

PROCESS CHAMBER AND SEMICONDUCTOR PROCESSING DEVICE

TECHNICAL FIELD

The present disclosure relates to the field of semiconductor processing technology, and in particular, to a process chamber and a semiconductor processing device.

BACKGROUND

In a process of performing a thin film deposition process by a magnetron sputtering device, in order to reduce wafer consumption, a shutter disk is generally used to cover a base when a new target needs to be bombarded or a chamber needs to be preheated. When a normal process is performed, the shutter disk needs to be moved into a shutter disk garage communicating with a chamber. Specifically, a transfer arm is generally used to perform a rotation motion, so as to realize position switching of the shutter disk between a chamber body and the shutter disk garage.

In an existing copper filling process, in order to ensure that a copper material can be successfully filled in a through hole structure, a thermal radiation source which may be an infrared tube usually needs to be added to an interior of the chamber. During the process, a wafer is placed on the base first for deposition of a copper seed layer; then, the wafer is pushed up from the base by an ejector pin mechanism to a position higher than the thermal radiation source, and a back surface of the wafer is heated by the thermal radiation source until a temperature of the wafer rises to a copper reflux temperature (generally above 350°C) which can ensure that the copper material can be successfully filled in the through hole structure; and finally, the ejector pin mechanism is lowered to return the wafer to the base for cryogenic cooling. The cycle of the above steps is performed until the copper material is completely filled in the through hole structure.

However, in the existing art, the thermal radiation source is generally disposed at the periphery of the chamber and far away from the wafer, which results in low heating efficiency, low heating rate and poor heating uniformity when heating the wafer, thereby affecting process uniformity and production capacity. Although it is possible to improve the heating efficiency by increasing power of the thermal radiation source, the following problems are raised: the increase of the power of the thermal radiation source can easily cause temperatures of parts, such as the chamber body and a shield, at the periphery of the heat radiation source to be too high, which not only affects service life of the parts but also requires an additional special water cooling design, resulting in an increase in device cost and structural complexity.

SUMMARY

In order to solve at least one technical problem in the existing art, the present disclosure provides a process chamber and a semiconductor processing device, with which temperature control efficiency and temperature control uniformity can be improved, and no adverse effect is brought to other parts in the process chamber.

In order to achieve the above objective, the present disclosure provides a process chamber, including a chamber body provided therein with a base and a first ejector pin mechanism, a shutter disk garage communicating with an interior of the chamber body, and a shutter disk; the process chamber further includes a transfer mechanism including a transfer arm and a temperature control device. The transfer arm is capable of moving between the chamber body and the shutter disk garage and supporting the shutter disk; and the temperature control device is disposed in the transfer arm and is configured to perform temperature control on a to-be-processed workpiece carried by the first ejector pin mechanism when the transfer arm is moved to the interior of the chamber body and is located at a position opposite to the to-be-processed workpiece.

Optionally, when the transfer arm is moved to the interior of the chamber body and is located at the position opposite to the to-be-processed workpiece, a height difference exists between one surface of the transfer arm and one surface of the to-be-processed workpiece, which are opposite to each other; and the temperature control device is exposed from the surface of the transfer arm opposite to the to-be-processed workpiece so as to carry out heat exchange with the to-be-processed workpiece through radiation.

Optionally, when the transfer arm is moved to the interior of the chamber body and is located at the position opposite to the to-be-processed workpiece, the to-be-processed workpiece is moved up or down by the first ejector pin mechanism to a position where the to-be-processed workpiece is in contact with the transfer arm; and the temperature control device controls a temperature of the to-be-processed workpiece through heat exchange.

Optionally, the process chamber further includes a second ejector pin mechanism which is disposed in the shutter disk garage and is configured to move up or down to transfer the shutter disk between the second ejector pin mechanism and the transfer arm when the transfer arm is located in the shutter disk garage.

Optionally, a contour of an orthographic projection of the transfer arm on a horizontal plane is set in such a shape that the transfer arm does not collide with the first ejector pin mechanism when the transfer arm moved into the chamber body, and does not collide with the second ejector pin mechanism when the transfer arm moved into the shutter disk garage.

Optionally, the height difference ranges from 20mm to 400mm.

Optionally, the transfer arm includes a driver, a vertically disposed rotation shaft, and a horizontal arm disposed at an upper end of the rotation shaft; the driver is configured to drive the rotation shaft to rotate around an axis of the rotation shaft, so as to move the horizontal arm between the chamber body and the shutter disk garage; and the horizontal arm is capable of supporting the shutter disk, and the temperature control device is disposed on the horizontal arm.

