SUBSTRATE SUPPORT AND PLASMA PROCESSING APPARATUS

Technical Field

[0001]

The present disclosure relates to a substrate support and a plasma processing apparatus.

Background Art

[0002]

Patent Literature 1 discloses a plasma processing system in which an edge ring is transferred into a plasma processing apparatus by a transfer device and the edge ring is placed on an electrostatic chuck of a stage.

Citation List

Patent Documents

[0003]

Patent Document 1: JP2021-61415A

Summary of Invention

Technical Problem

[0004]

Embodiments the present disclosure provides a substrate support and a plasma processing apparatus for placing an edge ring on an electrostatic chuck with high positional accuracy.

[0005]

According to a first aspect of the present invention, there is provided a substrate support, which includes: a base; a first electrostatic chuck region disposed at an upper portion of the base, the first electrostatic chuck region having a substrate support surface, and being configured to hold a substrate on the substrate support surface; and a second electrostatic chuck region disposed at the upper portion of the base to surround the first electrostatic chuck region, the second electrostatic chuck region having a ring support surface, and being configured to hold an edge ring on the ring support surface, in which the second electrostatic chuck region is provided with a positioning pin for positioning the edge ring, wherein a material forming the second electrostatic chuck region is alumina or yttria, and wherein a material forming the positioning pin is alumina, molybdenum, or titanium.

[0005a]

According to a second aspect of the present invention, there is provided a substrate support including: a base; a first electrostatic chuck region disposed at an upper portion of the base, the first electrostatic chuck region having a substrate support surface, and being configured to hold a substrate on the substrate support surface; and a second electrostatic chuck region disposed at the upper portion of the base to surround the first electrostatic chuck region, the second electrostatic chuck region having a ring support surface, and being configured to hold an edge ring on the ring support surface, wherein the second electrostatic chuck region has a supply hole, through which a heat transfer gas is supplied between an upper surface of the second electrostatic chuck region and the edge ring, and a part of a positioning pin for positioning the edge ring is provided inside the supply hole, wherein a material forming the second electrostatic chuck region is alumina or yttria, and wherein a material forming the positioning pin is alumina, molybdenum, or titanium.

[0005b]

According to a third aspect of the present invention, there is provided a plasma processing apparatus including: a plasma processing chamber; a substrate support provided in the plasma processing chamber and configured to hold a substrate and an edge ring; a gas supply configured to supply a processing gas to the plasma processing chamber; and a plasma generator configured to generate plasma from the processing gas, wherein the substrate support includes a base, a first electrostatic chuck region disposed at an upper portion of the base, the first electrostatic chuck region having a substrate support surface, and being configured to hold the

substrate on the substrate support surface, and a second electrostatic chuck region disposed at the upper portion of the base to surround the first electrostatic chuck region, the second electrostatic chuck region having a ring support surface, and being configured to hold an edge ring on the ring support surface, the second electrostatic chuck region has a supply hole, through which a heat transfer gas is supplied between an upper surface of the second electrostatic chuck region and the edge ring, and a part of a positioning pin for positioning the edge ring is provided inside the supply hole, wherein a material forming the second electrostatic chuck region is alumina or yttria, and wherein a material forming the positioning pin is alumina, molybdenum, or titanium.

[0005c]

Disclosed herein is a substrate support including: a base; a first electrostatic chuck region disposed at an upper portion of the base, the first electrostatic chuck region having a substrate support surface, and being configured to hold a substrate on the substrate support surface; and a second electrostatic chuck region disposed at the upper portion of the base to surround the first electrostatic chuck region, the second electrostatic chuck region having a ring support surface, and being configured to hold an edge ring on the ring support surface, wherein the second electrostatic chuck region is provided with a positioning pin of the edge ring, the positioning pin being formed of a material having such a linear expansion coefficient that a material forming the second electrostatic chuck region is not damaged when an amount of change in a temperature of the substrate within a predetermined time is controlled to 200°C or lower.

Advantageous Effects of Invention

[0006]

According to the above aspects, a substrate support and a plasma processing apparatus for placing an edge ring on an electrostatic chuck with high positional accuracy are provided.

Brief Description of Drawings

[0007]

[FIG. 1] is a drawing showing an example of a configuration of a plasma processing apparatus.

[FIG. 2] is an example of a partially enlarged cross-sectional view of a substrate support according to a first embodiment.

[FIG. 3] is an example of a plan view of a main body.

[FIG. 4] is an example of a bottom view of a ring assembly.

[FIG. 5A] is an example of a side view of a positioning pin.

[FIG. 5B] is an example of a top view of the positioning pin.

