl, pipecolamide, nipecotic acid, isonipecotoyl, isonipecotamide, pelletierine, isopelletierine, piperine, isopiperine, chavicine, isochavicine, pyridine, pyridyl, pyridylidene, pyridylene, pyridylene, piperideine, 2-pyridone, 4-pyridone, picoline, α-collidine, β-collidine, γ-collidine, picolinic acid, picolinoyl, picolinamide, nicotinic acid, nicotinoyl, nicotinamide, isonicotinic acid, isonicotinoyl, citrazinic acid, quinolinic acid, lutidinic acid, isocinchomeronic acid, dipicolinic acid, cinchomeronic acid, dinicotinic acid, berberonic acid, fusaric acid, ethionamide, nicotine, cotinine, anabasine, anatabine, homarine, trigonelline, guvacine,

arecaidine, arecoline, picolinuric acid, nicotinuric acid, risedronic acid, aminohydroxypyrazole, dihydroxypyridine, pyrazine, pyrazinoic acid, pyrazinoyl, pyrazinamide, ~~piperazine,~~ glycine anhydride, pyrimidine, cytosine, uracil, tegafur, carmofur, thymine, orotic acid, barbituric acid, barbital, dialluric acid, dilturic acid, uramil, alloxan, violuric acid, alloxanthine, murexide, isobarbituric acid, isouramil, divicine, vicine, thiamine, pyridazine, maleic acid hydrazide, melamine, and cyanuric acid. Among them, from the viewpoint of being industrially readily available and having high water solubility, cytosine and cyanuric acid are preferable.

[0038]

The cleaning liquid composition of the present invention contains a nitrogen atom-containing heteromonocyclic aromatic compound. The heteromonocyclic aromatic compound is added in order to remove organic residue on the substrate surface.

[0039]

Examples of the organic residue include, but are not limited to, a Cu-containing organic residue, which is a dimer or oligomer of an organometallic complex that is formed by crosslinking with Cu as a result of a reaction between Cu and an organic corrosion inhibitor such as benzotriazole (BTA) during a CMP process, the Cu-containing organic residue being insoluble. In order to dissolve this Cu-containing organic residue in the cleaning liquid, there is a method in which coordination bonding between Cu and an organic corrosion inhibitor is cleaved by changing the pH of the cleaning liquid to thus decrease the molecular weight.

Among Cu-containing organic residues, examples of the dimer or oligomer of an organometallic complex formed by crosslinking with Cu by a reaction between Cu and an organic corrosion inhibitor such as benzotriazole (BTA) during a CMP process include, but are not limited to, a Cu-benzotriazole (BTA) complex.

CLAIMS

[Claim 1]

A cleaning liquid composition for cleaning a substrate having Cu wiring, wherein:

the cleaning liquid composition ~~comprising~~ comprises:

one or more types of basic compound other than tetramethylammonium hydroxide, ~~and~~

one or more types of nitrogen atom-containing heteromonocyclic aromatic compound which is four-membered ring, five-membered ring or six-membered ring, and

one or more types of phosphonic acid-based chelating agent;

the cleaning liquid composition does not comprise isoascorbic acid, an ascorbic acid derivative, or gallic acid; and

the cleaning liquid composition has ~~having~~ a hydrogen ion concentration (pH) of 8 to 11.

[Claim 2]

The cleaning liquid composition according to Claim 1, wherein the substrate having Cu wiring is a substrate obtained after chemical mechanical polishing (CMP).

[Claim 3]

The cleaning liquid composition according to Claim 1 or 2, wherein the nitrogen atom-containing heteromonocyclic aromatic compound is a five-membered ring compound.

[Claim 4]

The cleaning liquid composition according to any one of Claims 1 to 3, wherein the basic compound is a quaternary ammonium compound other than tetramethylammonium hydroxide or a straight chain aliphatic amine.

~~[Claim 5]~~

~~The cleaning liquid composition according to any one of Claims 1 to 4, wherein it does not comprise one or more types selected from the group consisting of isoascorbic acid, an ascorbic acid derivative, and gallic acid.~~

[Claim ~~6~~ 5]

The cleaning composition according to any one of Claims 1 to ~~5~~ 4, wherein the basic compound is a quaternary ammonium compound other than tetramethylammonium hydroxide, or an alkanolamine.

~~[Claim 7]~~

~~The cleaning liquid composition according to any one of Claims 1 to 6, wherein it further comprises one or more types of phosphonic acid-based chelating agent.~~

[Claim ~~8~~ 6]

The cleaning liquid composition according to Claim ~~7~~ 5, wherein the phosphonic acid-based chelating agent is one or more types selected from the group consisting of *N*,*N*,*N*',*N*'-ethylenediaminetetrakis(methylenephosphonic acid) (EDTPO), glycine-*N*,*N*-bis(methylenephosphonic acid) (glyphosine), nitrilotris(methylenephosphonic acid) (NTMP), and salts thereof.

[Claim ~~9~~ 7]

The cleaning liquid composition according to any one of Claims 1 to ~~8~~ 6, wherein it further comprises one or more types of anionic or nonionic surfactant.

[Claim ~~10~~ 8]

A starting solution composition for the cleaning liquid composition according to any one of Claims 1 to ~~9~~ 7, the starting solution composition being for use in obtaining the

cleaning liquid composition by dilution at 10 times to 1000 times.

[Claim ~~11~~ 9]

A method for producing a semiconductor substrate, comprising a step of putting a substrate having Cu wiring in contact with the cleaning liquid composition according to any one of Claims 1 to ~~9~~ 7.

[Claim ~~12~~ 10]

The method for producing a semiconductor substrate according to Claim ~~11~~ 9, wherein it comprises a step of subjecting the substrate having Cu wiring to chemical mechanical polishing (CMP) prior to the step of putting a substrate having Cu wiring in contact.

[Claim ~~13~~ 11]

The method for producing a semiconductor substrate according to Claim ~~11 or 12~~ 9 or 10, wherein the step of putting a substrate having Cu wiring in contact is a step of cleaning the substrate having Cu wiring.

[Claim ~~14~~ 12]

A method for dissolving a Cu-containing organic residue, the method comprising a step of putting a Cu-containing organic residue in contact with a cleaning liquid composition, wherein:

the cleaning liquid composition ~~comprising~~ comprises:

one or more types of basic compound other than tetramethylammonium hydroxide, ~~and~~

one or more types of nitrogen atom-containing heteromonocyclic aromatic compound which is four-membered ring, five-membered ring or six-membered ring, and

one or more types of phosphonic acid-based chelating agent;

the cleaning liquid composition does not comprise isoascorbic acid, an ascorbic acid derivative, or gallic acid; and

the cleaning liquid composition has ~~having~~ a hydrogen ion concentration (pH) of 8 to 11.

[Claim ~~15~~ 13]

The method according to Claim ~~14~~ 12, wherein the Cu-containing organic residue comprises a Cu-benzotriazole (BTA) complex.