

WHAT IS CLAIMED IS:

1. A substrate treating apparatus for treating a substrate, the substrate treating apparatus comprising:

a support chuck configured to support the substrate; and

a warpage prevention device configured to prevent warpage of the substrate by applying a load to a peripheral area of the substrate by placing one or more clamp rings on the peripheral area of the substrate supported on the support chuck,

wherein the warpage prevention device is configured to adjust the load applied to the peripheral area of the substrate, by adjusting the number of clamp rings placed on the peripheral area of the substrate.

2. The substrate treating apparatus of claim 1, wherein the warpage prevention device includes:

a plurality of pins disposed around the support chuck, the plurality of pins extending in an up/down direction;

a plurality of support members provided on the plurality of pins along the up/down direction and configured to support the clamp rings in a horizontal direction;

a plurality of clamp rings including through-holes through which the plurality of pins pass and having a ring shape to press the peripheral area of the substrate, the plurality of clamp rings being supported on the plurality of support members, respectively;

a lifting unit configured to vertically move the plurality of pins; and

a controller configured to control the lifting unit to vertically move the plurality of pins such that the number of clamp rings placed on the peripheral area of the substrate is adjusted depending on a lift height of the plurality of pins.

3. The substrate treating apparatus of claim 2, wherein the plurality of support members include:

a plurality of first support members provided at first positions of the plurality of pins;
and

a plurality of second support members provided at second positions higher than the first positions of the plurality of pins,

wherein the plurality of clamp rings include:

a first clamp ring supported on the plurality of first support members, the first clamp ring having first through-holes formed therein through which the plurality of pins pass; and

a second clamp ring supported on the plurality of second support members, the second clamp ring having second through-holes formed therein through which the plurality of pins pass, and

wherein the first through-holes and the second through-holes have different sizes or different shapes.

4. The substrate treating apparatus of claim 3, wherein the first through-holes have a shape through which the plurality of second support members are able to pass but the plurality of first support members are unable to pass, and

wherein the second through-holes have a shape through which the plurality of second support members are unable to pass.

5. The substrate treating apparatus of claim 2, wherein the controller is configured to:

determine a lift height of the plurality of pins, based on at least one of a material of the

substrate or a substrate treating process; and

adjust the number of clamp rings placed on the peripheral area of the substrate, by vertically moving the plurality of pins depending on the determined lift height.

6. The substrate treating apparatus of claim 3, wherein the plurality of first support members and the plurality of second support members radially protrude from the plurality of pins,

wherein the first through-holes have a first diameter such that the plurality of second support members are able to pass through the first through-holes but the plurality of first support members are unable to pass through the first through-holes when the plurality of pins pass through the first through-holes, and

wherein the second through-holes have a second diameter smaller than the first diameter such that the plurality of second support members are unable to pass through the second through-holes when the plurality of pins pass through the second through-holes.

7. The substrate treating apparatus of claim 3, wherein the number of clamp rings placed on the peripheral area of the substrate is increased as the plurality of pins are lowered by the controller and the lifting unit, and

wherein the number of clamp rings placed on the peripheral area of the substrate is decreased as the plurality of pins are raised by the controller and the lifting unit.

8. The substrate treating apparatus of claim 3, wherein the plurality of first support members have a frusto-conical shape that is narrow at the top and wide at the base.

9. The substrate treating apparatus of claim 8, wherein lower diameters of the

plurality of first support members are greater than diameters of the first through-holes, and upper diameters of the plurality of first support members are equal to or smaller than the diameters of the first through-holes.

10. The substrate treating apparatus of claim 3, wherein the first clamp ring and the second clamp ring are spaced apart from each other in an up/down direction, and

wherein the lifting unit is configured to vertically move the plurality of pins by more than a separation distance between the first clamp ring and the second clamp ring.

11. The substrate treating apparatus of claim 3, wherein the controller is configured to adjust a clamp load applied to the substrate, by selecting one of a first mode for placing the first clamp ring on the peripheral area of the substrate by lowering the plurality of pins by a first height by controlling the lifting unit and a second mode for placing the first clamp ring and the second clamp ring on the peripheral area of the substrate by lowering the plurality of pins by a second height by controlling the lifting unit.

12. A substrate treating method for treating a substrate using the substrate treating apparatus of claim 2, the substrate treating method comprising:

preventing, by ~~a~~ the warpage prevention device, warpage of the substrate by applying a load to a peripheral area of the substrate by placing the one or more clamp rings on the peripheral area of the substrate supported on ~~a~~ the support chuck,

wherein the preventing of the warpage includes:

determining, by ~~a~~ the controller, a lift height of the plurality of pins, based on at least one of a material of the substrate or a substrate treating process, wherein the plurality of pins are disposed around the support chuck and extend in an up/down direction; and

adjusting, by ~~a~~ the lifting unit, the number of clamp rings placed on the peripheral area of the substrate, by vertically moving the plurality of clamp rings by vertically moving the plurality of pins depending on the lift height, wherein the plurality of clamp rings are supported on the plurality of support members provided on the plurality of pins along the up/down direction.

13. The substrate treating method of claim 12, wherein the number of clamp rings placed on the peripheral area of the substrate is increased as the plurality of pins are lowered by the controller and the lifting unit, and

wherein the number of clamp rings placed on the peripheral area of the substrate is decreased as the plurality of pins are raised by the controller and the lifting unit.

14. The substrate treating method of claim 12, wherein the preventing of the warpage includes:

adjusting, by the controller, a clamp load applied to the substrate, by selecting one of a first mode for placing a first clamp ring on the peripheral area of the substrate by lowering the plurality of pins by the first height by controlling the lifting unit and a second mode for placing the first clamp ring and a second clamp ring on the peripheral area of the substrate by lowering the plurality of pins by a second height by controlling the lifting unit.