Appeal Decision

Appeal No. 2020-7706

Appellant Applied Materials, Inc.

Patent Attorney SONODA & KOBAYASHI INTELLECTUAL PROPERTY LAW

The case of appeal against the examiner's decision of refusal of Japanese Patent Application No. 2017-536255, entitled "GATE STACK MATERIALS FOR SEMICONDUCTOR APPLICATIONS FOR LITHOGRAPHIC OVERLAY IMPROVEMENT", [international publication on July 14, 2016, WO2016/111798; national publication of the translated version on March 29, 2018, National Publication of International Patent Application No. 2018-508980] has resulted in the following appeal decision:

Conclusion

The appeal of the case was groundless.

Reason

No. 1 History of the procedures

The application was originally filed on December 9, 2015 (Heisei 27) as an International Patent Application (claim of priority under the Paris Convention was received by the foreign receiving office on January 9, 2015: the United States / on October 8, 2015: the United States), and its history of procedures is shown as follows.

Dated October 23, 2019 : A written notice of reasons for refusal
January 16, 2020 : Submission of a written opinion and a written amendment
Dated January 27, 2020 : Decision of refusal
June 4, 2020 : Submission of a written request for appeal and a written amendment

No. 2 Decision to Dismiss Amendment regarding the written amendment submitted on

June 4, 2020

[Conclusion of Decision to Dismiss Amendment]

The written amendment submitted on June 4, 2020 (hereinafter, referred to as "the Amendment") shall be dismissed.

[Reason]

1. Details of the Amendment

A The Amendment is one that includes amendments to make Claims 1-14 before the Amendment be amended to Claims 1-14 after the Amendment, and Claim 1 before the Amendment and Claim 1 after the Amendment are as follows. (The underlines indicate amended portions.)

(A) Claim 1 before the Amendment

"[Claim 1]

A method for forming a film layer on a substrate comprising:

supplying a deposition gas mixture including a silicon containing gas and a reacting gas onto a substrate disposed on a substrate support in a processing chamber;

forming plasma in the presence of the depositing gas mixture in the processing chamber;

applying current to a plasma profile modulator disposed in the processing chamber while supplying the depositing gas mixture into the processing chamber; and

rotating the substrate while depositing a film layer on the substrate and forming the plasma over the substrate."

(B) Claim 1 after the Amendment

"[Claim 1]

A method for forming a film layer on a substrate comprising:

supplying a deposition gas mixture including a silicon containing gas, an inactive gas, and a reacting gas onto a substrate disposed on a substrate support in a processing chamber, the silicon containing gas and the inactive gas being supplied at a ratio between 1:1 and 1:150, the silicon containing gas and the reacting gas being supplied at a ratio between 1:1 and 1:150;

forming plasma in the presence of the depositing gas mixture in the processing chamber;

applying current to a plasma profile modulator disposed in the processing chamber while supplying the depositing gas mixture into the processing chamber; and

rotating the substrate while depositing a film layer on the substrate and forming the plasma over the substrate."

B　Then, the Amendment to Claim 1 is one having the following amended matter as its content.

(Amended matter 1) To amend "supplying a deposition gas mixture including a silicon containing gas and a reacting gas" of Claim 1 before the Amendment to, "supplying a deposition gas mixture including a silicon containing gas, an inactive gas, and a reacting gas, the silicon containing gas and the inactive gas being supplied at a ratio between 1:1 and 1:150, the silicon containing gas and the reacting gas being supplied at a ratio between 1:1 and 1:150" of Claim 1 after the Amendment.

C　In addition, in the Amendment, the amendments to make Claims 2-14 before amendment be Claims 2-14 after amendment are ones including the following amended matters.

(Amended matter 2) To amend "the nitrogen containing gas is" of Claim 5 before the Amendment to, "the reacting gas is nitrogen containing gas, and the nitrogen containing gas is" of Claim 5 after the Amendment.

(Amended matter 3) To amend "about 0.5 A and about 40 A" of Claim 6 before the Amendment to "0.5 A and 40 A" of Claim 5 after the Amendment.

(Amended matter 4) To amend "about 0 degrees and about 360 degrees" of Claim 9 before the Amendment to "0 degrees and 360 degrees" of Claim 9 after the Amendment.

(Amended matter 5) To amend "controlling plasma" of Claim 11 before the Amendment to "controlling plasma, the gas mixture including a silicon containing gas, an inactive gas, and a reacting gas, the silicon containing gas and the inactive gas being supplied at a ratio between 1:1 and 1:150, the silicon containing gas and the reacting gas being supplied at a ratio between 1:1 and 1:150" of Claim 11 after the Amendment.

(Amended matter 6) To amend "the gas mixture includes a silicon containing gas and a nitrogen containing gas" of Claim 14 before the Amendment to "the reacting gas is nitrogen containing gas, and the silicon containing gas and the nitrogen containing gas are supplied into the processing chamber at a ratio between 1:1 and 1:100" of Claim 14 after the Amendment.