Optionally, the temperature control device includes a heating element and an electrical connection line connected to the heating element; the heating element is disposed in the horizontal arm; and a passage is disposed in the rotation shaft to allow the electrical connection line to be led out of the chamber body.

Optionally, a cooling passage for delivering cooling water is disposed in the horizontal arm, a water inlet channel and a water outlet channel are disposed in the rotation shaft, a first end of the water inlet channel and a first end of the water outlet channel are respectively connected to two ends of the cooling passage, and a second end of the water inlet channel and a second end of the water outlet channel are both located at a portion of the rotation shaft outside the chamber body.

Optionally, the process chamber is a deposition chamber.

As another technical solution, the present disclosure further provides a semiconductor processing device, including the above process chamber.

The present disclosure has the following beneficial effects: in the process chamber provided by the present disclosure, the temperature control device is disposed in the transfer arm and performs temperature control on the to-be-processed workpiece when the transfer arm is located in the interior of the chamber body and at the position opposite to the to-be-processed workpiece carried by the first ejector pin mechanism, such that, compared with the existing art, a temperature control distance between the temperature control device and the to-be-processed workpiece can be reduced and a temperature change rate can be improved, thereby improving temperature control efficiency and production capacity; meanwhile, temperature control uniformity can be improved, thereby improving process uniformity. In addition, by disposing the temperature control device in the transfer arm, the temperature control device is kept far away from the parts (such as the chamber body and a shield) at the periphery of the chamber, which can avoid over high temperatures of the parts, thereby eliminating the adverse effect on the parts.

Since the semiconductor processing device provided by the present disclosure adopts the

above process chamber, the heating efficiency and the heating uniformity can be improved, and no adverse effect is brought to other parts in the process chamber.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1A is a sectional view of a process chamber in a state according to a first embodiment of the present disclosure;

Fig. 1B is a sectional view of the process chamber in another state according to the first embodiment of the present disclosure;

Fig. 2A is a top sectional view of a transfer arm according to the first embodiment of the present disclosure;

Fig. 2B is a top view of the transfer arm when carrying a shutter disk according to the first embodiment of the present disclosure;

Fig. 3 is another top sectional view of the transfer arm according to the first embodiment of the present disclosure;

Fig. 4A is a sectional view of a process chamber according to a second embodiment of the present disclosure;

Fig. 4B is another sectional view of the process chamber according to the second embodiment of the present disclosure; and

Fig. 5 is a sectional view of a process chamber according to a third embodiment of the present disclosure.

DETAILED DESCRIPTION

The following disclosure provides various implementations or examples, which can be used to implement different features of the present disclosure. The specific examples of components and configurations described below are intended to simplify the present disclosure. It should be understood that the description below is merely for illustration and is not intended to limit the present disclosure. For example, in the following description, formation of a first feature on or over a second feature may include direct contact between the first feature and the second feature according to some embodiments, and may also include possible indirect contact between the first feature and the second feature due to formation of an additional component therebetween according to other embodiments. In addition, same symbols and/or numerals of

components may be used in a plurality of embodiments of the present disclosure. However, the same symbols and/or numerals are such used for the purpose of conciseness and clarity, and do not indicate relationships between different embodiments and/or configurations discussed.

Furthermore, the terms for representing spatially relative positions used herein, such as “under”, “below”, “lower”, “over”, “above” and the like, may be used to facilitate describing a relationship between one element or feature and another one or more elements or features in the drawings. Besides indicating the orientations shown in the drawings, these terms can further suggest various different orientations of a device when in use or in operation. The device may be located in other directions (for example, the device is rotated by 90 degrees or is located towards another direction), and these terms should be used to give corresponding explanations.

Although all numerical ranges and parameters used for defining a broad scope of the present disclosure are approximate values, the related values in the specific embodiments are provided herein as precisely as possible. However, any value essentially and inevitably contains a standard deviation resulting from an individual test method. The term “about” used herein generally indicates that variations of a specified value by 10%, 5%, 1%, or 0.5%. Or, the term “about” indicates that an actual value falls within an acceptable standard deviation of an average value. The specific indication of “about” is determined according to considerations of those of ordinary skill in the art to which the present disclosure belongs. It should be understood that, except the experimental examples, or unless otherwise stated, all ranges, quantities, values and percentages (e.g., those used for describing the amount of materials, duration, temperatures, operating conditions and ratios) used herein are modified by “about”. Therefore, unless otherwise stated, the numerical parameters disclosed in the description and annexed claims are all approximate values and can be changed as required. At least, these numerical parameters should be understood as values having specified significant figures and obtained by applying a general carry method. Numerical ranges herein are represented from one endpoint to another endpoint or between two endpoints; unless otherwise stated, all numerical ranges described herein include the endpoints.

