

CHAMBER

FIELD OF THE INVENTION

The present invention relates to the manufacturing field of semiconductor apparatus, and particularly, to a chamber.

BACKGROUND OF THE INVENTION

In the process of semiconductor manufacturing, a degas chamber is used for heating a wafer, such that foreign matters adhering to the wafer, such as organics and moisture, are volatilized, and the purpose of cleaning the wafer is thus realized.

Typically, a current structure of a degas chamber is as shown in Figs. 1 and 2, in which a quartz window 3 is provided between a chamber 1 and infrared heat lamps 2 for the purpose of isolation and ensuring the tightness of the chamber 1. A resin pad 4 is provided above a side wall 6 of the chamber 1, and the resin pad 4 and the side wall 6 of the chamber 1 together form a recess for accommodating the quartz window 3. The recess is not only used for restricting the movement of the quartz window 3 in a horizontal direction, but also used for supporting the quartz window 3. Generally, the inside of the chamber 1 is under a vacuum condition, and gas is introduced into the chamber 1 after a wafer is transferred from the outside of the chamber onto a heater 5, such that the pressure in the chamber 1 is about 10 torr. After that, the wafer is heated so as to remove foreign matters, and when the heating is finished, the gas in the chamber 1 is evacuated, resulting in that the inside of the chamber 1 is under the vacuum condition again.

During above gas introduction and evacuation processes, the quartz window 3 repeatedly bears an alternating pressure due to the variation in pressure inside the chamber 1. Since the quartz window 3 of the above current structure is not fixed in a vertical direction, but only supported by the resin pad 4, the quartz window 3 may move in the vertical direction under the action of the alternating pressure. Particularly, during the evacuation process, due to the atmospheric pressure above the chamber, the quartz window 3 bears a relatively large downward pressure, which is then transferred to the resin pad 4, and the resin pad 4 deforms when subject to the

downward pressure transferred from the quartz window 3, resulting in that the quartz window 3 moves downward. The deformation of the resin pad 4 being pressed is relatively large due to its relatively low hardness, generally resulting in that an upper surface thereof becomes not higher than an upper surface of the side wall 6 of the chamber 1 at the inner side of the resin pad 4, and in this case, a collision occurs between the quartz window 3 and the side wall 6 of the chamber 1, which leads to a breakage of the quartz window 3. Meanwhile, during the heating process, a temperature of the quartz window 3 is increased and heat is conducted to the resin pad 4, which may soften and deform the resin pad 4, so that the quartz window 3 will be subject to an uneven force, by which the quartz window 3 is more likely to be broken.

To prevent the quartz window from colliding with the chamber and thus being broken, there is also provided a degas chamber in the prior art, which has a quartz window fixing device. As shown in Fig. 3, on basis of the above structure of degas chamber, this degas chamber further includes a fixing device including a quartz window press ring 8, a press ring bumper 9 and a resin pad 4. The quartz window press ring 8 is fixedly mounted on the side wall 6 of the chamber, and the mounted quartz window press ring 8 is pressed against an upper surface of the quartz window 3 so as to apply a preload onto the quartz window 3. The press ring bumper 9 is directly placed on the quartz window 3 and is fixed by the preload from the quartz window press ring 8. The degas chamber having the quartz window fixing device is capable of confining the moving space of the quartz window 3 in the vertical direction to a certain extent when the pressure in the chamber varies, and thus preventing the quartz window 3 from frequently colliding with the chamber in the manufacturing process, thereby realizing a protection effect for the quartz window 3.

The above degas chamber having the quartz window fixing device is capable of reducing the moving space of the quartz window to a certain extent and thus lowering the force of collision between the quartz window and the chamber, but, since the quartz window is still supported by the resin pad, the resin pad is inevitably deformed due to the pressure in the repeated gas introduction and evacuation processes, and is inevitably deformed due to the heat in the heating process, and therefore, the damage to the quartz window caused by the side wall of the chamber cannot be fundamentally avoided.

SUMMARY OF THE INVENTION

In view of the above, an object of the present invention is to provide a chamber for solving the problem of damage to the isolation window, which is caused by collision of the isolation window when the isolation window moves in a vertical direction due to deformation of a resin pad subject to pressure or temperature variation.