2. Regarding existence or absence of addition of new matters and propriety of amendment purpose

Regarding the above-mentioned Amended matters 1-6, existence or absence of addition of new matters and propriety of amendment purpose will be examined.

A　Amended matter 1 is one in which, with respect to the matter of Claim 1 before amendment of "supplying a deposition gas mixture including a silicon containing gas and a reacting gas", the limitation that "inactive gas" is included as "deposition gas mixture" is made, and, further, the limitation of "the silicon containing gas and the inactive gas being supplied at a ratio between 1:1 and 1:150, the silicon containing gas and the reacting gas being supplied at a ratio between 1:1 and 1:150" is made, and, therefore, it falls under restriction of the scope of claims. Further, Amended matter 1 is one that is based on the descriptions of paragraph 0033 and paragraph 0034 of the description and the drawings originally attached to the application of the present application (hereinafter, referred to as "Originally attached description etc.").

B Amended matter 2 is one that adds, to the matter of "the nitrogen containing gas is" of Claim 2 before amendment, the limitation that "the reacting gas is nitrogen containing gas", and thus it is for the purpose of restriction of the scope of claims. Further, Amended matter 2 is one that is based on the description of paragraph 0032 of the Originally attached description etc.

C Amended matters 3 and 4 are ones to amend "about 0.5 A and about 40 A" and "about 0 degrees and about 360 degrees" of Claims 6 and 9 before amendment to "0.5 A and 40 A" and "0 degrees and 360 degrees" of Claims 6 and 9 after amendment by omitting "about", and therefore falls under the category of correction of errors. Further, Amended matters 3 and 4 were made within the range of the matters described in the Originally attached description etc.

D Since Amended matter 5 is one that adds, to the matter of Claim 11 before amendment of "controlling plasma", the limitation of "the gas mixture including a silicon containing gas, an inactive gas, and a reacting gas, the silicon containing gas and the inactive gas being supplied at a ratio between 1:1 and 1:150, the silicon containing gas and the reacting gas being supplied at a ratio between 1:1 and 1:150", it is for the purpose of restriction of the scope of claims. Further, Amended matter 5 is one that is based on the descriptions of paragraph 0033 and paragraph 0034 of the Originally attached description etc.

E Amended matter 6 is one that further limits "the gas mixture" of Claim 14 before amendment into "the reacting gas is nitrogen containing gas, and the silicon containing gas and the nitrogen containing gas are supplied into the processing chamber at a ratio between 1:1 and 1:100", and therefore it is for the purpose of restriction of the scope of claims. Further, Amended matter 6 is one that is based on the descriptions of paragraph 0032 and paragraph 0033 of the Originally attached description etc.

As described in the above A to E, Amended matters 1-6 comply with the prescription of Article 17-2(3) of the Patent Act, and fall under the category of ones for the purpose of the matters prescribed in Article 17-2(5)(ii) and (iii) of the Patent Act.

3. Consideration on independent requirements for patentability

As described in the above-mentioned 2, the Amendment for Claim 1 includes an amendment for the purpose of restriction of the scope of claims stipulated in Article 17-2(5)(ii) of the Patent Act. Therefore, whether the invention specified by the matters recited in Claim 1 of the scope of claims after the Amendment can be patented independently upon the filing of the patent application will be further examined hereinafter.

3.1 The invention according to Claim 1 after the Amendment

The invention according to Claim 1 after the Amendment (hereinafter, referred to as "Amended Invention 1") is as shown in Claim 1 of the scope of claims amended by the Amendment (the above-mentioned 1.A(B)).

3.2 The descriptions of Cited Documents

(1) The descriptions of Cited Document 1

A In the description of U.S. patent publication No. 2014/0118751 (hereinafter, referred to as "Cited Document 1"), which is a Publication cited in the reasons for refusal stated in the examiner's decision, and distributed abroad before the priority date of the present application, there are the following descriptions along with FIGS. 1 and 3. (Underlines were made by the body, and the same shall apply hereinafter.)

"[0002] Embodiments described herein relate to processes and apparatus for performing plasma deposition on a substrate. More specifically, embodiments described herein relate to plasma deposition processes and apparatus for forming layers having extreme uniformity of composition and thickness."

"[0004] Recently, manufacturers have developed processes that extend device structures into the third dimension to increase processing capability. Such devices generally feature large numbers of material layers deposited sequentially on a substrate. In some cases, over 100 layers may be formed. When so many layers are formed sequentially, non-uniformities in each layer can multiply, resulting in unusable structures. Current layer formation processes and apparatus typically produce non-uniformities that are not suitable for three-dimensional structures. Thus, new processes and apparatus are needed for forming extremely uniform layers on a substrate."

"[0027] Extremely uniform, high quality device layers may be formed on a substrate in a plasma process by controlling uniformity of gas flow, uniformity of temperature among surfaces of the processing chamber, temperature profile of the substrate, and plasma density profile at various locations of the substrate surface. Plasma density profile and temperature profile can be adjusted together to achieve a desired deposition rate profile across a substrate surface. Temperature uniformity of chamber surfaces can be adjusted to provide uniform concentration of reactive species and to control and/or minimize deposition on chamber surfaces."

