difference from the side central region A1 becomes smaller. Accordingly, in the side central region A1, a film thickness of plating tends to be larger than the film thickness of plating in the intermediate region A3.

[0013] Meanwhile, although in the corner region A2 of the quadrangular substrate S1, concentration of the electric field is somewhat small at the initial stage of plating, the electric field continues to concentrate consistently from the initial stage of plating to an end time. Consequently, in the corner region A2, the film thickness tends to be larger as compared with the film thickness in the side central region A1 and the intermediate region A3.

[0014] As above, the terminal effect in the polygonal substrate differs depending on the position of the peripheral portion of the substrate, and therefore, ununiformity in the current density distribution occurs in the peripheral portion of the substrate. Consequently, the present inventors have found out that in-plane uniformity of the film which is plated on the polygonal substrate is lower as compared with the in-plane uniformity of the film plated on a circular substrate.

[0015] The present invention is made in the light of the above described problem, and an object of the present invention is to enhance in-plane uniformity of a film which is plated on a polygonal substrate.

SUMMARY

[0015a] According to an aspect of the present disclosure, there is a plating apparatus, comprising:

an anode holder configured to hold an anode;

a substrate holder configured to hold a polygonal

substrate;

a plating bath for accommodating the anode holder and the substrate holder, and dipping the anode and the substrate in a plating solution; and

a control device for controlling a current that flows between the anode and the substrate,

wherein the substrate holder has a plurality of power feeding members that are disposed along respective sides of the polygonal substrate, and

the control device is configured to be able to control the current so that currents of at least two different values are simultaneously supplied to the plurality of power feeding members.

[0015b] According to an aspect of the present disclosure, there is a method for plating a polygonal substrate by passing a current between an anode and the polygonal substrate, comprising:

a step of bringing a plurality of power feeding members into contact with the polygonal substrate along respective sides of the polygonal substrate;

a step of dipping the anode and the polygonal substrate in a plating solution; and

a step of simultaneously supplying currents of at least two different values to the plurality of power feeding members.

[0016] According to an embodiment, a plating apparatus is provided. The plating apparatus has an anode holder configured to hold an anode, a substrate holder

configured to hold a polygonal substrate, a plating bath for accommodating the anode holder and the substrate holder, and dipping the anode and the substrate in a plating solution, and a control device for controlling a current that flows between the anode and the substrate. The substrate holder has a plurality of power feeding members that are disposed along respective sides of the polygonal substrate. The control device is configured to be able to control the current so that currents of at least two different values are simultaneously supplied to the plurality of power feeding members.

[0017] According to an embodiment, in the first aspect of the above described plating apparatus, the power feeding members include first power feeding members capable of contacting side central regions including central portions of the sides of the polygonal substrate, and second power feeding members capable of contacting intermediate regions adjacent to the side central regions and/or third power feeding members capable of contacting regions that are closer to corner portions of the polygonal substrate than the intermediate regions, and the control device is configured to be able to control the current to supply currents of different values respectively to the first power feeding members, and the second power feeding members and/or the third power feeding members.

[0018] According to an embodiment, in the above described plating apparatus, the control device is configured to be able to control the currents so that a value of a current that flows in the second

power feeding members becomes larger than a value of a current that flows in the first power feeding members.

[0019] According to an embodiment, in the above described plating apparatus, the control device is configured to be able to control the currents so that a current of a first value is supplied to the first power feeding members at a time of start of plating, and thereafter a current of a second value that is larger than the first value is supplied to the first power feeding members.

[0020] According to an embodiment, in the above described plating apparatus, the control device is configured to be able to control the currents so that the current that flows in the first power feeding members increases stepwise from the first value to the second value.

[0021] According to an embodiment, in the above described plating apparatus, the control device is configured to be able to control the currents so that the current which flows in the first power feeding members increases continuously from the first value to the second value.

[0022] According to an embodiment, in any one of the above described plating apparatus, the control device is configured to be able to control the currents so that a value of the current that flows in the third power feeding members becomes smaller than the value of the current that

flows in the first power feeding members.

[0023] According to an embodiment, in any one of the above described plating apparatus, the third power feeding members are configured to contact regions other than points of intersection of the sides of the polygonal substrate.

[0024] According to an embodiment, a method for plating a polygonal substrate by passing a current between an anode and the polygonal substrate is provided. The method has a step of bringing a plurality of power feeding members into contact with the polygonal substrate along respective sides of the polygonal substrate, a step of dipping the anode and the polygonal substrate in a plating solution, and a step of simultaneously supplying currents of at least two different values to the plurality of power feeding members.