To achieve the above object, the present invention provides a chamber for semiconductor processing, which includes a chamber body and an isolation window, the chamber body being of a tubby structure and having an upper end which is an open end, the isolation window being provided at the open end of the chamber body and used for sealing the chamber, wherein the chamber further includes an isolation window fixing structure used for fixing the isolation window at the open end of the chamber body and including a first fixing part and a second fixing part connected with each other, the first fixing part is fixedly connected with an edge area of an upper surface of the isolation window, and the second fixing part is fixedly connected with the chamber body.

Further, a lower surface of the first fixing part and a lower surface of the second fixing part are located in two horizontal planes.

Further, lower surfaces of the first and second fixing parts are located in a same horizontal plane.

Further, the isolation window fixing structure further includes a washer and a first fastener, the edge area of the upper surface of the isolation window is provided therein with a through hole, the lower surface of the first fixing part is provided with a first mounting hole, the washer is provided therein with a second mounting hole, and the first fastener passes through the second mounting hole and the through hole in the isolation window successively from bottom to top and is fixed into the first mounting hole, so as to fixedly connect the washer and the isolation window with the first fixing part.

Further, the washer is made of a copper material.

Further, the isolation window fixing structure further includes a buffering element, which is provided between the washer and the isolation window.

Further, the first and second fixing parts are made of a metal material.

Further, the first fixing part and/or the second fixing part are/is provided therein with a cooling water channel for introducing cooling water.

5 Further, a first sealing element is provided between the lower surface of the first fixing part and the upper surface of the isolation window.

Further, a second sealing element is provided between the lower surface of the second fixing part and an upper surface of a side wall of the chamber body.

Further, the chamber is a degas chamber or a reaction chamber.

10 The chamber provided by the present invention has been described above, and it can be seen from that, by providing the isolation window fixing structure, in which the first fixing part is fixedly connected with the edge area of the upper surface of the isolation window and the second fixing part is fixedly connected with the chamber body, the isolation window can be firmly fixed to the chamber body, so that the displacements of the isolation window in the vertical and horizontal directions are
15 confined, and the problem of damage to the isolation window caused by collision with the chamber body due to the displacements of the isolation window can be avoided. Meanwhile, the isolation window can be supported and fixed by the isolation window fixing structure without the conventional resin pad, so that the problem that the isolation window is likely to be damaged by uneven force applied thereto due to the
20 deformation of the heated resin pad can be avoided.

BRIEF DESCRIPTION OF THE DRAWINGS

Accompanying drawings, which serve to provide a further understanding of the present invention and constitute a part of the specification, are used to explain the present invention in conjunction with the following specific implementations, but not to
25 restrict the present invention. In the drawings:

Fig. 1 is an exemplary diagram of a structure of an existing chamber;

Fig. 2 is an exemplary partial view of a portion in Fig. 1;

Fig. 3 is an exemplary partial view of an existing degas chamber having a quartz window fixing device;

30 Fig. 4 is an exemplary partial view of a structure of a chamber provided by a first

embodiment of the present invention;

Fig. 5 is an exemplary partial view of a portion I in Fig. 4;

Fig. 6 is an exemplary diagram of a fixing member provided by the present invention;

5 Fig. 7 is an exemplary diagram of a washer provided by the present invention;

Fig. 8 is an exemplary diagram of an isolation window provided by the present invention; and

Fig. 9 is an exemplary partial view of a structure of a chamber provided by a second embodiment of the present invention.

10 Reference numerals:

1,40-chamber; 2-heat lamp; 3-quartz window; 4-resin pad; 5-heater; 6, 41-chamber body; 10-isolation window fixing structure; 11,11'-first fixing part; 12,12'-second fixing part; 13-first mounting hole; 14-cooling water channel; 15-second fastener; 20-isolation window; 21-through hole; 30-washer; 31-first fastener; 32-second mounting hole; 50-first sealing element; 51-second sealing element.

DETAILED DESCRIPTION OF THE EMBODIMENTS

Specific implementations will be described below in detail in conjunction with the accompanying drawings. It should be understood that the specific implementations described herein are merely used for explaining and illustrating the present invention, but not for limiting the present invention.