"[0028] A method 100 of forming a layer of uniform thickness and composition on a substrate is summarized in the flow diagram of FIG.1. At 102, a substrate is disposed on a substrate support in a CVD chamber."

"[0031] At 108, a precursor gas mixture is provided to the chamber through the temperature controlled face plate. The gas mixture maybe any suitable CVD precursor mixture, such as a silicon (polysilicon or amorphous silicon), silicon oxide, silicon nitride, or silicon oxynitride precursor mixture. Dopant precursors such as boron compounds, phosphorus compounds, and/or arsenic compounds may be included.
The following flow rate ranges apply for a chamber sized for 300 mm substrates. Appropriate scaling may be used for chambers sized for other substrates. A silicon precursor such as silane may be provided at a flow rate between about 20 sccm and about 2,000 sccm. TEOS may be provided at a flow rate between about 20 mgm and about 5,000 mgm. An oxygen precursor such as N_2O, O_2, O_3, H_2O, CO, or CO_2 may be provided at a flow rate between about 1,000 sccm and about 20,000 sccm. A nitrogen precursor such as N_2, N_2O, NH_3, or H_2N_2, or a substituted variant thereof, or any mixture of the foregoing nitrogen species, may be provided at a flow rate between about 200 sccm and about 50,000 sccm. A carbon precursor such as a hydrocarbon, for example methane, may be included to add carbon to the layer. Dopant precursors such as trimethylborane (TMB), diborane (B_2H_6), phosphine (PH_3), arsine (AsH_3), and substituted phosphines and arsines, or mixtures thereof, may be provided at flow rates between about 20 sccm and about 3,000 sccm. The dopant precursors may be carried

by a carrier gas, or diluted in a dilution gas, such as helium, argon, nitrogen, or hydrogen, or any mixture thereof, flowing at a rate between about 500 sccm and about 30,000 sccm. Operating pressure between about 0.5 Torr and about 10 Torr is established in the chamber. Spacing between the face plate and the substrate is established between about 200 mils (thousandths of an inch) and 1,100 mils."

"[0032] <u>At 110, a plasma is formed in the chamber from the precursor gas mixture</u>. The plasma may be formed by capacitive or inductive means, and may be energized by coupling RF power into the precursor gas mixture. The RF power may be a dual-frequency RF power that has a high frequency component and a low frequency component. The RF power is typically applied at a power level between about 50 W and about 1,500 W, which may be all high-frequency RF power, for example at a frequency of about 13.56 MHz, or may be a mixture of high-frequency power and low frequency power, for example at a frequency of about 300 kHz."

"[0033] <u>At 112, the plasma density profile is adjusted by biasing an electrode coupled to a side wall of the chamber and/or an electrode coupled to the substrate support</u>. Each electrode will typically be controlled to provide impedance for a selected current to flow through the electrode. A resonant tuning circuit is typically coupled to each electrode and to ground, and components for the resonant tuning circuit are selected, with at least one variable component, so <u>the impedance can be adjusted dynamically to maintain the target current flow. The current flow through each electrode may be controlled to a value between about 0 A and about 30 A or between about 1 A and about 30 A</u>."

"[0034] <u>At 114, a layer is formed on the substrate from the plasma</u>. Depending on the composition of the precursor, the layer may be a silicon layer, for example a polysilicon, microcrystalline silicon, or amorphous silicon layer, which may be doped, a silicon oxide layer, which may be doped, a silicon oxynitride layer, which may be doped, a silicon carbide layer, which may be doped, a silicon oxycarbide layer, which may be doped, a silicon nitrocarbide layer, which may be doped, a silicon nitroxycarbide layer, which may be doped, or a silicon nitride layer, which may be doped. Other layers, for example layers not containing silicon, may also be deposited by selecting appropriate precursors and flow rates."

"[0045] FIG. 3 is a schematic side view of an inventive apparatus 300 that may be used to practice processes described herein. The processing chamber 300 features a chamber body 302, a substrate support 304 disposed inside the chamber body 302, and a lid assembly 306 coupled to the chamber body 302 and enclosing the substrate support 304 in a processing volume 320. Substrates are provided to the processing volume 320 through an opening 326, which may be conventionally sealed for processing using a door."

"[0046] An electrode 308 may be disposed adjacent to the chamber body 302 and separating the chamber body 302 from other components of the lid assembly 306. The electrode 308 may be part of the lid assembly 306, or may be a separate side wall electrode. The electrode 308 may be an annular, or ring-like member, and may be a ring electrode. The electrode 308 may be a continuous loop around a circumference of the processing chamber 300 surrounding the processing volume 320, or may be discontinuous at selected locations if desired. The electrode 308 may also be a perforated electrode, such as a perforated ring or a mesh electrode. The electrode 308 may also be a plate electrode, for example a secondary gas distributor."