First Embodiment

With reference to Fig. 1A and Fig. 1B, the embodiment provides a process chamber applicable to a deposition chamber, and the process chamber specifically includes a chamber body 1, a shutter disk garage 2 communicating with an interior of the chamber body 1, a shutter disk 10, and a transfer mechanism. A base 3 and a first ejector pin mechanism 4 are disposed in the chamber body 1, the base 3 is configured to carry a to-be-processed workpiece 5 when a thin film deposition process is performed, and the first ejector pin mechanism 4 is configured

to move up or down to transfer the to-be-processed workpiece 5 between the first ejector pin mechanism 4 and the base 3. Specifically, the first ejector pin mechanism 4 includes at least three ejector pins disposed around an axis of the base 3 at intervals and an elevating mechanism connected to the at least three ejector pins. Driven by the elevating mechanism, the at least three ejector pins can be synchronously moved up to a highest position where top ends thereof are higher than the base 3 or down to a lowest position where the top ends are lower than the base 3. In a process of moving the ejector pins up to the highest position, the ejector pins can push up the to-be-processed workpiece 5 from the base 3; and in a process of moving the ejector pins down to the lowest position, the to-be-processed workpiece 5 can be carried on the base 3.

The transfer mechanism includes a transfer arm 6 capable of moving between the chamber body 1 and the shutter disk garage 2, and a temperature control device 8. In the embodiment, with reference to Fig. 1A and Fig. 1B, the transfer arm 6 includes a driver 7, a vertically disposed rotation shaft 61, and a horizontal arm 62 disposed at an upper end of the rotation shaft 61; the driver 7 is connected to the rotation shaft 61 and is configured to drive the rotation shaft 61 to rotate along an axis of the rotation shaft 61. The driver 7 may be a motor, an air cylinder or a hydraulic cylinder which can provide rotary power. Optionally, the driver 7 is disposed outside the chamber, and a lower end of the rotation shaft 61 extends from the bottom of the chamber body 1 out of the chamber body 1 and is connected to the driver 7. Driven by the driver 7, the rotation shaft 61 makes the horizontal arm 62 rotate around the rotation shaft 61 into the chamber body 1 or the shutter disk 10.

In the embodiment, the process chamber further includes a second ejector pin mechanism 9 which is disposed in the shutter disk garage 2 and is configured to move up or down to transfer the shutter disk 10 between the second ejector pin mechanism 9 and the transfer arm 6 when the transfer arm 6 is located in the shutter disk garage 2. The second ejector pin mechanism 9 has a structure similar to that of the first ejector pin mechanism 4, and includes at least three ejector pins and an elevating mechanism connected to the at least three ejector pins.

As shown in Figs. 1A to 2B, the transfer arm 6 can support the shutter disk 10, and transfer the shutter disk 10 into the chamber body 1 or the shutter disk garage 2 through rotation. When the transfer arm 6 carries the shutter disk 10 and rotates into the shutter disk garage 2, the second ejector pin mechanism 9 can move up to push the shutter disk 10 from the transfer arm 6 until reaching a position C1 shown in Fig. 1B. At this time, the shutter disk 10 is separated from the transfer arm 6, so that the transfer arm 6 can rotate alone into the chamber body 1 without carrying the shutter disk 10.

In practical applications, the second ejector pin mechanism 9 may not be provided, and

other methods are adopted to allow the transfer arm 6 to rotate alone into the chamber body 1 without carrying the shutter disk 10. For example, the shutter disk 10 is taken out by opening the chamber.

When the transfer arm 6 is moved to the interior of the chamber body 1 and is located at a position opposite to the to-be-processed workpiece 5 carried by the first ejector pin mechanism 4, a height difference exists between one surface of the transfer arm 6 and one surface of the to-be-processed workpiece 5, which are opposite to each other. Certainly, temperature control can be further achieved by adjusting the height difference. The temperature control device 8 is exposed from the surface of the transfer arm 6 opposite to the to-be-processed workpiece 5 so as to carry out heat exchange with the to-be-processed workpiece 5 through radiation.