Referring to Figs. 4-8, an embodiment of the present invention provides a chamber 40, including a chamber body 41, an isolation window 20 and an isolation window fixing structure 10. The chamber body 41 is of a tubby structure and an upper end thereof is an open end; the isolation window 20 is provided at the open end of the chamber body 41 and used for sealing the chamber 40; the isolation window fixing structure 10 is used for fixing the isolation window 20 at the open end of the chamber body 41 and includes a first fixing part 11 and a second fixing part 22 connected with each other, the first fixing part 11 may be fixedly connected with an edge area of an upper surface of the isolation window 20, and the second fixing part 12 may be fixedly connected with the chamber body 41.

Specifically, the isolation window fixing structure 10 may be arranged to surround the isolation window 20, and a shape of the isolation window fixing structure 10 may correspond to a shape of the isolation window 20 so as to be arranged to surround the isolation window 20. For example, the isolation window 20 may be a circular quartz window, and the isolation window fixing structure 10 may be processed to have a ring shape corresponding thereto. The isolation window fixing structure 10 includes the first fixing part 11 and the second fixing part 12 provided at outer edge of the first fixing part 11, wherein the outer edge of the first fixing part 11 refers to an edge area of the first fixing part 11 at a side thereof that is far away from a center of the isolation window fixing structure 10. Specifically, the first fixing part 11 is provided above the isolation window 20, and a first fastener 31 may be used to fixedly connect the first fixing part 11 with the isolation window 20; and the second fixing part 12 is provided on a side wall of the chamber body and fixedly connected with the side wall of the chamber body through a second fastener 15. The isolation window 20 can be fixedly provided above the chamber body 41 by virtue of the isolation window fixing structure 10.

With above structure replacing the recess formed of the resin pad and the side wall of the chamber in the prior art, the isolation window 20 is firmly fixed on the chamber body 41, so that displacement of the isolation window 20 in the vertical direction and horizontal direction is confined, and the problem of the isolation window 20 being damaged by collision with the side wall of the chamber body 41 due to the displacement thereof is avoided. When the pressure inside the chamber 40 is decreased, a downward pressure will be applied onto the isolation window 20, but, since the isolation window fixing structure 10 firmly fixes the isolation window 20 onto the chamber body 41 and thus confines the position of the isolation window 20, the possibility of the isolation window 20 being displaced and colliding with the chamber body 41 is fundamentally avoided. Meanwhile, since the resin pad is not adopted, the problem that the isolation window 20 is easily damaged by uneven force applied thereto due to the deformation of the heated resin pad in the prior art can be avoided.

Further, according to the chamber provided by the present embodiment, a lower surface of the first fixing part 11 and a lower surface of the second fixing part 12 are located in two horizontal planes, that is to say, the first fixing part 11 and the second fixing part 12 are arranged in a step manner, and the lower surface of the second

fixing part 12 is arranged under an outer edge of the lower surface of the first fixing part 11, as shown in Fig. 6.

Further, the chamber provided by the present invention may also include a washer 30, and the lower surface of the first fixing part 11 is provided therein with a first mounting hole 13, as shown in Fig. 6. A second mounting hole 32 is provided in the washer 30, as shown in Fig. 7. The washer 30 may be provided at the lower surface of the isolation window 20. The first fastener 31 is used for being mounted in the first mounting hole 13 after passing through the second mounting hole 32 and a through hole preset in the isolation window 20 as shown in Fig. 8. As such, the washer 30, the isolation window 20 and the first fixing part 11 can be fixedly connected through the first fastener 31. Preferably, there is a plurality of through holes 21, which are uniformly arranged along the circumferential direction of the isolation window 20. In this case, the numbers and positions of the washers 30, the first fasteners 31 and the first mounting holes 13 correspond to the number and position of the through holes 21 in the isolation window 20 one by one, so as to improve uniformity of force applied onto the isolation window fixing structure 10.

In this case, the vacuum force applied onto the isolation window 20 and the tensile force generated from the first fastener 31 are balanced. Specifically, the number of the first fasteners 31 can be set based on the weight of the isolation window 20, the pressure applied onto the isolation window 20, the area of the isolation window 20 and how much force each first fastener 31 can bear.