"[0049] The electrode 308 may be coupled to a tuning circuit 328 that controls a ground pathway of the processing chamber 300. The tuning circuit 328 comprises an electronic sensor 330 and an electronic controller 334, which may be a variable capacitor. The tuning circuit 328 may be an LLC circuit comprising one or more inductors 332. The tuning circuit 328 may be any circuit that features a variable or controllable impedance under the plasma conditions present in the processing volume 320 during processing. In the embodiment of FIG. 3, the tuning circuit 328 features a first inductor 332A in series with the electronic controller 334 and a second inductor 332B in parallel with the electronic controller 334. The electronic sensor 330 may be a voltage or current sensor, and may be coupled to the electronic controller 334 to afford a degree of closed-loop control of plasma conditions inside the processing volume 320."

"[0055] Each of the tuning circuits 328 and 336 has a variable impedance that may be adjusted using the respective electronic controllers 334 and 340. Where the electronic controllers 334 and 340 are variable capacitors, the capacitance range of each of the variable capacitors, and the inductances of the inductors 332A and 332B, are chosen to provide an impedance range, depending on the frequency and voltage characteristics of the plasma, that has a minimum in the capacitance range of each variable capacitor. Thus, when the capacitance of the electronic controller 334 is at a minimum or maximum, impedance of the circuit 328 is high, resulting in a plasma shape that has a minimum areal coverage over the substrate support. When the capacitance of the electronic controller 334 approaches a value that minimizes the impedance of the circuit 328, the areal coverage of the plasma grows to a maximum, effectively covering the entire working area of the substrate support 304. As the capacitance of the electronic controller 334 deviates from the minimum impedance setting, the plasma shape shrinks from the chamber walls and areal coverage of the substrate support declines. The electronic controller 340 has a similar effect, increasing and decreasing areal coverage of the plasma over the substrate support as the capacitance of the electronic controller 340 is changed."

"[0147] A silicon oxide layer may be formed using silane as a precursor by another embodiment of the processes described herein using an apparatus described herein. Silane is flowed at 100 sccm, with helium at 3,000 sccm and N_2O at 6,000 sccm. Spacing is 300 mils, pressure is 3 Torr, high frequency power is at 400 W, low frequency power is at 100 W, face plate temperature is at 200°C, substrate temperature is 500°C, temperature zone offset is 5°C (outer above inner), side wall tuning electrode current target is 1 A, and substrate support tuning electrode current target is 3 A. A silicon oxide layer is formed with thickness uniformity that is no worse than about 1%."

There is shown the following drawing as FIG. 1 of Cited Document 1.

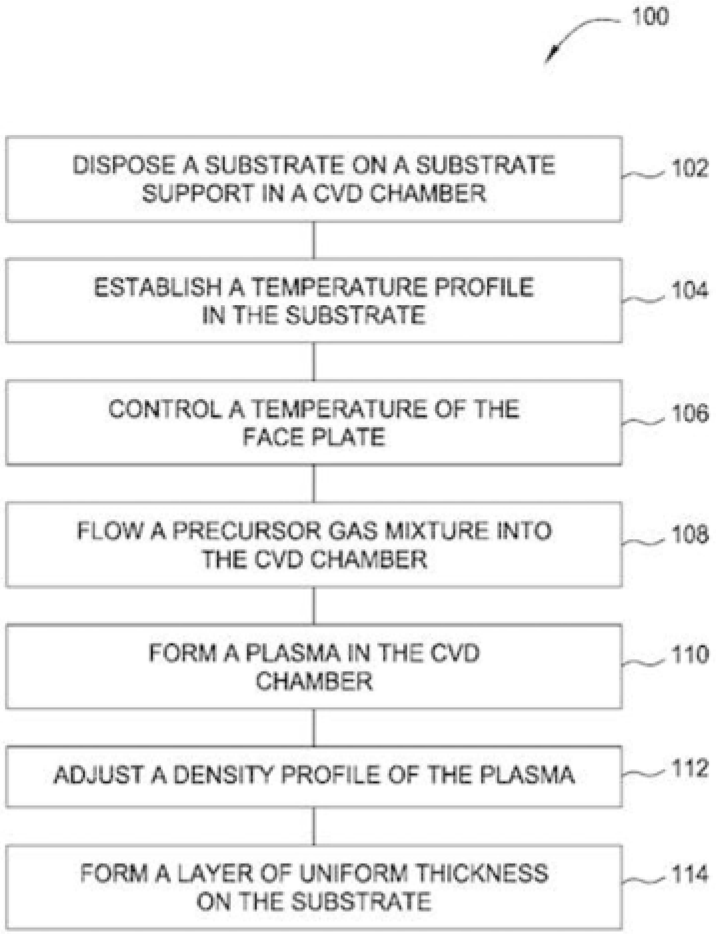

FIG. 1

There is shown the following drawing as FIG. 3 of Cited Document 1.