In the embodiment, when the transfer arm 6 is moved to the interior of the chamber body 1 and is located below the to-be-processed workpiece 5, the temperature control device 8 is exposed from an upper surface of the transfer arm 6, so as to radiate heat towards the to-be-processed workpiece 5. The temperature control device 8 includes a heating element 81 and an electrical connection line 82 connected to the heating element 81, and the heating element 81 may be a heating element capable of radiating heat towards the to-be-processed workpiece 5, such as an infrared tube or a heating wire. Optionally, as shown in Fig. 2A, the heating element 81 is in a shape of spiral and is relatively evenly distributed on an upper surface of the horizontal arm 62 to improve heating uniformity.

In the embodiment, a contour 621 of an orthographic projection of the transfer arm 6 on a horizontal plane is set in such a shape that the transfer arm 6 does not collide with the first ejector pin mechanism 4 when moved into the chamber body 1, and does not collide with the second ejector pin mechanism 9 when moved into the shutter disk garage 2. One shape of the contour 621 is shown in Fig. 2A, and such a shape can ensure that the horizontal arm 62 can be moved to inner sides of the three ejector pins from a gap between two adjacent ejector pins without colliding with the three ejector pins. When the horizontal arm 62 is moved into the shutter disk garage 2, the three ejector pins of the second ejector pin mechanism 9 are located outside a contour of the horizontal arm 62, so as to push up the shutter disk 10 from the horizontal arm 62. Certainly, in practical applications, the contour of the transfer arm 6 may be set in other shapes as long as the transfer arm 6 does not collide with the ejector pins of the second ejector pin mechanism 9.

It should be noted that the present disclosure is not limited to the manner of designing the contour of the transfer arm 6 for ensuring that the transfer arm 6 does not collide with the ejector pins. For example, passages may be disposed in the transfer arm 6 to allow the ejector pins to

pass through, such that each ejector pin can enter the passage from an opening of the passage without colliding with the transfer arm in a process of rotating the transfer arm 6 into the shutter disk garage 2, and can move out of the passage from the opening of the passage in a process of rotating the transfer arm 6 into the chamber body 1.

When a copper filling process is performed in the process chamber provided by the embodiment, firstly, a to-be-processed workpiece (wafer) is placed on the base 3 for deposition of a copper seed layer; then, as shown in Fig. 1B, the wafer is pushed up from the base 3 to a highest position A1 by the first ejector pin mechanism 4, and the shutter disk 10 is pushed up from the transfer arm 6 by the second ejector pin mechanism 9; then, as shown in Fig. 1A, the transfer arm 6 is driven by the driver 7 to rotate into the chamber body 1 and is located at a position B1 below the wafer, at this time, a back surface of the wafer is heated by the temperature control device 8 until a temperature of the wafer rises to a copper reflux temperature (generally above 350°C) which can ensure that a copper material can be successfully filled in a through hole structure. After the heating is completed, the transfer arm 6 is driven by the driver 7 to rotate into the shutter disk garage 2, and the first ejector pin mechanism 4 is moved down to a lowest position to return the wafer to the base 3 for cryogenic cooling. The cycle of the above steps is performed until the copper material is completely filled in the through hole structure.

When a new target in the process chamber needs to be bombarded or the chamber needs to be preheated, the second ejector pin mechanism 9 is moved down to place the shutter disk 10 on the transfer arm 6, and then the transfer arm 6 carrying the shutter disk is driven by the driver 7 to rotate into the chamber body 1 and above the base 3, so as to cover the base 3.

Optionally, the height difference H between the surface of the transfer arm 6 and the opposite surface of the to-be-processed workpiece 5 ranges from 20mm to 400mm. In such a range, the heating efficiency can be ensured and the heating power of the temperature control device 8 can be prevented from being too high, thereby avoiding the adverse effect on the parts around the temperature control device 8. Optionally, output power of the temperature control device 8 is greater than or equal to 500W.

In the embodiment, optionally, a passage is disposed in the rotation shaft 61 to allow the electrical connection line 82 of the temperature control device 8 to be led out of the chamber body 1, so as to prevent the electrical connection line 82 from being exposed in the chamber body 1.

