ELECTROPLATING CHUCK FOR SQUARE SUBSTRATE AND ELECTROPLATING METHOD

FIELD OF THE INVENTION

The present invention relates to the field of semiconductor manufacturing equipment, and in particular to an electroplating chuck for a square substrate and an electroplating method thereof.

BACKGROUND

At present, semiconductor copper electroplating equipment is mainly used for processing wafers with a maximum size of 12 inches and a maximum warpage range of ±3 mm. A pressing plate of the electroplating chuck can be directly pressed on the wafer surface to flatten the wafer and meet the requirements of electroplating processes.

With the gradual popularization of fan-out advanced packaging technology and changes in substrate materials, square substrates have been increasingly widely applied. Common specifications of square substrates are 515 mm*510 mm and 600 mm*600 mm, with a thickness ranging from 1 mm to 3 mm. Due to the large size of square substrates and glass base materials, a certain degree of bending deformation will be generated after multiple previous processes, with a maximum warpage range reaching ±10 mm, which results in the actual shape of the square substrates to exhibit both concave and convex states.

When a wafer electroplating chuck is applied to square substrates, convex square substrates can be flattened by pressing. However, for concave square substrates, the electroplating chuck only clamps the edges of the square substrates without supporting the central parts of the square substrates, so that pressure is usually applied to the periphery of the pressing plate, while the central part of the pressing plate cannot contact the square substrates, so the concave square substrates cannot be flattened, ultimately causing non-uniform electroplating during the electroplating process.

SUMMARY

The objective of the present invention is to provide an electroplating chuck for a

square substrate and an electroplating method thereof, so as to solve the problem of non-uniform electroplating caused by warpage of the square substrate in the prior art.

To achieve the above objective and other related objectives, the present invention provides an electroplating chuck for a square substrate, comprising:

a substrate chuck plate, provided with an inner edge for supporting the substrate;

a pressing plate, disposed above the substrate chuck plate, wherein a guide post is arranged between the substrate chuck plate and the pressing plate, the pressing plate can ascend or descend along the guide post, the bottom of the pressing plate is provided with a first reinforcing rib configured to contact the edge of the substrate when the pressing plate presses the substrate, the first reinforcing rib is square-shaped, and the inner side length of the first reinforcing rib is less than the side length of the substrate;

at least one suction member, fixed on the pressing plate, for adsorbing the substrate.

Preferably, the suction member is a suction cup, the suction cup is provided with an adsorption end at one end and a gas hole at the other end, and the suction cup penetrates through the pressing plate.

Preferably, the electroplating chuck further comprises a pump and a plurality of gas pipes, wherein the pump is connected to the gas hole of each suction cup via the gas pipe.

Preferably, a plurality of suction cups are arranged on the pressing plate to form a plurality of concentric squares, and the squares are consistent with the shape of the substrate.

Preferably, the height of the first reinforcing rib is less than or equal to the distance from the adsorption end of the suction cup in a relaxed state to the bottom of the pressing plate.

Preferably, a plurality of second reinforcing ribs are further arranged on the bottom of the pressing plate within the area enclosed by the first reinforcing rib, and

the plurality of second reinforcing ribs are square-shaped and all arranged concentrically with the first reinforcing rib.

Preferably, a plurality of uniformly distributed second reinforcing ribs are further arranged on the bottom of the pressing plate within the area enclosed by the first reinforcing rib, and the second reinforcing ribs are configured to equally divide the area enclosed by the first reinforcing rib into a plurality of sub-regions.

Preferably, third reinforcing ribs are further arranged within each square annular region divided by the plurality of second reinforcing ribs on the bottom of the pressing plate, and the third reinforcing ribs equally divide each side of the square annular region.

Preferably, tooth-shaped protrusions are arranged on the end face of the first reinforcing rib that contacts the substrate; a plurality of bumps are uniformly distributed on the second reinforcing ribs, and the distance from the end portions of the plurality of bumps and the tooth-shaped protrusions to the bottom of the pressing plate is equal.

Preferably, the electroplating chuck further comprises at least one spring pin penetrating through the pressing plate, wherein a spring inside the spring pin is in a compressed state when the pressing plate presses the substrate.

Preferably, the suction cups are uniformly distributed on the pressing plate and arranged opposite to the non-electroplating region of the substrate.