With the above structure, the isolation window 20 can be arranged under the first fixing part 11 and is fixedly connected with the first fixing part 11 through the first fastener 31, wherein the first fastener 31 may be a screw and the first mounting hole 13 may be a screwed hole. Since the isolation window 20 is generally made of quartz material and a lower fixing end of the first fastener 31 has a small area, the isolation window 20 may be damaged if the first fastener 31 is directly brought into contact with the isolation window 20. For this reason, the washer 30 may be provided at the lower surface of the isolation window 20 so as to increase the area of action force applied onto the isolation window 20 from the first fastener 31, and to buffer the action force between the first fastener 31 and the isolation window 20, thereby preventing the isolation window 20 from being damaged.

Further, the washer 30 may be made of a copper material. Preferably, red copper

may be processed to form the washer 30. Since the hardness of the red copper is relatively small, the action force between the isolation window 20 and the first fastener 31 can be effectively buffered by the washer. Particularly, in the evacuation process, the isolation window 20 is subject to an atmospheric pressure above the chamber 40 and presses downwardly, and the washer 30 can effectively prevent the isolation window 20 from pressing the first fastener 31 downwardly and being damaged.

Further, the first fixing part 11 and the second fixing part 12 may be formed integrally, but the present invention is not limited thereto. In practical applications, the first fixing part 11 and the second fixing part 12 may be formed as two parts separated from each other, and can be rigidly connected through a fastener such as a screw when used, as long as it is ensured that when any one of the first fixing part 11 and the second fixing part 12 is displaced or subject to a force, the other one connected thereto is not displaced or deformed relatively.

Further, the chamber provided by the present invention may also include a buffering element, which may be provided between the washer 30 and the isolation window 20. That is, a buffering element made of a soft material may be separately provided between the isolation window 20 and the washer 30 to buffer the action force between the washer 30 and the isolation window 20.

Further, the isolation window fixing structure 10 may be made of a metal material. It helps to firmly fix the isolation window 20 when the isolation window fixing structure 10 is made of a metal material. Meanwhile, the heat from the isolation window 20 can be dissipated by virtue of the isolation window fixing structure 10 that is made of a metal material, so that heat dissipation of the isolation window 20 is facilitated. Preferably, aluminum or copper may be selected to manufacture the isolation window fixing structure 10.

Further, a first sealing element 50, such as a sealing ring, may be provided between the lower surface of the first fixing part 11 and the upper surface of the isolation window 20, so as to ensure the tightness of the chamber 40. The isolation window 20 may press downwardly due to the atmospheric pressure above the chamber 40, and the above structure in which the first sealing element 50 is provided on the upper surface of the isolation window 20 can avoid the situation in which the isolation window 20 excessively presses the first sealing element 50, and leads to deformation and/or damage of the first sealing element 50, resulting in movement of

the isolation window 20 in the vertical direction.

Further, a second sealing element 51, such as a sealing ring, may be provided between the lower surface of the second fixing part 12 and the upper surface of the side wall of the chamber body, so as to further ensure the tightness of the chamber

5 40.

Further, the isolation window fixing structure 10 may be provided with a cooling water channel 14 therein, which may be used to introduce cooling water. The arrangement of the cooling water channel 14 can make the heat taken away by the cooling water in the cooling water channel 14 after the heat is transferred from the isolation window 20 to the isolation window fixing structure 10, so that the heat

10 dissipation of the isolation window 20 is facilitated, and the isolation window 20 is under protection. Meanwhile, the damage to the first sealing element 50 between the first fixing part 11 and the isolation window 20, due to an increase in temperature of the isolation window 20, can be avoided. Preferably, the cooling water channel 14 is

15 provided in a portion of the isolation window fixing structure 10 close to the isolation window 20, for example, on the first fixing part 11.

The chamber provided by the present invention has been described above, and it can be seen that by providing the isolation window fixing structure 10, in which the first fixing part 11 is fixedly connected with the edge area of the upper surface of the isolation window 20 and the second fixing part 12 is fixedly connected with the chamber body 41, the isolation window 20 can be firmly fixed to the chamber body 41,

20 so that the displacements of the isolation window 20 in the vertical and horizontal directions are confined, and the problem of damage to the isolation window 20 caused by its collision with the chamber body 41 due to the displacements of the isolation window 20 can be avoided. Meanwhile, the isolation window 20 can be supported and

25 fixed by the isolation window fixing structure 10 without the conventional resin pad, so that the problem that the isolation window is likely to be damaged by uneven force applied thereto due to the deformation of the heated resin pad can be avoided.

