CLAIMS

[Claim 1]

A liquid chemical for forming a water repellent protecting film, the liquid chemical for forming a water repellent protecting film being for forming a water repellent protecting film on a wafer having at its surface an uneven pattern and containing at least one kind of element selected from the group consisting of titanium, tungsten, aluminum, copper, tin, tantalum and ruthenium at surfaces of recessed portions of the uneven pattern, the water repellent protecting film being formed at least on the surfaces of the recessed portions, characterized by including:

a water repellent protecting film forming agent; and

water~~,~~; and

a solvent other than water,

wherein the water repellent protecting film forming agent is at least one selected from compounds represented by the following general formula [1] and salt compounds thereof, and

wherein, in the liquid chemical, the concentration of the water relative to the total quantity of the water and the solvent other than water ~~a solvent contained in the liquid chemical~~ is not smaller than 50 mass%~~.~~:

$$R^1 - \overset{\overset{O}{\|}}{P} - (OH)_a(R^2)_{2-a} \qquad [1]$$

(~~I~~in the formula [1], R^1 represents a C_1-C_{18} monovalent hydrocarbon group the hydrogen elements of which may partially or entirely be replaced with a fluorine element(s)~~.~~; R^2 mutually independently represents a monovalent organic group having a C_1-C_{18} hydrocarbon group the hydrogen elements of which may partially or entirely be replaced with a fluorine element(s)~~.~~; "a" is an integer of from 0 to 2~~.~~).

[Claim 2]

A liquid chemical for forming a water repellent protecting film, as claimed in Claim 1, characterized in that the water repellent protecting film

forming agent is at least one selected from compounds represented by the following general formula [2] and salt compounds thereof~~.~~:

$$R^3 - \overset{\overset{O}{\|}}{P} - (OH)_2 \qquad [2]$$

(~~I~~in the formula [2], R^3 represents a C_1-C_{18} monovalent hydrocarbon group the hydrogen elements of which may partially or entirely be replaced with a fluorine element(s)~~.~~).

[Claim 3]

A process for cleaning a wafer having an uneven pattern at its surface, the wafer containing at least one kind of element selected from the group consisting of titanium, tungsten, aluminum, copper, tin, tantalum and ruthenium at surfaces of recessed portions of the uneven pattern, characterized by including at least the steps of:

a water repellent protecting film forming step in which a liquid chemical for forming a protecting film is retained at least in the recessed portions of the uneven pattern;

a drying step in which a liquid is removed from the uneven pattern by drying; and

a film removing step in which the protecting film is removed,

wherein the liquid chemical for forming a protecting film includes a water repellent protecting film forming agent and water,

wherein the water repellent protecting film forming agent is at least one selected from compounds represented by the following general formula [1] and salt compounds thereof, and

wherein the concentration of the water relative to the total quantity of a solvent contained in the liquid chemical is not smaller than 50 mass%~~.~~:

$$R^1 - \overset{\overset{O}{\|}}{P} - (OH)_a(R^2)_{2-a} \qquad [1]$$

(~~In~~in the formula [1], R^1 represents a C_1-C_{18} monovalent hydrocarbon group the hydrogen elements of which may partially or entirely be replaced with a fluorine element(s)~~.~~; R^2 mutually independently represents a monovalent organic group having a C_1-C_{18} hydrocarbon group the hydrogen elements of which may partially or entirely be replaced with a fluorine element(s)~~.~~; "a" is an integer of from 0 to 2~~.~~).

[Claim 4]

A process for cleaning a wafer, as claimed in Claim 3, characterized by including a water-based cleaning step in which a water-based cleaning liquid is retained at least in the recessed portions of the uneven pattern, the water-based cleaning step being conducted earlier than the water repellent protecting film forming step.

[Claim 5]

A process for cleaning a wafer, as claimed in Claim 3 or Claim 4, characterized in that the water repellent protecting film forming agent is at least one selected from compounds represented by the following general formula [2] and salt compounds thereof~~.~~:

$$R^3 - \overset{\overset{O}{\|}}{P} - (OH)_2 \qquad [2]$$

(~~In~~in the formula [2], R^3 represents a C_1-C_{18} monovalent hydrocarbon group the hydrogen elements of which may partially or entirely be replaced with a fluorine element(s)~~.~~).

[Claim 6]

A process for cleaning a wafer, as claimed in any of Claim 3 to Claim 5, characterized in that the wafer is a wafer containing at least one element of titanium and ruthenium at least at the surfaces of the recessed portions of the uneven pattern.