Preferably, the suction cups are uniformly distributed on the center lines of the pressing plate.

Preferably, two channels are further arranged inside the pressing plate corresponding to the center lines, the bottoms of the channels are in communication with the gas holes of the suction cups on the corresponding center lines, gas passage ports are arranged at the tops of the channels, and the gas passage ports are connected to the pump.

Preferably, the electroplating chuck further comprises a sealing member

extending from the bottom of the substrate chuck plate and wrapping around the inner edge of the substrate chuck plate.

Preferably, a fourth reinforcing rib is further arranged on the bottom of the pressing plate within the area enclosed by the first reinforcing rib, the fourth reinforcing rib is arranged opposite to the non-electroplating region of the substrate, and the suction member is a groove formed on the fourth reinforcing rib.

Preferably, the fourth reinforcing ribs are arranged on the center lines of the pressing plate.

Preferably, the opening of the vacuum groove faces downward, a gas passage port is arranged at the bottom of the vacuum groove, and the gas passage port is connected to the pump.

The present invention further provides an electroplating method for a square substrate, comprising the following steps:

loading the substrate to be electroplated onto a substrate chuck plate, applying a first pressure to a pressing plate to press the pressing plate onto the substrate, so that the pressing plate comes into contact with the substrate;

evacuating the interior of a suction member to enable the suction member to adsorb the substrate;

applying a second pressure to the pressing plate to realize sealing between the inner edge of the substrate chuck plate and the edge of the substrate, wherein the second pressure is greater than the first pressure;

introducing gas into the interior of the suction member to release the substrate from the suction member;

performing electroplating treatment on the substrate.

The present invention further provides another electroplating method for a square substrate, comprising the following steps:

loading the substrate to be electroplated onto a robot, controlling the robot to convey the substrate to a corresponding position below a pressing plate, so that the substrate comes into contact with the pressing plate;

evacuating the interior of a suction member on the pressing plate to enable the suction member to adsorb the substrate;

after the robot moves away from the position below the pressing plate, applying pressure to the pressing plate to drive the substrate to move downward for pressing, so as to realize sealing between the inner edge of a substrate chuck plate and the edge of the substrate;

introducing gas into the interior of the suction member to release the substrate from the suction member;

performing electroplating treatment on the substrate.

As described above, the present invention provides an electroplating chuck for a square substrate and an electroplating method thereof. A suction member is additionally arranged on the pressing plate, which can not only apply pressure to the substrate but also provide adsorption force for the substrate through the suction member. The concave substrate can be flattened by dual opposing forces, which effectively solves the warpage problem of large-size square substrate products, significantly improves the electroplating uniformity of the square substrate, reliably guarantees product quality and the yield rate of continuous production, and features a simple structure and low production cost.

BRIEF DESCRIPTION OF THE DRAWINGS

The features and performance of the present application are further illustrated by the following embodiments and the accompanying drawings of the embodiments.

FIG. 1 is a schematic diagram of the electroplating chuck according to Embodiment 1 of the present invention;

FIG. 2 is a schematic diagram of the bottom of the pressing plate according to

Embodiment 1 of the present invention;

FIG. 3 is a schematic diagram of the top of the pressing plate according to Embodiment 1 of the present invention;

FIG. 4 is a schematic cross-sectional diagram of the pressing plate according to Embodiment 1 of the present invention;

FIG. 5 is a schematic diagram of the suction cup shown in FIG. 4;

FIG. 6 is a bottom diagram of the pressing plate according to Embodiment 1 of the present invention;

FIG. 7 is another schematic cross-sectional diagram of the pressing plate according to Embodiment 1 of the present invention;

FIG. 8 is a schematic cross-sectional diagram of the substrate chuck plate according to Embodiment 1 of the present invention;

FIG. 9 is a schematic diagram of the top of the pressing plate according to Embodiment 2 of the present invention;

FIG. 10 is a schematic diagram of the bottom of the pressing plate according to Embodiment 2 of the present invention;

FIG. 11 is a bottom diagram of the pressing plate according to Embodiment 2 of the present invention;

FIG. 12 is a schematic cross-sectional diagram of the pressing plate according to Embodiment 2 of the present invention;

FIG. 13 is a schematic diagram of the top of the pressing plate according to Embodiment 3 of the present invention;

FIG. 14 is a schematic diagram of the bottom of the pressing plate according to Embodiment 3 of the present invention;

FIG. 15 is a bottom diagram of the pressing plate according to Embodiment 3 of the present invention;

FIG. 16 is a schematic cross-sectional diagram of the pressing plate according to Embodiment 3 of the present invention.

