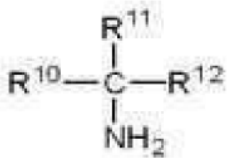
CLAIMS

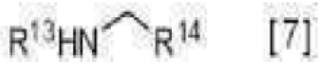
Claim 1

A cleaning agent for a semiconductor substrate to be used in a post process of a chemical mechanical polishing process of the semiconductor substrate having a tungsten wiring or a tungsten alloy wiring, and a silicon oxide film, the cleaning agent for a semiconductor substrate is characterized by comprising (A) a phosphonic acid-based chelating agent, (B) a primary monoamine represented by the general formula [6] or a primary or secondary monoamine represented by the general formula [7], and (C) water, wherein a pH is over 6 and below 7.



[6]

(wherein R^{10} and R^{11} each independently represent a monohydroxyalkyl group having 1 to 3 carbon atoms, and R^{12} represents a hydrogen atom, an alkyl group having 1 to 3 carbon atoms or a monohydroxyalkyl group having 1 to 3 carbon atoms.)



[7]

(wherein R^{13} represents a hydrogen atom or an alkyl group having 1 to 3 carbon atoms, and R^{14} represents a dihydroxyalkyl group having 1 to 3 carbon atoms.)

Claim 2

The cleaning agent for a semiconductor substrate according to claim 1, wherein (B) the primary monoamine represented by the general formula [6] or the primary or secondary monoamine represented by the general formula [7] is 2-amino-1,3-propanediol, 2-amino-2-methyl-1,3-propanediol, 2-amino-2-hydroxymethyl-1,3-propanediol, 2-amino-2-ethyl-1,3-propanediol, 3-amino-1,2-propanediol or 3-methylamino-1,2-propanediol.

Claim 3

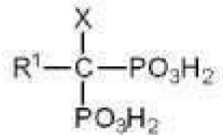
The cleaning agent for a semiconductor substrate according to claim 1, wherein (B) the primary monoamine represented by the general formula [6] or the primary or secondary monoamine represented by the general formula [7] is 2-amino-2-hydroxymethyl-1,3-propanediol.

Claim 4

The cleaning agent for a semiconductor substrate according to claim 1, wherein the pH is 6.2 to 6.8.

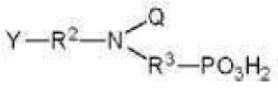
Claim 5

The cleaning agent for a semiconductor substrate according to claim 1, wherein (A) the phosphonic acid-based chelating agent is represented by the general formula [1], [2] or [3]:



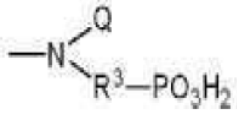
[1]

(wherein X represents a hydrogen atom or a hydroxyl group, and R^1 represents a hydrogen atom or an alkyl group having 1 to 10 carbon atoms.)



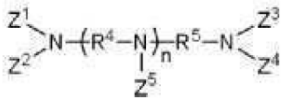
[2]

(wherein Q represents a hydrogen atom or $-R^3-PO_3H_2$, R^2 and R^3 each independently represent an alkylene group, and Y represents a hydrogen atom, $-R^3-PO_3H_2$ or a group represented by the general formula [4].)



[4]

(wherein Q and R^3 are the same as Q and R^3 of the general formula 2.)



[3]

(wherein R^4 and R^5 each independently represent an alkylene group having 1 to 4 carbon atoms, n represents an integer of 1 to 4, and at least 4 of Z^1 to Z^4 and n moieties of Z^5 represent an alkyl group having a phosphonic acid group, and the remaining represents an alkyl group.)

Claim 6

The cleaning agent for a semiconductor substrate according to claim 1, wherein (A) the phosphonic acid-based chelating agent is 1-hydroxyethylidene-1,1'-diphosphonic acid, nitrilotris(methylenephosphonic acid), ethylenediamine tetra(methylenephosphonic acid) or diethylenetriamine penta(methylenephosphonic acid).

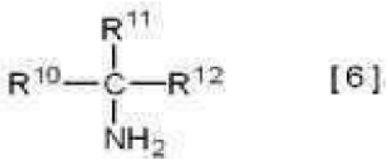
Claim 7

The cleaning agent for a semiconductor substrate according to claim 1, wherein the semiconductor substrate further has a silicon nitride film.

