

TITLE: WAFER CARRIER TRAY

(a) Technical Field of the Invention

The present invention generally relates to the technical field regarding a wafer carrier tray for use in a wafer processing machine, and more particularly to a wafer carrier tray that does not cause accumulation of impurities that affects precision and accuracy thereof and that is easy to assemble and has low cost and low defect rate.

(b) Description of the Prior Art

Referring to FIGS. 1-3, a conventional wafer carrier tray 1 comprises a tray seat 10 and a tray cover 11, which are made of ceramic materials. The tray seat 10 comprises a bore 12 formed in a central portion thereof for receiving therein an electrostatic chuck 20 of a machine 2. The tray seat 10 has a bottom that is coupled to the machine 2. The tray seat 10 also has a top that is made in the form of a step-like configuration and is provided, on a portion thereof adjacent to the bore 12, with four equally-spaced carrier blocks 13. The carrier blocks 13 each comprise a support face 14 and two side faces 15. The support face 14 is located on the top of the carrier block and is in the form of a rectangle that slants downward from outside to inside. The two side faces 15 are located on opposite sides of the carrier block and are in the form of triangles having top edges connected to two opposite side edges of the support face 14. The tray cover 11 is in the form of a ring and is coupled to and supported on the step of the top of the tray seat 10. However, the conventional wafer carrier tray 1 is formed by combining the tray seat 10 with

the a tray cover 11, so that when a wafer 3 is carried by the tray is subjected to processing (such as vapor deposition), impurities generated by the pressing operation may get accumulated at the interface between the tray seat 10 and the tray cover 11 on surfaces thereof that contact each other, causing

5 deformations and cracking and thus affecting leveling and circularity so as to deteriorate precision and accuracy of processing. Further, the location where the processing is carried out may also have impurities that may have the tray seat 10 and the tray cover 11 adhering to each other and hard to separate.

This would cause problems in disassembling. Further, the tray seat 10 and
10 the tray cover 11 are manufactured separately and then combined together to form a wafer carrier tray 1. The manufacturing cost is high and assembling is difficult. Particularly, the multiple carrier blocks 13 are structured so that the slanting support faces 14 thereof that are provided to carry the wafer 3 are generally rectangular. This increases the contact area (W1) between the
15 carrier blocks 13 and the wafer 3 so that the wafer 3, when carried thereon and conveyed thereby, is easily subjected to abrasion and damage, leading to an increase of defect rate.

SUMMARY OF THE INVENTION

The conventional wafer carrier tray have the problems of being hard to assembly, high cost, and high defect rate, and particularly, it suffers easy accumulation of processing impurities between the tray seat and the tray cover
 5 and processing accuracy being affected thereby.

The present invention provides a wafer carrier tray, which is integrally formed of a high purity insulation material (such as ceramics) as a unitary structure and comprises a bore, a coupling surface, and a carrying surface. The bore is formed in a center of the tray and extends therethrough from the
 10 top to the bottom so as to make the tray, in the entirety thereof, in the form of a ring. The bore receives an electrostatic chuck of a machine to fit therein. The coupling surface is formed on the bottom for coupling to the machine. The carrying surface is formed on the top and comprises a plurality of equally spaced carrier blocks arranged at locations adjacent to an edge of the bore.
 15 Each of carrier blocks comprises a support face and two side faces. The support face is located on a top and is in the form of a slanting surface that slants downwards from outside to inside for supporting and carrying an underside of a circumference of a wafer. The two side faces are located on opposite sides and are in the form of slanting surfaces that slant toward each
 20 other from outside to inside. The two side faces have top edges that are connected to two opposite side edges of the support face.

The wafer carrier tray provided by the present invention is made integrally of a high purity insulation material (such as ceramics) as a unitary

structure so that when a wafer is carried thereon to proceed with processing (such as vapor deposition), no impurity may get accumulated thereon to cause deformation and cracking and thus affecting leveling and circularity and no adhering that makes disassembling difficult may result, whereby improved
5 processing precision and accuracy may be obtained and assembling is made easy and simple to thereby greatly reduce manufacturing cost. Particularly, the slanting support faces of the multiple carrier blocks that support thereon a wafer are made converging from outside to inside so that contact area between the multiple carrier blocks and the wafer can be reduced and thus, abrasion
10 and damage of the wafer carried thereon and conveyed thereby is reduced to therefore greatly reduce defect rate.

The foregoing objectives and summary provide only a brief introduction to the present invention. To fully appreciate these and other objects of the present invention as well as the invention itself, all of which will become
15 apparent to those skilled in the art, the following detailed description of the invention and the claims should be read in conjunction with the accompanying drawings. Throughout the specification and drawings identical reference numerals refer to identical or similar parts.

Many other advantages and features of the present invention will become
20 manifest to those versed in the art upon making reference to the detailed description and the accompanying sheets of drawings in which a preferred structural embodiment incorporating the principles of the present invention is shown by way of illustrative example.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is an exploded view showing a conventional wafer carrier tray.

FIG. 2 is an enlarged view of a cross-section of the conventional wafer carrier tray in an assembled form.

5 FIG. 3 is a perspective view, in an enlarged form, showing a portion of the conventional wafer carrier tray in a condition of use.