PREFERRED EMBODIMENTS OF THE APPLICATION

The implementation modes of the present invention are illustrated below through specific embodiments. Those skilled in the art can easily understand other advantages and effects of the present invention from the content disclosed in the present specification. The present invention can also be implemented or applied through other specific embodiments, and various modifications or changes can be made to all details in the present specification based on different viewpoints and applications without departing from the spirit of the present invention.

It should be noted that the drawings provided in the present embodiments merely illustrate the basic conception of the present invention in a schematic manner. Although the drawings only show components related to the present invention, the drawings are not drawn according to the number, shape, and size of the components in actual implementation. In actual implementation, the shape, quantity, and proportion of each component can be arbitrarily changed, and the layout structure of components may be more complex. In addition, the same reference numerals in multiple accompanying drawings represent the same or equivalent parts or components.

Embodiment 1

The present Embodiment 1 provides an electroplating chuck for a square substrate, and the electroplating chuck is configured to clamp the substrate and immerse a substrate w downward into an electroplating tank to execute electroplating processes during electroplating. As shown in FIG. 1 and FIG. 2, the electroplating chuck comprises a pressing plate 11, a substrate chuck plate 12, and suction cups 13. Guide posts 14 are connected between the substrate chuck plate 12 and the pressing plate 11, and the pressing plate 11 is connected to a driving mechanism 15. The driving mechanism 15 controls the pressing plate 11 to ascend or descend along the guide posts

14 to realize loading and unloading of the substrate w. The substrate chuck plate 12 is of a hollow structure and provided with an inner edge for supporting the substrate w. When the substrate w is loaded onto the substrate chuck plate 12, the outer edge of the substrate w is placed on the inner edge of the substrate chuck plate 12. As shown in FIG. 8, a sealing member 121 is arranged on the inner edge of the substrate chuck plate 12. When the pressing plate 11 presses the substrate w, the outer edge of the substrate w is sealed against the inner edge of the substrate chuck plate 12 to isolate the substrate w to be electroplated, prevent electroplating liquid from invading the non-electroplating area of the substrate w to cause nonuniform coating thickness, and prevent electroplating liquid from invading and contaminating internal components of the substrate chuck plate 12. As shown in FIG. 4, the suction cups 13 are fixed on the pressing plate 11. When the substrate w is loaded onto the substrate chuck plate 12, the pressing plate 11 descends along the guide posts 14 to press the substrate w, and the substrate w is flattened by the adsorption force of the suction cups 13 on the substrate w.

To solve the problem that the central part of the pressing plate 11 cannot contact the substrate w, at least one suction cup 13 is arranged at the central part of the pressing plate 11. Preferably, a plurality of suction cups 13 are arranged on the pressing plate 11, and the plurality of suction cups 13 are arranged on the pressing plate 11 to form a plurality of concentric squares consistent with the shape of the substrate w.

As shown in FIG. 5, each suction cup 13 includes a gas hole 131 and an adsorption end 132, the gas hole 131 is arranged at the top of the adsorption end 132, the suction cup 13 penetrates through the pressing plate 11, and the substrate w is adsorbed and flattened via the adsorption end 132. Preferably, the distance between the adsorption end 132 and the bottom of the pressing plate 11 is adjustable, for example, an external thread is arranged on the suction cup 13 and is engaged with a nut to adjust the position of the adsorption end 132.

The gas hole 131 of each suction cup 13 is connected to a gas pipe, and each gas pipe is connected to a pump via a main gas pipe. Specifically, a plurality of gas pipes are respectively connected to the gas holes 131 of the plurality of suction cups 13 and the main gas pipe, and the main gas pipe is connected to the pump. After the adsorption ends 132 contact the substrate w, the pump evacuates gas inside the adsorption ends

132 through the gas holes 131 to form vacuum states inside the adsorption ends 132. At this time, the gas pressure inside the adsorption ends 132 is lower than the external gas pressure of the adsorption ends 132, and the substrate w is adsorbed under the action of external pressure. The higher the vacuum degree inside the adsorption ends 132, the tighter the fit between the adsorption ends 132 and the substrate w, and the warped substrate w can be flattened by the adsorption force of the adsorption ends 132. When the substrate w needs to be released, the pump introduces gas into the adsorption ends 132 through the gas holes 131 to increase the internal gas pressure of the adsorption ends 132 and separate the adsorption ends 132 from the substrate w.