[0025] According to an embodiment, in the above described plating method, the step of bringing the plurality of power feeding members into contact includes a step of bringing first power feeding members into contact with side central regions including central portions of the sides of the polygonal substrate, and a step of bringing second power feeding members into contact with intermediate regions adjacent to the side central regions, and/or bringing third power feeding members into contact with regions that are closer to corner portions of the polygonal substrate than the intermediate regions, and the step of

supplying the currents includes a step of supplying currents of different values respectively to the first power feeding members, and the second power feeding members and/or the third power feeding members.

[0026] According to an embodiment, in the above described plating method, the step of supplying the currents includes a step of supplying the currents to the first power feeding members and the second power feeding members so that a value of a current flowing in the second power feeding members becomes larger than a value of a current flowing in the first power feeding members.

[0027] According to an embodiment, in the above described plating method, the step of supplying the currents includes a step of supplying a current of a first value to the first power feeding members at a time of start of plating, and thereafter supplying a current of a second value that is larger than the first value to the first power feeding members.

[0028] According to an embodiment, in the above described plating method, the step of supplying the currents includes a step of increasing the current that flows in the first power feeding members stepwise from the first value to the second value.

[0029] According to an embodiment, in the above described plating method, the step of supplying the currents includes a

step of continuously increasing the current that flows in the first power feeding members from the first value to the second value.

[0030] According to an embodiment, in any one of the above described plating method, the step of supplying the currents includes a step of supplying currents to the first power feeding members and the third power feeding members so that a value of a current flowing in the third power feeding members becomes smaller than a value of the current flowing in the first power feeding members.

[0031] According to an embodiment, in any one of the above described plating method, the step of bringing the third power feeding members into contact with the corner regions of the polygonal substrate includes a step of bringing the third power feeding members into contact with regions other than points of intersection of the sides of the polygonal substrate.

[0032] According to an embodiment, a substrate holder for holding a polygonal substrate is provided. The substrate holder has a substrate holding surface for holding the polygonal substrate, and a plurality of power feeding members for feeding power to the polygonal substrate held on the substrate holding surface, the power feeding members have contact sections configured to be able to contact the polygonal substrate, and the contact sections are aligned in a substantially straight line to be

along sides of the polygonal substrate.

[0033] According to an embodiment, in the above described substrate holder, the substrate holder has an external contact section that is electrically connected to power supplies for supplying currents to the power feeding members, and a connection unit that connects the external contact section and the power feeding members, the power feeding members include first power feeding members capable of contacting side central regions including central portions of the sides of the polygonal substrate, and second power feeding members capable of contacting intermediate regions adjacent to the side central regions and/or third power feeding members capable of contacting regions that are closer to corner portions of the polygonal substrate than the intermediate regions, and the connection unit has a plurality of connection units that are respectively connected to the first power feeding members, and the second power feeding members and/or the third power feeding members from the external contact section, and are electrically independent from one another.

[0034] According to an embodiment, in the above described substrate holder, the external contact section has a plurality of first external contact sections that are connected to the first power feeding members via the connection unit, and a plurality of second external contact sections that are connected to the second power feeding members via the connection unit and/or a plurality of third external contact

sections that are connected to the third power feeding members via the connection unit, and the connection units have a plurality of first contact wirings that are respectively connected to the plurality of first external contact sections, a first plate that is connected to the plurality of first contact wirings, and a first power feeding wiring that electrically connects the first plate and the first power feeding members, and a plurality of second contact wirings that are respectively connected to the plurality of second external contact sections, a second plate that is connected to the plurality of second contact wirings, and a second power feeding wiring that electrically connects the second plate and the second power feeding members, and/or a plurality of third contact wirings that are respectively connected to the plurality of third external contact sections, a third plate that is connected to the plurality of third contact wirings, and a third power feeding wiring that electrically connects the third plate and the third power feeding members.

[0035] According to an embodiment, in the above described substrate holder, the third power feeding members are configured to contact regions other than points of intersection of the sides of the polygonal substrate.

[0036] According to the present disclosure, in-plane uniformity of the film which is plated on the polygonal substrate can be enhanced.

BRIEF DESCRIPTION OF DRAWINGS

[0037] FIG. 1 is an entire disposition diagram of an

WHAT IS CLAIMED IS:

1. A plating apparatus, comprising:

an anode holder configured to hold an anode;

a substrate holder configured to hold a polygonal substrate;

a plating bath for accommodating the anode holder and the substrate holder, and dipping the anode and the substrate in a plating solution; and

a control device for controlling a current that flows between the anode and the substrate,

wherein the substrate holder has a plurality of power feeding members that are disposed along respective sides of the polygonal substrate, and

the control device is configured to be able to control the current so that currents of at least two different values are simultaneously supplied to the plurality of power feeding members.