[Claim 7]

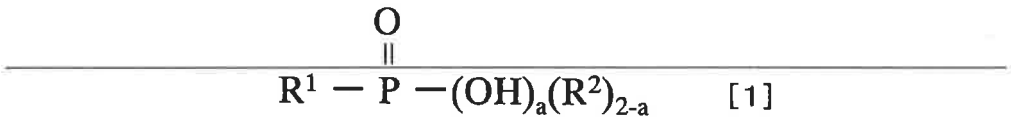
A process for cleaning a wafer having an uneven pattern at its surface, the wafer containing at least one kind of element selected from the group consisting of titanium, tungsten, aluminum, copper, tin, tantalum and ruthenium at surfaces of recessed portions of the uneven pattern, characterized by including at least the steps of:

a water repellent protecting film forming step in which a liquid chemical for forming a water repellent protecting film is provided at least to the recessed portions of the wafer to form a water repellent protecting film on the surfaces of the recessed portions, the liquid chemical for forming a water repellent protecting film containing a water repellent protecting film forming agent which is for forming a water repellent protecting film on the surface of the wafer,

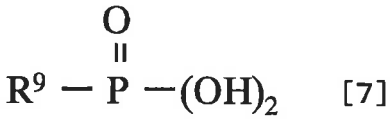
wherein an excess of the liquid chemical for forming a water repellent protecting film which excess occurs during the water repellent protecting film forming step, and/or a liquid chemical for forming a water repellent protecting film which liquid chemical has undergone the water repellent protecting film forming step is recalled and recycled, and

wherein the water repellent protecting film forming agent is a compound having no hydrolyzable functional group,

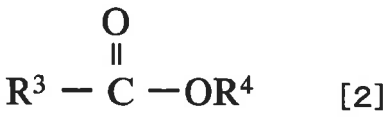
the water repellant protecting film forming agent is at least one selected from compounds represented by the following general formulas ~~[1]~~[7], [2], ~~and~~ [4] ~~to~~and [6] and salt compounds thereof~~.~~:

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~~(In the formula [1], R^1 represents a C_1-C_{18} monovalent hydrocarbon group the hydrogen elements of which may partially or entirely be replaced with a fluorine element(s). R^2 mutually independently represents a monovalent organic group having a C_1-C_{18} hydrocarbon group the hydrogen elements of which may partially or entirely be replaced with a fluorine element(s). "a" is an integer of from 0 to 2.)~~



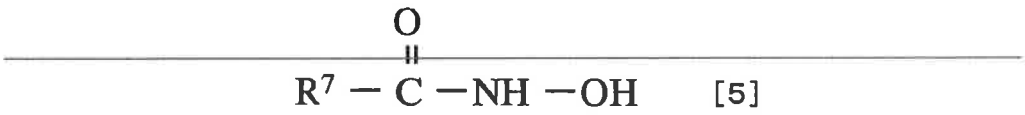
(in the formula [7], R^9 represents a C_1-C_{18} monovalent hydrocarbon group the hydrogen elements of which may partially or entirely be replaced with a fluorine element(s)),



(~~In~~in the formula [2], ~~R^1 represents a C_1-C_{18} monovalent hydrocarbon group the hydrogen elements of which may partially or entirely be replaced with a fluorine element(s). R^2 mutually independently represents a monovalent organic group having a C_1-C_{18} hydrocarbon group the hydrogen elements of which may partially or entirely be replaced with a fluorine element(s).~~R^3 represents a C_1-C_{18} monovalent hydrocarbon group the hydrogen elements of which may partially or entirely be replaced with a fluorine element(s); R^4 represents a hydrogen group),

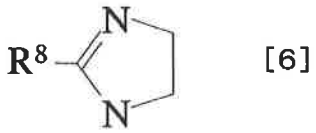
$$R^6(X)_c \quad [4]$$

(~~In~~in the formula [4], X mutually independently represents a mercapto group or aldehyde group~~.~~; "c" is an integer of from 1 to 6~~.~~; R^6 represents a C_1-C_{18} monovalent hydrocarbon group the hydrogen elements of which may partially or entirely be replaced with a fluorine element(s), in which the "c" number of hydrogen element(s) or fluorine element(s) is replaced with the X group~~.~~)~~.~~



$$R^7 - C(=O) - NH - OH \quad [5]$$

~~(In the formula [5], R^7 represents a C_1-C_{18} monovalent hydrocarbon group the hydrogen elements of which may partially or entirely be replaced with a fluorine element(s).)~~



[6]

(~~I~~in the formula [6], R^8 represents a C_1-C_{18} monovalent hydrocarbon group the hydrogen elements of which may partially or entirely be replaced with a fluorine element(s)~~.~~).

[Claim 8]

A process for cleaning a wafer, as claimed in Claim 7, characterized by including:

a step of cleaning the surface of the wafer with a cleaning liquid

[Claim 9]

A process for cleaning a wafer, as claimed in Claim 7 to Claim 8, characterized in that the water repellent protecting film forming agent is at least one selected from compounds represented by the following general formula [7] and salt compounds thereof:

$$R^9 - \overset{\overset{O}{\|}}{P} - (OH)_2 \quad [7]$$

(~~I~~nin the formula [7], R^9 represents a C_1-C_{18} monovalent hydrocarbon group the hydrogen elements of which may partially or entirely be replaced with a fluorine element(s)~~.~~).

[Claim 10]

A process for cleaning a wafer, as claimed in any of Claim 7 to Claim 9, characterized in that the wafer is a wafer containing at least one element of titanium, ruthenium and tungsten at least at the surfaces of the recessed portions of the uneven pattern.