

CLAIMS

1. A cooling chamber for cooling a substrate, comprising:
 - a chamber body having an inner volume;
 - a substrate support disposed in the chamber body and having a support surface to support a substrate;
 - a plate disposed in the chamber body opposite the substrate support, wherein the substrate support and the plate are movable with respect to each other between a first position and a second position, wherein when in the first position the substrate support and the plate are disposed away from each other such that the support surface is exposed to a first volume within the inner volume, wherein when in the second position the substrate support and the plate are disposed adjacent to each other such that the support surface is exposed to a second volume within the inner volume, and wherein the second volume is smaller than the first volume;
 - an annular seal disposed between the substrate support and the plate such that the annular seal contacts the plate when the substrate support and the plate are in the second position;
 - a plurality of flow channels disposed in at least one of the plate or the substrate support to flow a coolant; and
 - a gas inlet to provide a gas into the second volume.
2. The cooling chamber of claim 1, wherein the substrate support comprises an outer ring surrounding the support surface, wherein the outer ring includes an annular groove, and wherein the annular seal is disposed within the annular groove.
3. The cooling chamber of claim 1, wherein the substrate support comprises an outer ring surrounding the support surface, wherein an annular channel is disposed between the outer ring and the support surface extending from the support surface in a direction opposite the plate, and wherein at least one through hole extends from the annular channel to a peripheral surface of the outer ring.

4. The cooling chamber of claim 3, wherein the annular channel is perpendicular to the at least one through hole.
5. The cooling chamber of claim 3, wherein the annular channel and the at least one through hole are shaped and sized to create a choked flow of the gas from the second volume to a remaining portion of the inner volume outside of the second volume.
6. The cooling chamber of claim 1, wherein the plurality of flow channels are disposed in the plate.
7. The cooling chamber of claim 1, wherein a substrate support facing surface of the plate is concave.
8. The cooling chamber of claim 1, wherein the substrate support comprises a plurality of support elements disposed on the support surface to support a substrate in a spaced apart relation to the support surface.
9. The cooling chamber of claim 1, wherein the substrate support comprises an opening to flow a backside gas between a substrate and the support surface when the substrate disposed on the substrate support.
10. The cooling chamber of claim 1, wherein the substrate support comprises a lift pin assembly to facilitate placement and removal of a substrate onto and off of the substrate support.
11. The cooling chamber of claim 1, wherein the gas inlet is disposed through the plate.
12. A substrate processing system, comprising:
a central vacuum transfer chamber;

at least one vacuum processing chamber coupled to the central vacuum transfer chamber to perform a process on a substrate; and

a cooling chamber coupled to the central vacuum transfer chamber to cool the substrate, the cooling chamber comprising:

a chamber body having an inner volume;

a substrate support disposed in the chamber body and having a support surface to support a substrate;

a plate disposed in the chamber body opposite the substrate support, wherein the substrate support and the plate are movable with respect to each other between a first position and a second position, wherein when in the first position the substrate support and the plate are disposed away from each other such that the support surface is exposed to a first volume within the inner volume, wherein when in the second position the substrate support and the plate are disposed adjacent to each other such that the support surface is exposed to a second volume within the inner volume, and wherein the second volume is smaller than the first volume;

an annular seal disposed between the substrate support and the plate such that the annular seal contacts the plate when the substrate support and the plate are in the second position;

a plurality of flow channels disposed in at least one of the plate or the substrate support to flow a coolant; and

a gas inlet to provide a gas into the second volume.

13. A cooling chamber for cooling a substrate, comprising:

a chamber body having an inner volume;

a substrate support disposed in the chamber body and having a support surface to support a substrate;

a plate disposed in the chamber body opposite the substrate support, wherein the substrate support and the plate are movable with respect to each other between a first position and a second position, wherein when in the first position the substrate support and the plate are disposed away from each other within the inner volume,

wherein when in the second position the substrate support and the plate are disposed adjacent to each other and together at least partially define a second volume that is smaller than and substantially sealed off from a remaining portion of the inner volume, and wherein the support surface is exposed to the second volume;

a plurality of flow channels disposed in at least one of the plate or the substrate support to flow a coolant; and

a gas inlet to provide a gas into the second volume.

14. The cooling chamber of claim 13, further comprising:

an annular seal disposed between the substrate support and the plate to substantially seal off the second volume from the remaining portion of the inner volume when in the substrate support and the plate are in the second position.

15. The cooling chamber of claim 13, further comprising:

an outer ring surrounding the support surface and including at least one through hole fluidly coupling the second volume to the remaining portion of the inner volume to control the flow of gas from the second volume into the remaining portion of the inner volume.