As shown in FIG. 2, a first reinforcing rib 111 is arranged at the outer edge of the bottom of the pressing plate 11, and the first reinforcing rib 111 is configured to contact the edge of the substrate w when the pressing plate 11 presses the substrate w. The first reinforcing rib 111 is square-shaped, and the inner side length of the first reinforcing rib 111 is less than the side length of the substrate. Preferably, the height of the reinforcing rib is slightly less than the distance from the adsorption ends 132 of the suction cups 13 in a relaxed state to the bottom surface of the pressing plate 11, so that the suction cups 13 can contact and adsorb the substrate w.

Preferably, a plurality of second reinforcing ribs 112 are further arranged on the bottom of the pressing plate 11 within the area enclosed by the first reinforcing rib 111. The second reinforcing ribs 112 can be square-shaped and all arranged concentrically with the first reinforcing rib 111. The second reinforcing ribs 112 can also be uniformly distributed on the bottom of the pressing plate 11 to equally divide the area enclosed by the first reinforcing rib 111 on the bottom of the pressing plate 11 into a plurality of square sub-regions. The second reinforcing ribs 112 can also be arranged at the diagonal positions within the area enclosed by the first reinforcing rib 111 on the bottom of the pressing plate 11. When the substrate w is convexly warped, the substrate w can be directly flattened by the first reinforcing rib 111 and the second reinforcing ribs 112 on the pressing plate 11. More reinforcing ribs can be arranged to increase the contact area between the pressing plate 11 and the substrate w and achieve a better flattening effect of the substrate w.

In the present embodiment, as shown in FIG. 2, FIG. 3, and FIG. 6, the plurality of concentric second reinforcing ribs 112 are arranged on the bottom of the pressing

plate 11, and the second reinforcing ribs 112 divide the area enclosed by the first reinforcing rib 111 on the bottom of the pressing plate 11 into a central square region and a plurality of square annular regions. Third reinforcing ribs 113 are further arranged along the outer side length of each square annular region in an equally dividing manner to divide each square annular region into a plurality of sub-regions, and one suction cup 13 is arranged inside each sub-region. Wherein, arranging the third reinforcing ribs 113 to equally divide each side of the adjacent square annular regions along the first reinforcing rib 111 and disposing the suction cups 13 can better ensure the uniformity of adsorption force distribution around the edge of the substrate w. At least one suction cup 13 is arranged in the central square region of the pressing plate 11.

Specifically, as shown in FIG. 2, FIG. 3, and FIG. 6, the pressing plate 11 in the present embodiment is divided by the first reinforcing rib 111 and the second reinforcing ribs 112 from the center to the edge into a central square region A, a first square annular region B, and a second square annular region C. Four suction cups 13 arranged in a square shape are disposed in the central square region A. The first square annular region B is equally divided into four sub-regions by the third reinforcing ribs 113, one suction cup 13 is arranged in each sub-region, and the suction cups 13 of the four sub-regions are arranged in a square shape. The third reinforcing ribs 113 are arranged at equal intervals along the outer side length of the second square annular region C, so as to divide the second square annular region C into 12 sub-regions, and similarly, the suction cups 13 inside the 12 sub-regions are arranged in a square shape. Due to the large warpage range of the square substrate w, more suction cups 13 are arranged at the edge and center of the pressing plate 11, so that the pressing plate 11 can be tightly fitted to the substrate w via the suction cups 13, the uniformity of pressing force is guaranteed, and a better flattening effect of the substrate w is realized.