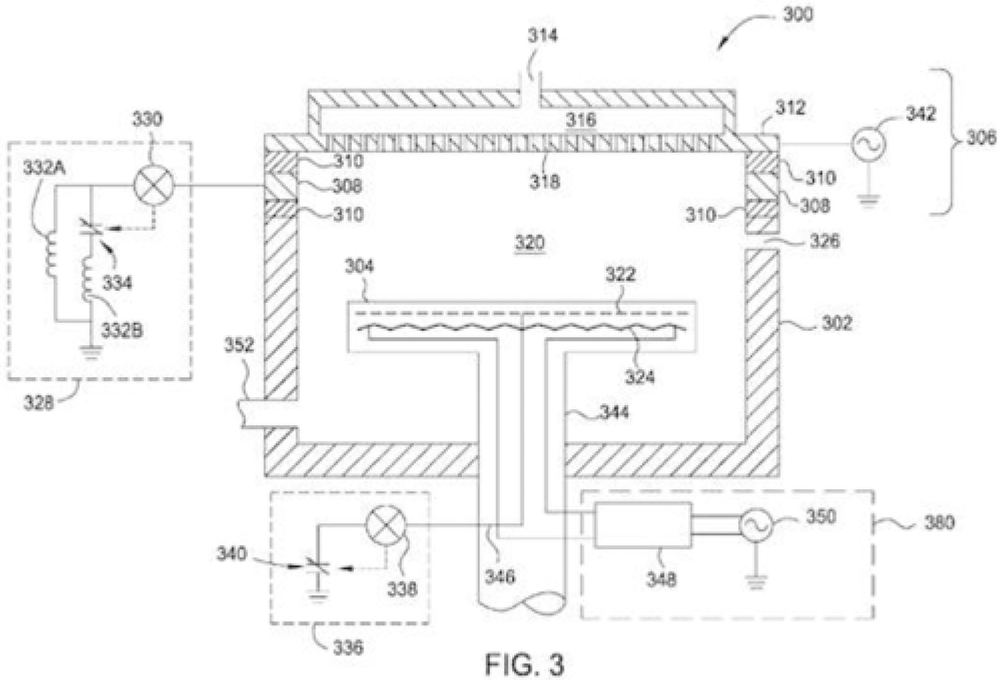

FIG. 3

B　When the above-mentioned quotations are sorted out, it can be understood that, in Cited Document 1, there is described the following matters.

a　It is an invention related to processes of plasma deposition for forming a layer having extremely uniform composition and thickness.　An extremely uniform, high quality, device layer is formed on a substrate in a plasma process by controlling a plasma density profile at various locations across the substrate surface. (Paragraph 0002 and paragraph 0027)

b　At Step 102, a substrate is disposed on a substrate support in a CVD chamber. (Paragraph 0028 and FIG. 1)

c　At Step 108, a precursor gas mixture is provided to the chamber. (Paragraph 0031 and FIG. 1)

d　A silicon oxide layer is formed by making silane, helium, and N_2O as a precursor flow at 100 sccm, 3000 sccm, and 6000 sccm, respectively.　On this occasion, side wall tuning electrode current target is 1 A. (Paragraph 0147)

e　At Step 110, plasma is formed from the precursor gas mixture in the chamber. (Paragraph 0032 and FIG. 1)

f　At Step 112, a plasma density profile is adjusted by biasing an electrode coupled to the side wall of the chamber. (Paragraph 0033 and FIG. 1)

g　At Step 114, a layer is formed on the substrate from the plasma. (Paragraph 0034 and FIG. 1)

h　The processing chamber 300 is constituted including the chamber body 302, the substrate support 304 disposed inside the chamber body, and the lid assembly 306 coupled to the chamber body and enclosing the substrate support 304 in a processing volume 320. (Paragraph 0045 and FIG. 3)

i The electrode 308 may be disposed adjacent to the chamber body 302, and may be a side wall electrode. (Paragraph 0046 and FIG. 3)

j The electrode 308 is coupled to the tuning circuit 328. The tuning circuit 328 has an impedance that is variable or controllable under the plasma condition existing in the processing volume 320 during processing. (Paragraph 0049)

k When the impedance of the tuning circuit 328 is high, a plasma shape having the minimum areal coverage over the substrate support is obtained, and, when the impedance of the tuning circuit 328 is put close to the minimum value, the areal coverage of plasma increases to the maximum value while covering the entire working area of the substrate support 304. (Paragraph 0055)

C According to the above-mentioned a-k, it is recognized that, in Cited Document 1, there is described the following invention (hereinafter, referred to as "Cited Invention 1").

"A process of plasma deposition for forming an extremely uniform layer on a substrate, comprising:

disposing a substrate on a substrate support 304 in a processing chamber 300;

providing a precursor gas mixture into the processing chamber 300, the providing the precursor gas mixture providing, as the gas mixture, silane at 100 sccm, helium at 3000 sccm, and N_2O at 6000 sccm;

generating plasma from the precursor gas mixture in the chamber;

adjusting a shape of plasma covering the substrate support by making current flow through an electrode 308 of a chamber side wall and a tuning circuit 328 coupled to the electrode 308 and adjusting impedance of the tuning circuit under plasma conditions existing in the processing volume 320 during processing; and

forming a layer on the substrate from the plasma."