In the embodiment, optionally, as shown in Fig. 3, a cooling passage 622 is disposed in

the horizontal arm 62 for delivering cooling water. The cooling passage 622 may be disposed below the temperature control device 8 to cool the transfer arm 6. Furthermore, a water inlet channel 623 and a water outlet channel 624 are disposed in the rotation shaft 61, a first end of the water inlet channel 623 and a first end of the water outlet channel 624 are respectively connected to two ends of the cooling passage 622, and a second end of the water inlet channel 623 and a second end of the water outlet channel 624 are both located at a portion of the rotation shaft 61 outside the chamber body 1. That is, the cooling passage is led out of the chamber body 1 through the rotation shaft 61, so as to prevent the cooling passage from being exposed in the chamber body 1.

In comparison with the existing art, according to the process chamber provided by the embodiment of the present disclosure, a temperature control distance between the temperature control device 8 and the to-be-processed workpiece 5 can be reduced, and a temperature control rate can be increased, thereby improving temperature control efficiency and production capacity; meanwhile, temperature control uniformity can be improved, thereby improving process uniformity. In addition, by disposing the temperature control device 8 in the transfer arm 6, the temperature control device 8 is kept far away from the parts (such as the chamber body and the shield) at the periphery of the chamber, which can avoid over high temperatures of the parts, thereby eliminating the adverse effect on the parts.

Second Embodiment

With reference to Fig. 4A, the embodiment provides a process chamber which, like the process chamber provided in the First Embodiment, also includes a chamber body 1, a shutter disk garage 2, a shutter disk 10, and a transfer mechanism, which have the same structures and functions as those described in the First Embodiment and thus are not described in detail here. Only the differences between the Second Embodiment and the First Embodiment are described in detail below.

Specifically, the transfer arm 6 is located above a to-be-processed workpiece carried by the first ejector pin mechanism 4 when placed in an interior of the chamber body 1. As shown in Fig. 4A, a highest position A2 of the first ejector pin mechanism 4 is lower than a position B2 of the transfer arm 6 in the interior of the chamber body 1. Moreover, the temperature control device 8 is exposed from a lower surface of the transfer arm 6 so as to carry out heat exchange with the to-be-processed workpiece 5 through radiation. In such a way, temperature control of the to-be-processed workpiece 5 can be achieved.

Optionally, a height difference H between one surface of the transfer arm 6 and one surface of the to-be-processed workpiece 5, which are opposite to each other, ranges from 20mm to

400mm.

In the embodiment, the process chamber further includes a second ejector pin mechanism 9 disposed in the shutter disk garage 2 for allowing the transfer arm 6 to rotate alone into the chamber body 1 without carrying the shutter disk 10. However, since the temperature control device 8 is exposed from the lower surface of the transfer arm 6, it is possible not to provide the second ejector pin mechanism 9. As shown in Fig. 4B, the transfer arm 6 carrying the shutter disk 10 can be rotated into the chamber body 1, and the temperature control device 8 can radiate heat towards a front surface of the to-be-processed workpiece 5 while the transfer arm 6 carries the shutter disk 10.

Other structures and functions of the process chamber provided by the embodiment are the same as those specifically described in the First Embodiment, and thus are not repeated here.

Third Embodiment

With reference to Fig. 5, the embodiment provides a process chamber which, like the process chambers provided in the First Embodiment and the Second Embodiment, also includes a chamber body 1, a shutter disk garage 2, a shutter disk 10, and a transfer mechanism, which have the same structures and functions as those described in the First Embodiment and the Second Embodiment and thus are not described in detail here. Only the differences between this embodiment and the First Embodiment and the Second Embodiment are described in detail below.

Specifically, when the transfer arm 6 is moved to an interior of the chamber body 1 and is located at a position opposite to the to-be-processed workpiece 5 carried by the first ejector pin mechanism 4, the to-be-processed workpiece 5 can be moved up or down by the first ejector pin mechanism 4 to a position where the to-be-processed workpiece 5 is in contact with the transfer arm 6; and a temperature control device 8' controls a temperature of the to-be-processed workpiece 5 through heat exchange (heat conduction). The temperature control device 8' includes a heating element such as a heating wire or a heating electrode.

In practical applications, the temperature control device 8' may be in direct contact with the to-be-processed workpiece 5, or the temperature control device 8' may heat the to-be-processed workpiece 5 indirectly through the heating the transfer arm 6, without being in contact with the to-be-processed workpiece 5.