As shown in FIG. 2 and FIG. 6, a circle of tooth-shaped protrusions 114 is further arranged on the first reinforcing rib 111. When the pressing plate 11 presses the substrate w, the end faces of the tooth-shaped protrusions 114 exactly press the edge of the substrate w to squeeze the substrate w against the sealing member 121 on the inner edge of the substrate chuck plate 12. The tooth-shaped protrusions 114 can exhaust gas between the pressing plate 11 and the substrate w, prevent excessively tight

fit between the outer edge of the pressing plate 11 and the substrate w to avoid vacuum adhesion, and prevent adhesion between the pressing plate 11 and the substrate w when the pressing plate 11 ascends. Correspondingly, as shown in FIG. 2 and FIG. 6, a plurality of bumps 115 are uniformly distributed on the second reinforcing ribs 112, and the height of the plurality of bumps 115 is equal to the height of the above-mentioned tooth-shaped protrusions 114. When the pressing plate 11 presses the substrate w, the tooth-shaped protrusions 114 and the bumps 115 contact the substrate w, preventing the central region of the pressing plate 11 from losing contact with the substrate w, which would otherwise compromise the flattening effect. Moreover, the arrangement can also prevent the excessive adsorption force of the adsorption ends 132 from causing convex warpage in partial regions of the substrate w.

As shown in FIG. 7, a plurality of spring pins 16 are further arranged to penetrate through the pressing plate 11. When the pressing plate 11 presses the substrate w, the spring pins 16 are in a compressed state. After the substrate w is flattened, gas is introduced into the adsorption ends 132 to release the substrate w from the adsorption ends 132, while simultaneously the elastic force of the spring pins 16 pushes the substrate w away, thereby preventing the substrate w from being adsorbed on the adsorption ends 132 during electroplating, which would otherwise allow the adsorption force of the adsorption ends 132 to still act on the substrate w and affect the electroplating effect. In the embodiment shown in FIG. 2, FIG. 3, and FIG. 6, the spring pins 16 are arranged on the third reinforcing ribs 113 at the edge of the pressing plate 11.

As shown in FIG. 8, the sealing member 121 on the inner edge of the substrate chuck plate 12 can be a rubber member extending from the bottom of the substrate chuck plate 12 and wrapping around the inner edge of the substrate chuck plate 12, which ensures better sealing performance between the outer edge of the substrate w and the inner edge of the substrate chuck plate 12, reduces stress generated by the inner edge of the substrate chuck plate 12 on the substrate w when the pressing plate 11 presses downward, and the integrated molding design eliminates complicated installation procedures. Through holes are arranged on the inner edge of the substrate chuck plate 12 for filling the sealing member 121 to fix the sealing member 121 and guarantee the structural stability of the sealing member 121 and the substrate chuck

plate 12.

Embodiment 2

The present Embodiment 2 provides an electroplating chuck for a square substrate, which differs from Embodiment 1 in the layout of reinforcing ribs and suction cups 13 on a pressing plate 21. As shown in FIGS. 9 to 12, only the first reinforcing rib 111 is arranged on the pressing plate 21. When the pressing plate 21 presses the substrate w, the end face of the first reinforcing rib 111 contacts the edge of the substrate w and squeezes the substrate w against the sealing member 121 on the inner edge of the substrate chuck plate 12. The plurality of suction cups 13 are distributed along the center lines of the pressing plate 21.

The electroplating chuck for the square substrate of the present Embodiment 2 is applicable to double-sided electroplating processes. The regions outside the center lines of the square substrate w are electroplating regions, and the center lines and surrounding areas are non-electroplating regions. Therefore, the suction cups 13 are only arranged at the center lines of the pressing plate 21, and the first reinforcing rib 111 is arranged only at the outer edge of the pressing plate 21, preventing the suction cups 13 from adsorbing the electroplating regions of the substrate w or the pressing plate 21 from pressing on the electroplating regions of the substrate w, which would otherwise affect the electroplating effect.

As shown in FIG. 12, two channels 212 are further arranged inside the pressing plate 21 corresponding to the center lines, the bottoms of the two channels 212 are respectively in communication with the gas holes 131 of the suction cups 13 on the two center lines, gas passage ports 213 are arranged at the tops of the channels 212, and the gas passage ports 213 are connected to the pump for gas introduction into the suction cups 13 and vacuum evacuation thereof. Five gas passage ports 213 are arranged in the present embodiment, uniformly distributed at the center lines and the center of the pressing plate 21 to ensure more uniform adsorption force of the suction cups 13 on the substrate w.

Other configurations of the present embodiment are the same as the configurations of Embodiment 1, which will not be repeated herein.