(2) The descriptions of Cited Document 2

In Japanese Unexamined Patent Application Publication No. 2014-53309, which is a publication cited in the reasons for refusal stated in the examiner's decision and distributed in Japan before the priority date of the present application (hereinafter, referred to as "Cited Document 2"), there are the following descriptions.

"[0017]

FIG. 2A is a schematic cross-sectional view of one embodiment of the plasma enhanced chemical vapor deposition (PECVD) system 100. The PECVD system 100 generally comprises a chamber body 102 supporting a chamber lid 104, which can be attached to the chamber body 102 by one or more fasteners such as screws, bolts, hinges, and the like. The chamber body 102 includes a chamber sidewall 112 and a bottom wall 116 that define a processing volume 120 for containing plasma 103 between a substrate support 128 and a showerhead assembly 142. Among other functions, a controller 175 is coupled to the system 100 to provide process control, such as functions of delivery and exhaust, transfer, and the like of gases."

"[0020]

The substrate support 128 is configured to support and hold the substrate 121 during processing. The substrate support 128 is adapted to move vertically within the processing volume 120 and, in addition, may be configured to rotate by a drive system coupled to the stem 122. Lift pins 161 can be included in the substrate support 128 to facilitate transfer of substrates into and out of the processing volume 120. In one embodiment, the substrate support 128 includes at least one electrode 123 to which a voltage is applied to electrostatically clamp the substrate 121 thereon. The electrode 123 is powered from a direct current (DC) power source 176 coupled to the electrode 123. Although the substrate support 128 is depicted as a monopolar DC chuck, the embodiments described herein can be used with any substrate support adapted to function as a ground plane in plasma chamber, and, in addition, it may be a bipolar chuck, a three-pole chuck, a DC chuck, an interdigitated chuck, a zone chuck, or the like."

(3) The descriptions of Cited Document 3

In National Publication of International Patent Application No. H10-504604 (hereinafter, referred to as "Cited Document 3"), which is a publication cited in the reasons for refusal stated in the examiner's decision and distributed in Japan before the priority date of the present application, there are the following descriptions.

"Additionally, when using a CVD process to form a film, it is desirable to uniformly deposit the film. To do so, such as apply a uniform film of tungsten (W), for example, a uniform supply of reactant gases must be supplied across the surface of the substrate and the spent gases and reaction by-products should be removed from the surface being coated. In this respect, prior art CVD processes have again performed with limited success. Specifically, in known CVD processes, turbulence in the flow of reaction gases inhibits the efficiency and uniformity of the coating process and aggravates the deposition and migration of contaminants within the reaction chamber." (Page 13, line 23 to page 14, line 1)

"Accordingly, there is a need for CVD processes which have improved gas flow and reduced gas flow turbulence to more efficiently and more uniformly supply reaction gases to and remove reaction by-products from the surfaces of the substrate being coated." (Page 14, line 5 to line 7)

"For efficient delivery of the radicals, the present invention utilizes a rotating susceptor which supports and rotates the substrate and creates a downward pumping action in the direction of the substrate. The rotating susceptor pumps radicals relative to the substrate surface" (Page 15, lines 22-24)

"The unique pumping action and laminar flow of gases created by the rotating susceptor ensure a useful density of radicals at the substrate surface." (Page 16, lines 8-9)

"The laminar pattern created by the rotating susceptor minimizes gas particle recirculations and subsequent radical recombinations at the substrate surface, and therefore, there are more activated radicals available at the substrate surface for the low temperature CVD process. Additionally, in the method of the present invention, by increasing the rotation rate of the susceptor increases the deposition rate at the substrate surface." (Page 16, lines 17-21)

(4) The described matters of Cited Document 2 and Cited Document 3

According to the above-mentioned (2), in Cited Document 2, it is described that, in a PECVD apparatus, a substrate support is made to be rotatable. According to the above-mentioned (3), in Cited Document 3, it is described that, to make a film be uniformly formed using a CVD process, a rotating susceptor is used to support and rotate a substrate.

3.3 Comparison between Amended Invention 1 and Cited Invention 1

Amended Invention 1 and Cited Invention 1 will be compared.

A "The processing chamber 300" and "the substrate support 304" of Cited Invention 1 correspond to "processing chamber" and "substrate support" of Amended Invention 1.

B In view of the illustration of "silicon containing gas", "reacting gas", and "inactive gas" described in paragraph 0031, 0032, and 0034 of the description of the present application, "silane", "N_2O", and "helium" in Cited Invention 1 correspond to "silicon containing gas", "reacting gas" and "inactive gas" in Amended Invention 1, respectively.

C From the above-mentioned A and B, "disposing a substrate on a substrate support 304 in a processing chamber 300" and "providing a precursor gas mixture into the processing chamber 300" in Cited Invention 1 correspond to "supplying a deposition gas mixture" "onto a substrate disposed on a substrate support in a processing chamber" in Amended Invention 1.