Claim 8

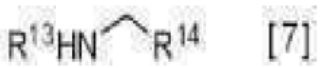
A method for processing a semiconductor substrate surface, comprising:

a process for treating a surface of a semiconductor substrate having a tungsten wiring or a tungsten alloy wiring, and a silicon oxide film, by chemical mechanical polishing; and a process for cleaning the semiconductor substrate after the process by the chemical mechanical polishing, with a cleaning agent for a semiconductor substrate comprising (A) a phosphonic acid-based chelating agent, (B) a primary monoamine represented by the general formula [6] or a primary or secondary monoamine represented by the general formula [7], and (C) water, wherein a pH is over 6 and below 7.



[6]

(wherein R^{10} and R^{11} each independently represent a monohydroxyalkyl group having 1 to 3 carbon atoms, and R^{12} represents a hydrogen atom, an alkyl group having 1 to 3 carbon atoms or a monohydroxyalkyl group having 1 to 3 carbon atoms.)



[7]

(wherein R^{13} represents a hydrogen atom or an alkyl group having 1 to 3 carbon atoms, and R^{14} represents a dihydroxyalkyl group having 1 to 3 carbon atoms.)

Claim 9

The method for processing a semiconductor substrate surface according to claim 8, wherein (B) the primary monoamine represented by the general formula [6] or the primary or secondary monoamine represented by the general formula [7] is 2-amino-1,3-propanediol, 2-amino-2-methyl-1,3-propanediol, 2-amino-2-hydroxymethyl-1,3-propanediol, 2-amino-2-ethyl-1,3-propanediol, 3-amino-1,2-propanediol or 3-methylamino-1,2-propanediol.

Claim 10

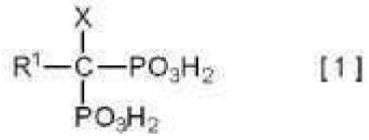
The method for processing a semiconductor substrate surface according to claim 8, wherein (B) the primary monoamine represented by the general formula [6] or the primary or secondary monoamine represented by the general formula [7] is 2-amino-2-hydroxymethyl-1,3-propanediol.

Claim 11

The method for processing a semiconductor substrate surface according to claim 8, wherein the pH is 6.2 to 6.8.

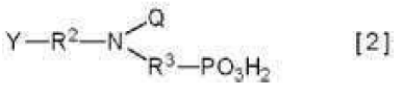
Claim 12

The method for processing a semiconductor substrate surface according to claim 8, wherein (A) the phosphonic acid-based chelating agent is represented by the general formula [1], [2] or [3]:



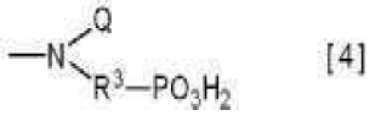
[1]

(wherein X represents a hydrogen atom or a hydroxyl group, and R^1 represents a hydrogen atom or an alkyl group having 1 to 10 carbon atoms.)



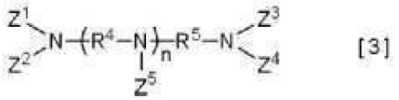
[2]

(wherein Q represents a hydrogen atom or $-R^3-PO_3H_2$, R^2 and R^3 each independently represent an alkylene group, and Y represents a hydrogen atom, $-R^3-PO_3H_2$ or a group represented by the general formula [4].)



[4]

(wherein Q and R^3 are the same as Q and R^3 of the general formula 2.)



[3]

(wherein R^4 and R^5 each independently represent an alkylene group having 1 to 4 carbon atoms, n represents an integer of 1 to 4, and at least 4 of Z^1 to Z^4 and n moieties of Z^5 represent an alkyl group having a phosphonic acid group, and the remaining represents an alkyl group.)

Claim 13

The method for processing a semiconductor substrate surface according to claim 8, wherein (A) the phosphonic acid-based chelating agent is 1-hydroxyethylidene-1,1'-diphosphonic acid, nitrilotris(methylenephosphonic acid), ethylenediamine tetra(methylenephosphonic acid) or diethylenetriamine penta(methylenephosphonic acid).

Claim 14

The method for processing a semiconductor substrate surface according to claim 8, wherein the semiconductor substrate further has a silicon nitride film.