Embodiment 3

The present Embodiment 3 provides an electroplating chuck for a square substrate, which differs from Embodiment 2 in that grooves 312 replace the suction cups 13 to realize vacuum evacuation inside a pressing plate 31. As shown in FIGS. 13 to 16, two cross-shaped fourth reinforcing ribs 311 are arranged at the center lines of the pressing plate 31, and the height of the fourth reinforcing ribs 311 is consistent with the height of the first reinforcing rib 111. The grooves 312 are formed on the fourth reinforcing ribs 311, the grooves 312 are connected to gas passage ports 313, and the gas passage ports 313 are connected to the pump for gas introduction into the grooves 312 and vacuum evacuation thereof.

Other configurations of the present embodiment are the same as the configurations of Embodiment 2, which will not be repeated herein.

Embodiment 4

The present Embodiment 4 provides an electroplating method for a square substrate, comprising the following steps:

Step S1: loading the substrate to be electroplated onto a substrate chuck plate, applying a first pressure to a pressing plate to press the pressing plate onto the substrate to be electroplated, so that the pressing plate comes into contact with the substrate;

Step S2: evacuating the interior of a suction member on the pressing plate to enable the suction member to adsorb the substrate;

Step S3: applying a second pressure to the pressing plate to realize sealing between the inner edge of the substrate chuck plate and the edge of the substrate, wherein the second pressure is greater than the first pressure;

Step S4: introducing gas into the interior of the suction member to release the substrate from the suction member;

Step S5: performing electroplating treatment on the substrate.

Wherein, the suction member can be the suction cup described in Embodiment 1 and Embodiment 2, or the groove described in Embodiment 3.

Embodiment 5

The present Embodiment 5 provides another electroplating method for a square substrate, comprising the following steps:

Step S11: loading the substrate to be electroplated onto a robot, controlling the robot to convey the substrate to a corresponding position below a pressing plate, so that the substrate comes into contact with the pressing plate;

Step S21: evacuating the interior of a suction member on the pressing plate to enable the suction member to adsorb the substrate;

Step S31: after the robot moves away from the position below the pressing plate, applying pressure to the pressing plate to drive the substrate to move downward for pressing, so as to realize sealing between the inner edge of a substrate chuck plate and the edge of the substrate;

Step S41: introducing gas into the interior of the suction member to release the substrate from the suction member;

Step S51: performing electroplating treatment on the substrate.

Wherein, the suction member can be the suction cup described in Embodiment 1 and Embodiment 2, or the groove described in Embodiment 3.

The above embodiments merely exemplarily illustrate the principles and effects of the present invention, rather than limiting the present invention. Any person skilled in the art can modify or change the above embodiments without departing from the spirit and scope of the present invention. Therefore, all equivalent modifications or changes completed by those having ordinary knowledge in the art without departing from the spirit and the technical idea disclosed by the present invention shall still be covered by the claims of the present invention.

What is claimed is:

1. An electroplating chuck for a square substrate, comprising:

a substrate chuck plate, provided with an inner edge for supporting the substrate;

a pressing plate, disposed above the substrate chuck plate, wherein a guide post is arranged between the substrate chuck plate and the pressing plate, the pressing plate can ascend or descend along the guide post, the bottom of the pressing plate is provided with a first reinforcing rib configured to contact the edge of the substrate when the pressing plate presses the substrate, the first reinforcing rib is square-shaped, and the inner side length of the first reinforcing rib is less than the side length of the substrate;

at least one suction member, fixed on the pressing plate, for adsorbing the substrate.

2. The electroplating chuck for the square substrate according to claim 1, wherein the suction member is a suction cup, the suction cup is provided with an adsorption end at one end and a gas hole at the other end, and the suction cup penetrates through the pressing plate.

3. The electroplating chuck for the square substrate according to claim 2, wherein the electroplating chuck further comprises a pump and a plurality of gas pipes, and the pump is connected to the gas hole of each suction cup via the gas pipe.

4. The electroplating chuck for the square substrate according to claim 2, wherein the plurality of suction cups are arranged on the pressing plate to form a plurality of concentric squares, and the squares are consistent with the shape of the substrate.

5. The electroplating chuck for the square substrate according to claim 2, wherein the height of the first reinforcing rib is less than or equal to the distance from the adsorption end of the suction cup in a relaxed state to the bottom of the pressing plate.