D From the above B, "providing, as the gas mixture, silane at 100 sccm, helium at 3000 sccm, and N_2O at 6000 sccm" in Cited invention 1 corresponds to "supplying a deposition gas mixture including a silicon containing gas, an inactive gas, and a reacting gas, the silicon containing gas and the inactive gas being supplied at a ratio between 1:1 and 1:150, the silicon containing gas and the reacting gas being supplied at a ratio between 1:1 and 1:150" in Amended Invention 1.

E "Generating plasma from the precursor gas mixture in the chamber" in Cited invention 1 corresponds to "forming plasma in the presence of the deposition gas mixture in the processing chamber" in Amended Invention 1.

F Since "the electrode 308 of a chamber side wall" and "the tuning circuit 328" of Cited Invention 1 are ones that adjust the shape of plasma covering the substrate support by adjusting the impedance under plasma conditions, it can be understood that, in light of the descriptions of paragraphs 0016, 0019, and 0025 of the description of the present application, these correspond to "a plasma profile modulator disposed in the processing chamber" of Amended Invention 1.

Then, "adjusting a shape of plasma covering the substrate support by making current through an electrode 308 of a chamber side wall and a tuning circuit 328 coupled to the electrode 308 and adjusting impedance of the tuning circuit under plasma conditions existing in the processing volume 320 during processing" in Cited invention 1 corresponds to "applying current to a plasma profile modulator disposed in the processing chamber while supplying the deposition gas mixture into the processing chamber" in Amended Invention 1.

G In Cited invention 1, plasma is formed in "the processing volume 320", and a layer is formed from the relevant plasma. Here, from FIG. 3 of Cited Document 1, it is obvious that "processing volume 320" is located "over the substrate".

Then, regarding "rotating the substrate while depositing a film layer on the substrate and forming the plasma over the substrate", Amended Invention 1 and Cited Invention 1 are identical in a point of "depositing a film layer on the substrate and forming the plasma over the substrate".

According to the above A-G, the corresponding feature and a different feature between Amended Invention 1 and Cited Invention 1 are as follows.

<Corresponding Feature>

"A method for forming a film layer on a substrate comprising:

supplying a deposition gas mixture including a silicon containing gas, an inactive gas, and a reacting gas onto a substrate disposed on a substrate support in a processing chamber, the silicon containing gas and the inactive gas being supplied at a ratio between 1:1 and 1:150, the silicon containing gas and the reacting gas being supplied at a ratio of between 1:1 and 1:150;

forming plasma in the presence of the depositing gas mixture in the processing chamber;

applying current to a plasma profile modulator disposed in the processing chamber while supplying the depositing gas mixture into the processing chamber; and

depositing a film layer on the substrate and forming the plasma over the substrate."

<Different Feature>

Amended Invention 1 includes "rotating the substrate while depositing a film layer on the substrate and forming the plasma over the substrate", whereas, in Cited Invention 1, "rotating the substrate" is not specified.

3.4 Judgment on Different Feature

According to the above 3.2(4), in a CVD process, it is a well-known art described in the above Cited Document 2 and Cited Document 3 to rotate a substrate, and it can be said that it is a matter of well-known art for a person skilled in the art, as shown in the descriptions of the following well-known documents 1-3, that, in plasma CVD, a uniform film formation is possible by performing plasma processing while making a substrate rotate.

• Well-known document 1: National Publication of International Patent Application No. 2002-540622

In this well-known document 1, there are the following descriptions.

"[0021]

A susceptor 32 rests on a base 33 and supports a planar substrate 30 in an orientation generally parallel to a showerhead 14. For a particular process, such as a CVD or PECVD process (or an etching process), the substrate 30 and accordingly the susceptor 32 might need to be heated (or cooled) and will therefore be coupled to a suitable heating or cooling system and a temperature control system (not shown) through base 33. Also, it may be desirable to rotate the susceptor 32 for uniform deposition onto the substrate 30. To that end, the susceptor 32 might be coupled to an external rotational control system 37. It will be readily understood by a person of ordinary skill in the art that other susceptor control systems, such as a back plane heating system and a substrate chuck or clamping system, might also be utilized with the susceptor 32 in accordance with well-known principles in the art. During processing, the process space 20 of the chamber 16 is at a low pressure, and accordingly, the chamber 16 is coupled to a vacuum system 39 through an appropriate opening in the chamber 16, such as a vacuum opening 34. The pressure within the process space 20 maintained by the vacuum system 39 will be in accordance with known process parameters."

• Well-known document 2: Japanese Unexamined Patent Application Publication No. 2010-147201

In the above well-known document 2, there are the following descriptions.

"[0028]

Further, in this constitution, the upper electrode 16 is insulated from the reaction chamber wall 14 by an insulating block 28, and the high frequency power output from the oscillator 30 is supplied to the similarly insulated susceptor shaft 52 via the matching unit 32 passing through the rotation introducing terminal 54, and the plasma 34 is generated by using the reaction gases 22 and 24 that are introduced from the reaction gas introduction unit 20 under reduced pressure.