As a chamber provided by another embodiment of the present invention, it also includes a first fastener 31, a first mounting hole 13, a second fastener 15, a second mounting hole 32, a washer 30, a cooling water channel 14 and a buffering element,

30 as shown in Fig. 9. Since structural relationships among the above components and their functions have been described in detail in the first embodiment, they will not be

described herein. The difference between the present embodiment and the first embodiment as above lies in that a first fixing part 11' and a second fixing part 12' are not arranged in a step manner. Specifically, in the present embodiment, an upper surface of the first fixing part 11' and an upper surface of the second fixing part 12' are located in a same plane, and the a lower surface of the first fixing part 11' and a lower surface of the second fixing part 12' are located in a same plane. That is to say, the first fixing part 11' and the second fixing part 12' are provided in a same horizontal plane.

It needs to be noted that, in actual applications, the lower surface of the first fixing part may be arranged to be lower than the lower surface of the second fixing part according to actual needs. That is, the upper surface of the isolation window is made lower than the upper surface of the side wall of the chamber body.

It also needs to be noted that, the chamber provided by embodiments of the present invention may be a degas chamber, a reaction chamber or the like in the field of semiconductor processing technology. The chamber provided by embodiments of the present invention is applicable for these chambers as long as they have an isolation window and involve the gas introduction process and the evacuation process.

It also could be understood that the foregoing implementations are merely exemplary implementations used for the purpose of explaining the principle of the present invention, but the present invention is not limited thereto. Many variations and improvements can be made by those of ordinary skill in the art without departing from the spirit and essence of the present invention. These variations and improvements are also regarded as the protection scope of the present invention.

What is claimed is:

1. A chamber for semiconductor processing, which includes a chamber body and an isolation window, the chamber body being of a tubby structure and having an upper end which is an open end, the isolation window being provided at the open end of the chamber body and used for sealing the chamber, wherein the chamber further includes an isolation window fixing structure used for fixing the isolation window at the open end of the chamber body and including a first fixing part and a second fixing part connected with each other, the first fixing part is fixedly connected with an edge area of an upper surface of the isolation window, and the second fixing part is fixedly connected with the chamber body; and

the said isolation window fixing structure further includes a first fastener and a second fastener, the first fastener is used for fixedly connecting the isolation window with the first fixing part, and the second fastener is used for fixedly connecting the second fixing part with the chamber body.

2. The chamber according to claim 1, wherein a lower surface of the first fixing part and a lower surface of the second fixing part are located in two horizontal planes.

3. The chamber according to claim 1, wherein a lower surface of the first fixing part and a lower surface of the second fixing part are located in a same horizontal plane.

4. The chamber according to any one of claims 1-3, wherein the isolation window fixing structure further includes a washer, the edge area of the upper surface of the isolation window is provided therein with a through hole, the lower surface of the first fixing part is provided with a first mounting hole, the washer is provided therein with a second mounting hole, and the first fastener passes through the second mounting hole and the through hole in the isolation window successively from bottom to top and is fixed into the first mounting hole, so as to fixedly connect the washer and the isolation window with the first fixing part.

5. The chamber according to claim 4, wherein the washer is made of a copper material.

6. The chamber according to claim 4, wherein the isolation window fixing structure further includes a buffering element, which is provided between the washer and the isolation window.

5 7. The chamber according to claim 4, wherein the first and second fixing parts are made of a metal material.

10 8. The chamber according to claim 4, wherein the first fixing part and/or the second fixing part are/is provided therein with a cooling water channel for introducing cooling water.

15 9. The chamber according to claim 1, wherein a first sealing element is provided between a lower surface of the first fixing part and the upper surface of the isolation window.

10. The chamber according to claim 1, wherein a second sealing element is provided between a lower surface of the second fixing part and an upper surface of a side wall of the chamber body.

20 11. The chamber according to claim 1, wherein the chamber is a degas chamber or a reaction chamber.