[FIG. 5C] is an example of a cross-sectional view of the positioning pin.

[FIG. 6] is an example of a configuration diagram of another positioning pin.

[FIG. 7] is an example of a partially enlarged cross-sectional view of a substrate support according to a second embodiment.

Description of Embodiments

[0008]

Hereinafter, various exemplary embodiments will be described in detail with reference to the drawings. Further, like reference numerals will be given to like or corresponding parts throughout the drawings.

[0009]

An example of a configuration of a plasma processing system will be described with reference to FIG. 1. FIG. 1 is a view for explaining an example of a configuration of a capacitively-coupled plasma processing apparatus.

[0010]

The plasma processing system includes a capacitively-coupled plasma processing apparatus 1 and a controller 2. The capacitively-coupled plasma processing apparatus 1 includes the plasma processing chamber 10, a gas supply 20, a power source 30, and an exhaust system

CLAIMS

1. A substrate support comprising:

a base;

a first electrostatic chuck region disposed at an upper portion of the base, the first electrostatic chuck region having a substrate support surface, and being configured to hold a substrate on the substrate support surface; and

a second electrostatic chuck region disposed at the upper portion of the base to surround the first electrostatic chuck region, the second electrostatic chuck region having a ring support surface, and being configured to hold an edge ring on the ring support surface, wherein

the second electrostatic chuck region is provided with a positioning pin for positioning the edge ring,,

wherein a material forming the second electrostatic chuck region is alumina or yttria, and

wherein a material forming the positioning pin is alumina, molybdenum, or titanium.

2. The substrate support according to claim 1, wherein

the positioning pin is provided on an upper surface of the second electrostatic chuck region.

3. The substrate support according to claim 1, wherein

the positioning pin is fixed to the second electrostatic chuck region.

4. The substrate support according to claim 1, wherein

the second electrostatic chuck region has a supply hole, through which a heat transfer gas is supplied between an upper surface of the second electrostatic chuck region and the edge ring, and

a part of the positioning pin is provided inside the supply hole.

5. A substrate support comprising:

a base;

a first electrostatic chuck region disposed at an upper portion of the base, the first electrostatic chuck region having a substrate support surface, and being configured to hold a substrate on the substrate support surface; and

a second electrostatic chuck region disposed at the upper portion of the base to surround the first electrostatic chuck region, the second electrostatic chuck region having a ring support surface, and being configured to hold an edge ring on the ring support surface, wherein

the second electrostatic chuck region has a supply hole, through which a heat transfer gas is supplied between an upper surface of the second electrostatic chuck region and the edge ring, and

a part of a positioning pin for positioning the edge ring is provided inside the supply hole,

wherein a material forming the second electrostatic chuck region is alumina or yttria, and

wherein a material forming the positioning pin is alumina, molybdenum, or titanium.

6. The substrate support according to claim 4 or 5, wherein
a side surface of the positioning pin is formed with a groove.

7. The substrate support according to claim 6, wherein
a plurality of the grooves are formed in the side surface of the positioning pin.

8. The substrate support according to claim 6, wherein
the groove is formed perpendicularly to the side surface of the positioning pin.

9. The substrate support according to claim 6, wherein
the groove is formed in a spiral shape in the side surface of the positioning pin.

10. The substrate support according to claim 4 or 5, wherein
the positioning pin is formed of a porous material.

11. The substrate support according to claim 4 or 5, wherein
the supply hole is provided with an embedded member at a lower portion of the positioning pin.

12. The substrate support according to claim 11, wherein
an upper portion of the embedded member is formed of a conductive material, and a lower portion of the embedded member is formed of an insulating material.

13. A plasma processing apparatus comprising:

a plasma processing chamber;

a substrate support provided in the plasma processing chamber and configured to hold a substrate and an edge ring;

a gas supply configured to supply a processing gas to the plasma processing chamber; and

a plasma generator configured to generate plasma from the processing gas, wherein

the substrate support includes

a base,

a first electrostatic chuck region disposed at an upper portion of the base, the first electrostatic chuck region having a substrate support surface, and being configured to hold the substrate on the substrate support surface, and

a second electrostatic chuck region disposed at the upper portion of the base to surround the first electrostatic chuck region, the second electrostatic chuck region having a ring support surface, and being configured to hold an edge ring on the ring support surface,

the second electrostatic chuck region has a supply hole, through which a heat transfer gas is supplied between an upper surface of the second electrostatic chuck region and the edge ring, and

a part of a positioning pin for positioning the edge ring is provided inside the supply hole,

wherein a material forming the second electrostatic chuck region is alumina or yttria, and

wherein a material forming the positioning pin is alumina, molybdenum, or titanium.