[0029]

The susceptor 18 is heated by a susceptor heater 36 to heat the to-be-processed substrate 38 on the susceptor 18, and the susceptor 18 is rotatable. Since the susceptor 18 can rotate, the processing on the to-be-processed substrate 38 can be performed uniformly."

• Well-known document 3: Japanese Unexamined Patent Application Publication No. S61-163280

In the above well-known document 3, there are the following descriptions.

"Further, it is desirable that the base support 17 have a constitution rotatable about the support shaft 19. By doing so, it is possible to uniformly irradiate generated plasma of gases on the base material 18 placed on the base support 17, and, even if a plurality of base materials 18 are placed on the base support 17, for example, they can be irradiated uniformly." (Page 2, lower left column, line 18 to lower right column, line 3)

On the other hand, according to the descriptions of paragraph 0002, paragraph 0004, and paragraph 0027 of Cited Document 1, it can be understood that Cited Invention 1 is also an invention for the purpose of performing uniform deposition. Thus, it can be said that it would have been achieved by a person skilled in the art with ease to make, in light of the above-mentioned well-known art, a substrate rotate on the occasion of film formation in Cited Invention 1.

Therefore, Amended Invention 1 is one that would have been easily made by a person skilled in the art based on Cited Invention 1 in light of the well-known art shown in Cited Documents 2-3 and well-known documents 1-3.

3.5 Summary of judgment on independent requirements for patentability

As the above 3.4, since Amended Invention 1 is one that would have been easily made by a person skilled in the art based on Cited Invention 1, Cited Documents 2-3 and well-known documents 1-3, it could not be patented independently upon the filing of the patent application under the provisions of Article 29(2) of the Patent Act.

4 Summary regarding decision to dismiss amendment

Therefore, since the Amendment does not comply with the provisions of Article 126(7) of the Patent Act as applied mutatis mutandis pursuant to the provisions of Article 17-2(6) of the same Act, it should be dismissed under the provisions of Article 53(1) of the Patent Act which is applied mutatis mutandis by replacing certain terms pursuant to Article 159(1) of the same Act.

Therefore, the decision is made as Conclusion of Decision to Dismiss Amendment.

No. 3 Regarding the invention

1. The Invention

As the amendment dated June 4, 2020 was dismissed as above, the inventions according to Claims 1-14 of the present application are ones that are specified by the matters recited in Claims 1-14 of the scope of claims amended by the written amendment submitted on January 16, 2020, and, among these, the invention according to Claim 1 (hereinafter, referred to as "the Invention") is an invention described in the above-mentioned No. 2, 1.A(A) as Claim 1 before the Amendment.

2. Reasons for refusal stated in the examiner's decision

The reasons for refusal stated in the examiner's decision are ones to the effect that, since the inventions according to Claims 1-14 of this application would have been easily made by a person ordinarily skilled in the technical field of the invention before the application was filed based on the invention described in the following Cited Document 1 and the matters described in Cited Document 2-3 distributed or made available to public through electric communication lines before the priority date of the present application, the Appellant should not be granted a patent for these in accordance with the provisions of Article 29(2) of the Patent Act.

Cited Document 1: The description of U.S. patent publication No. 2014/0118751
Cited Document 2: Japanese Unexamined Patent Application Publication No. 2014-053309
Cited Document 3: National Publication of International Patent Application No. H10-504604

3. The descriptions of Cited Documents

The descriptions of Cited Document 1-3 cited in the reasons for refusal stated in the examiner's decision are as have been described in the above-mentioned No. 2, 3.2.

4. Comparison / Judgment

As examined in the above-mentioned No. 2, 2., Amended Invention 1 is one in which the limitation of the Amended matter 1 indicated in the above-mentioned No. 2, 1.B is made with respect to Claim 1 before the Amendment.

Then, since Amended Invention 1 which includes all the constituent components of the Invention and further limits this is one that would have been easily made by a person skilled in the art based on Cited Invention 1 in light of the well-known art of Cited Documents 2 and 3 and the well-known documents 1-3 as indicated in reason the above-mentioned No. 2, 3., the Invention would have been easily made by a person skilled in the art by the similar reason.

5. Conclusion regarding the Invention

As described above, the Invention would have been easily made by a person skilled in the art based on Cited Invention 1 and the well-known art indicated in Cited

Documents 2 and 3 and the well-known documents 1-3, and, therefore, the Appellant should not be granted a patent for that in accordance with the provisions of Article 29(2) of the Patent Act.

No. 4 Summary

As described above, the present application should be rejected without examining the inventions according to the other claims.

Therefore, the appeal decision shall be made as described in the conclusion.

January 20, 2021

Chief administrative judge:	KATO, Koichi
Administrative judge:	OGAWA, Masayuki
Administrative judge:	WAKIMIZU, Yoshihiro