FIG. 4 is a perspective view showing the present invention.

FIG. 5 is an enlarged view of a cross-section of the present invention in an assembled form.

10 FIG. 6 is a perspective view, in an enlarged form, showing a portion of the present invention in a condition of use.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

The following descriptions are exemplary embodiments only, and are not intended to limit the scope, applicability or configuration of the invention in any way. Rather, the following description provides a convenient illustration
5 for implementing exemplary embodiments of the invention. Various changes to the described embodiments may be made in the function and arrangement of the elements described without departing from the scope of the invention as set forth in the appended claims.

Referring to FIGS. 4-6, a wafer carrier tray 4 according to the present
10 invention is made of an insulation material of high purity (such as ceramics) as a unitary structure, which comprises a bore 40, a coupling surface 41 and a carrying surface 42.

The bore 40 is formed in a center of the tray and extends therethrough from a top to a bottom so as to make the tray, in the entirety thereof, in the
15 form of a ring. The bore 40 is formed to receive an electrostatic chuck 50 of a machine 5 to fit therein.

The coupling surface 41 is formed on the bottom of the tray for coupling with the machine 5. The coupling surface 41 comprises an annular groove
43 formed therein for receiving a ceramic insulator 51 of the machine 5 to fit
20 therein.

The carrying surface 42 is formed on the top of the tray and is made in the form of a slanting face that slants downward from inside to outside. The carrying surface 42 is provided, on an edge thereof adjacent to the bore 40,

with four carrier blocks 44 that are arranged in an equally spaced manner.

Each of the carrier blocks 44 comprises a support face 45 and two side faces

46. The support face 45 is located on a top of the carrier block and is in the form of a slanting surface that slants downwards from outside to inside for

5 supporting and carrying an underside of a circumference of a wafer 6. The

two side faces 46 are located on opposite sides of the carrier block and are in the form of slanting surfaces that slant toward each other from outside to

inside. The two side faces 46 have top edges that are connected to two

opposite side edges of the support face 45 so that each of the carrier blocks 44,

10 in the entirety thereof, shows a configuration of a quadrangular pyramid

having an apex pointing toward the bore 40, wherein the support face 45 and

the two side faces 46 are triangles that are each reduced from outside to inside

and the apex of each of the carrier blocks 44 is spaced from the circumference of the bore 40 by a predetermined distance.

15 The wafer carrier tray 4 provided in the present invention is made

integrally of a high purity insulation material (such as ceramics) as a unitary

structure so that when a wafer 6 is carried thereby to proceed with processing

(such as vapor deposition), no impurity may get accumulated thereon to cause deformation and cracking and thus affecting leveling and circularity and no

20 adhering that makes disassembling difficult may result, whereby improved

processing precision and accuracy may be obtained and assembling is made

easy and simple to thereby greatly reduce manufacturing cost. Particularly,

the slanting support faces 45 of the multiple carrier blocks 44 that support

thereon a wafer 6 are made in the form of triangles converging from outside to inside so that contact area (W2) between the multiple carrier blocks 44 and the wafer 6 can be reduced and thus, abrasion and damage of the wafer 6 carried thereon and conveyed thereby is reduced to therefore greatly reduce defect rate.

It will be understood that each of the elements described above, or two or more together may also find a useful application in other types of methods differing from the type described above.

While certain novel features of this invention have been shown and described and are pointed out in the annexed claim, it is not intended to be limited to the details above, since it will be understood that various omissions, modifications, substitutions and changes in the forms and details of the device illustrated and in its operation can be made by those skilled in the art without departing in any way from the spirit of the present invention.

I CLAIM:

1. A wafer carrier tray, which is integrally formed of a high purity insulation material as a unitary structure and comprises:
 - a bore, which is formed in a center and extends therethrough from a top to a bottom so as to form a ring configuration, the bore receiving an electrostatic chuck of a machine to fit therein;
 - a coupling surface, which is formed on the bottom for compiling to the machine; and
 - a carrying surface, which is formed on the top and comprises a plurality of equally spaced carrier blocks arranged at locations adjacent to an edge of the bore, each of carrier blocks comprising a support face and two side faces, the support face being located on a top and being in the form of a slanting surface that slants downwards from outside to inside for supporting and carrying an underside of a circumference of a wafer, the two side faces being located on opposite sides and being in the form of slanting surfaces that slant toward each other from outside to inside, the two side faces having top edges that are connected to two opposite side edges of the support face.
2. The wafer carrier tray according to claim 1, which is in the form of a circular ring.

3. The wafer carrier tray according to claim 1, wherein the coupling surface further comprises an annular groove formed therein for receiving a ceramic insulator of the machine to fit therein.
4. The wafer carrier tray according to claim 1, wherein the carrier
5 blocks are each a quadrangular pyramid having an apex pointing toward the bore.
5. The wafer carrier tray according to claim 4, wherein the apex of each of the carrier blocks is spaced from a circumference of the bore by a predetermined distance.
- 10 6. The wafer carrier tray according to claim 1, wherein the carrying surface is in the form of a slanting face that slants downward from inside to outside.
7. The wafer carrier tray according to claim 1, wherein the number of the carrier blocks is four.
- 15 8. The wafer carrier tray according to claim 1, which is made of a ceramic material.