6. The electroplating chuck for the square substrate according to claim 1, wherein a plurality of second reinforcing ribs are further arranged on the bottom of the pressing plate within the area enclosed by the first reinforcing rib, and the plurality of second

reinforcing ribs are square-shaped and all arranged concentrically with the first reinforcing rib.

7. The electroplating chuck for the square substrate according to claim 1, wherein a plurality of uniformly distributed second reinforcing ribs are further arranged on the bottom of the pressing plate within the area enclosed by the first reinforcing rib, and the second reinforcing ribs are configured to equally divide the area enclosed by the first reinforcing rib into a plurality of sub-regions.

8. The electroplating chuck for the square substrate according to claim 6, wherein third reinforcing ribs are further arranged within each square annular region divided by the plurality of second reinforcing ribs on the bottom of the pressing plate, and the third reinforcing ribs equally divide each side of the square annular region.

9. The electroplating chuck for the square substrate according to claim 6, wherein tooth-shaped protrusions are arranged on the end face of the first reinforcing rib that contacts the substrate; a plurality of bumps are uniformly distributed on the second reinforcing ribs, and the distance from the end portions of the plurality of bumps and the tooth-shaped protrusions to the bottom of the pressing plate is equal.

10. The electroplating chuck for the square substrate according to claim 1, wherein the electroplating chuck further comprises at least one spring pin penetrating through the pressing plate, and a spring inside the spring pin is in a compressed state when the pressing plate presses the substrate.

11. The electroplating chuck for the square substrate according to claim 2, wherein the suction cups are uniformly distributed on the pressing plate and arranged opposite to the non-electroplating region of the substrate.

12. The electroplating chuck for the square substrate according to claim 11, wherein the suction cups are uniformly distributed on the center lines of the pressing plate.

13. The electroplating chuck for the square substrate according to claim 12, wherein two channels are further arranged inside the pressing plate corresponding to the center lines, the bottoms of the channels are in communication with the gas holes

of the suction cups on the corresponding center lines, gas passage ports are arranged at the tops of the channels, and the gas passage ports are connected to the pump.

14. The electroplating chuck for the square substrate according to claim 1, wherein the electroplating chuck further comprises a sealing member extending from the bottom of the substrate chuck plate and wrapping around the inner edge of the substrate chuck plate.

15. The electroplating chuck for the square substrate according to claim 1, wherein a fourth reinforcing rib is further arranged on the bottom of the pressing plate within the area enclosed by the first reinforcing rib, the fourth reinforcing rib is arranged opposite to the non-electroplating region of the substrate, and the suction member is a groove formed on the fourth reinforcing rib.

16. The electroplating chuck for the square substrate according to claim 15, wherein the fourth reinforcing ribs are arranged on the center lines of the pressing plate.

17. The electroplating chuck for the square substrate according to claim 15, wherein the opening of the groove faces downward, a gas passage port is arranged at the bottom of the groove, and the gas passage port is connected to the pump.

18. An electroplating method for a square substrate, applied to the electroplating chuck for the square substrate according to any one of claims 1 to 17, comprising the following steps:

loading the substrate to be electroplated onto the substrate chuck plate, applying a first pressure to the pressing plate to press the pressing plate onto the substrate, so that the pressing plate comes into contact with the substrate;

evacuating the interior of the suction member to enable the suction member to adsorb the substrate;

applying a second pressure to the pressing plate to realize sealing between the inner edge of the substrate chuck plate and the edge of the substrate, wherein the second pressure is greater than the first pressure;

introducing gas into the interior of the suction member to release the substrate from the suction member;

performing electroplating treatment on the substrate.

19. An electroplating method for a square substrate, applied to the electroplating chuck for the square substrate according to any one of claims 1 to 17, comprising the following steps:

loading the substrate to be electroplated onto a robot, controlling the robot to convey the substrate to a corresponding position below the pressing plate, so that the substrate comes into contact with the pressing plate;

evacuating the interior of the suction member on the pressing plate to enable the suction member to adsorb the substrate;

after the robot moves away from the position below the pressing plate, applying pressure to the pressing plate to drive the substrate to move downward for pressing, so as to realize sealing between the inner edge of the substrate chuck plate and the edge of the substrate;

introducing gas into the interior of the suction member to release the substrate from the suction member;

performing electroplating treatment on the substrate.