2. The plating apparatus according to claim 1,

wherein the power feeding members include first power feeding members capable of contacting side central regions including central portions of the sides of the polygonal substrate, and second power feeding members capable of contacting intermediate regions adjacent to the side central regions or third power feeding members capable of contacting regions that are closer to corner

portions of the polygonal substrate than the intermediate regions, and

the control device is configured to be able to control the current to supply currents of different values respectively to the first power feeding members and the second power feeding members or the third power feeding members.

3. The plating apparatus according to claim 1,

wherein the power feeding members include first power feeding members capable of contacting side central regions including central portions of the sides of the polygonal substrate, second power feeding members capable of contacting intermediate regions adjacent to the side central regions, and third power feeding members capable of contacting regions that are closer to corner portions of the polygonal substrate than the intermediate regions, and

the control device is configured to be able to control the current to supply currents of different values respectively to the first power feeding members, the second power feeding members, and the third power feeding members.

4. The plating apparatus according to claim 2 or 3,

wherein the control device is configured to be able to control the currents so that a value of a current that

flows in the second power feeding members becomes larger than a value of a current that flows in the first power feeding members.

5. The plating apparatus according to any one of claims 2 to 4,

wherein the control device is configured to be able to control the currents so that a current of a first value is supplied to the first power feeding members at a time of start of plating, and thereafter a current of a second value that is larger than the first value is supplied to the first power feeding members.

6. The plating apparatus according to claim 5,

wherein the control device is configured to be able to control the currents so that the current that flows in the first power feeding members increases stepwise from the first value to the second value.

7. The plating apparatus according to claim 5,

wherein the control device is configured to be able to control the currents so that the current which flows in the first power feeding members increases continuously from the first value to the second value.

8. The plating apparatus according to any one of claims 2 to 7,

wherein the control device is configured to be able to control the currents so that a value of the current that flows in the third power feeding members becomes smaller than the value of the current that flows in the first power feeding members.

9. The plating apparatus according to any one of claims 2 to 8,

wherein the third power feeding members are configured to contact regions other than points of intersection of the sides of the polygonal substrate.

10. A method for plating a polygonal substrate by passing a current between an anode and the polygonal substrate, comprising:

a step of bringing a plurality of power feeding members into contact with the polygonal substrate along respective sides of the polygonal substrate;

a step of dipping the anode and the polygonal substrate in a plating solution; and

a step of simultaneously supplying currents of at least two different values to the plurality of power feeding members.

11. The method according to claim 10,

wherein the step of bringing the plurality of power feeding members into contact includes

a step of bringing first power feeding members into contact with side central regions including central portions of the sides of the polygonal substrate, and

a step of bringing second power feeding members into contact with intermediate regions adjacent to the side central regions, or bringing third power feeding members into contact with regions that are closer to corner portions of the polygonal substrate than the intermediate regions, and

the step of supplying the currents includes a step of supplying currents of different values respectively to the first power feeding members, and the second power feeding members or the third power feeding members.

12. The method according to claim 10,

wherein the step of bringing the plurality of power feeding members into contact includes

a step of bringing first power feeding members into contact with side central regions including central portions of the sides of the polygonal substrate, and

a step of bringing second power feeding members into contact with intermediate regions adjacent to the side central regions, and bringing third power feeding members into contact with regions that are closer to corner portions of the polygonal substrate than the intermediate regions, and

the step of supplying the currents includes a step of supplying currents of different values respectively to the first power feeding members, the second power feeding members, and the third power feeding members.

13. The method according to claim 11 or 12,

wherein the step of supplying the currents includes a step of supplying the currents to the first power feeding members and the second power feeding members so that a value of a current flowing in the second power feeding members becomes larger than a value of a current flowing in the first power feeding members.

14. The method according to any one of claims 11 to 13,

wherein the step of supplying the currents includes a step of supplying a current of a first value to the first power feeding members at a time of start of plating, and thereafter supplying a current of a second value that is larger than the first value to the first power feeding members.

15. The method according to claim 14,

wherein the step of supplying the currents includes a step of increasing the current that flows in the first power feeding members stepwise from the first value to the second value.

16. The method according to claim 14,

wherein the step of supplying the currents includes a step of continuously increasing the current that flows in the first power feeding members from the first value to the second value.

17. The method according to any one of claims 11 to 16,

wherein the step of supplying the currents includes a step of supplying currents to the first power feeding members and the third power feeding members so that a value of a current flowing in the third power feeding members becomes smaller than a value of the current flowing in the first power feeding members.

18. The method according to any one of claims 11 to 17,

wherein the step of bringing the third power feeding members into contact with the corner regions of the polygonal substrate includes a step of bringing the third power feeding members into contact with regions other than points of intersection of the sides of the polygonal substrate.