It should be noted that, in the embodiment, the transfer arm 6 is located below the to-be-processed workpiece 5 carried by the first ejector pin mechanism 4 when placed in the interior of the chamber body 1, but the present disclosure is not limited thereto. In practical applications, when placed in the interior of the chamber body 1, the transfer arm 6 may be located above the

to-be-processed workpiece 5, and then the to-be-processed workpiece 5 is pushed up by the first ejector pin mechanism 4 to be brought into contact with the transfer arm 6.

As another technical solution, an embodiment of the present disclosure further provides a semiconductor processing device, including the process chamber provided by any embodiment of the present disclosure.

The semiconductor processing device may be a magnetron sputtering device or other Physical Vapor Deposition (PVD) devices, which can be applied to thin film deposition of Cu, Ta, Ti, Al, or the like.

Since the semiconductor processing device provided by the embodiment of the present disclosure adopts the process chamber provided by any embodiment of the present disclosure, the heating efficiency and the heating uniformity can be improved, and no adverse effect is brought to other parts in the chamber.

What is claimed is:

1. A process chamber, comprising a chamber body, a shutter disk garage communicating with an interior of the chamber body, and a shutter disk, wherein a base and a first ejector pin mechanism are disposed in the chamber body; and the process chamber further comprises a transfer mechanism comprising a transfer arm and a temperature control device,

the transfer arm is capable of moving between the chamber body and the shutter disk garage and supporting the shutter disk; and

the temperature control device is disposed in the transfer arm and is configured to perform temperature control on a to-be-processed workpiece carried by the first ejector pin mechanism when the transfer arm is moved to the interior of the chamber body and is located at a position opposite to the to-be-processed workpiece.

2. The process chamber of claim 1, wherein, when the transfer arm is moved to the interior of the chamber body and is located at the position opposite to the to-be-processed workpiece, a height difference exists between one surface of the transfer arm and one surface of the to-be-processed workpiece, which are opposite to each other; and the temperature control device is exposed from the surface of the transfer arm opposite to the to-be-processed workpiece so as to carry out heat exchange with the to-be-processed workpiece through radiation.

3. The process chamber of claim 1, wherein, when the transfer arm is moved to the interior of the chamber body and is located at the position opposite to the to-be-processed workpiece, the to-be-processed workpiece is moved up or down by the first ejector pin mechanism to a position where the to-be-processed workpiece is in contact with the transfer arm; and

the temperature control device controls a temperature of the to-be-processed workpiece through heat exchange.

4. The process chamber of any one of claims 1 to 3, further comprising a second ejector pin mechanism which is disposed in the shutter disk garage and is configured to move up or down to transfer the shutter disk between the second ejector pin mechanism and the transfer arm when the transfer arm is located in the shutter disk garage.

5. The process chamber of claim 4, wherein a contour of an orthographic projection of the transfer arm on a horizontal plane is set in such a shape that the transfer arm does not collide

with the first ejector pin mechanism when the transfer arm moved into the chamber body, and does not collide with the second ejector pin mechanism when the transfer arm moved into the shutter disk garage.

6. The process chamber of claim 2, wherein the height difference ranges from 20mm to 400mm.

7. The process chamber of any one of claims 1 to 3, wherein the transfer arm comprises a driver, a vertically disposed rotation shaft, and a horizontal arm disposed at an upper end of the rotation shaft; the driver is configured to drive the rotation shaft to rotate around an axis of the rotation shaft, so as to move the horizontal arm between the chamber body and the shutter disk garage; and the horizontal arm is capable of supporting the shutter disk, and the temperature control device is disposed on the horizontal arm.

8. The process chamber of claim 7, wherein the temperature control device comprises a heating element and an electrical connection line connected to the heating element;

the heating element is disposed in the horizontal arm; and

a passage is disposed in the rotation shaft to allow the electrical connection line to be led out of the chamber body.

9. The process chamber of claim 8, wherein a cooling passage for delivering cooling water is disposed in the horizontal arm, a water inlet channel and a water outlet channel are disposed in the rotation shaft, a first end of the water inlet channel and a first end of the water outlet channel are respectively connected to two ends of the cooling passage, and a second end of the water inlet channel and a second end of the water outlet channel are both located at a portion of the rotation shaft outside the chamber body.

10. The process chamber of claim 1, wherein the process chamber is a deposition chamber.

11. A semiconductor processing device, comprising the process chamber of any one of claims 1 to 10.