more substrates 112 from the buffer 120 to the plurality of process chambers 105 and from the plurality of process chambers 105 back to the buffer 120.

[0019] The transfer chamber 106 may have one or more environmental controls. For example, an airflow opening in the transfer chamber 106 may include a filter to filter the airflow entering the transfer chamber 106. Other environmental controls may include one or more of humidity control, static control, temperature control, or pressure control.

[0020] The one or more process chambers 105 may be coupled orthogonally to the transfer chamber 106 or may be coupled at an angle with respect to the transfer chamber 106. The plurality of process chambers 105 may be sealingly engaged with the transfer chamber 106. The transfer chamber 106 generally operates at atmospheric pressure but may be configured to operate at vacuum pressure. The plurality of process chambers 105 are configured to perform one or more processing steps to one or more substrates 112 being processed in the tool 100. For example, the plurality of process chambers 105 may comprise one or more wet clean chambers 130 (three shown in Figure 1) configured to clean the one or more substrates 112 with a liquid, for example, water. The plurality of process chambers 105 may comprise one or more dry clean chambers 140 (two shown in Figure 1) configured to perform a dry clean process on the one or more substrates 112, for example, via a plasma etch or plasma ashing procedure. The one or more process chambers 105 includes at least one baking chamber, for example, the baking chamber 150 configured to heat the one or more substrates to remove residue or haze left over after the wet clean or dry clean process. In some embodiments, the one or more wet clean chambers 130 are disposed on a side of the transfer chamber 106 different than the one or more dry clean chambers 140.

[0021] Figure 2 depicts a schematic cross-sectional side view of a baking chamber 150 in accordance with at least some embodiments of the present disclosure. The baking chamber 150 may be part of a multi-chamber process tool such as tool 100, or a standalone chamber. The baking chamber 150 generally comprises a chamber body 202 enclosing an interior volume 204. In some embodiments, the interior

volume 204 is configured to operate at non-vacuum, or atmospheric, pressure. The chamber body 202 may be made of a metal, such as aluminum or stainless steel.

[0022] A heater 208 is disposed in the interior volume 204. In some embodiments, a surface temperature of the heater 208 is about 100 to about 400 degrees Celsius during use. In some embodiments, the heater 208 comprises a hot plate including one or more resistive heating elements. In some embodiments, the heater 208 comprises one or more infrared (IR) lamps arranged in a suitable pattern. In some embodiments, the heater 208 is configured to heat the substrate 240 to about 70 to about 150 degrees Celsius.

[0023] A substrate support 232 configured to support a substrate 240 is disposed in the interior volume 204. In some embodiments, the substrate support 232 is configured to support the substrate 240 about 0.2 mm to about 3 mm from the heater 208. The substrate 240 may be one of the one or more substrates 112 of Figure 1. The substrate support 232 has a direct line of sight with the heater 208 such that during use, heat from the heater 208 can impinge upon the substrate support 232 or the substrate 240 when disposed on the substrate support via convection. In some embodiments, an edge ring 220 is disposed on the substrate support 232 and configured to surround the substrate 240 to enhance temperature uniformity of the substrate 240. In some embodiments, the substrate support 232 is a simple support configured to support the substrate 240 via gravity and with no chucking features, for example, no electrostatic chucking or vacuum chucking features. In some embodiments, the substrate support 232 does not include any heating or cooling features. For example, the substrate support 232 does not include any cooling channels. In some embodiments, the interior volume 204 does not include any other heating elements besides the heater 208. In some embodiments, an outer diameter or width of the heater 208 is greater than an outer diameter or width of the substrate 240. In some embodiments, the heater 208 is sized similar to the substrate 240 and the edge ring 220 together.

[0024] In some embodiments, a lift mechanism 242 is coupled to the substrate support 232 and configured to raise or lower the substrate support 232 in the interior volume 204. In some embodiments, the substrate support 232 includes one or more

[0029] At 404, the method includes opening a vacuum valve (*e.g.,* vacuum valve 236) to pump down the interior volume of the baking chamber to a vacuum pressure via a vacuum pump (*e.g.,* vacuum pump 230). Pumping down the interior volume to a vacuum pressure dilutes or removes unwanted gases from the interior volume such as, for example, oxygen gas, water vapor, sulfur dioxide, and ammonium, which may react with the dissociated residue.

[0030] At 406, the method includes closing the vacuum valve and opening a gas inlet valve (*e.g.,* gas inlet valve 224) to fill the interior volume with an inert gas. The inert gas may be provided via a gas supply (*e.g.,* gas supply 250). In some embodiments, filling the interior volume with inert gas further comprises maintaining a partial pressure of one or more of oxygen gas, water vapor, sulfur dioxide gas, or ammonium in the interior volume at a desired level. In some embodiments, the desired level is a concentration at or below 1 part per million (ppm). The gas inlet valve 224 may be closed after filling the interior volume with the inert gas.

[0031] In some embodiments, if the desired partial pressure is not achieved after a first pump down and inert gas fill, the gas inlet valve is closed, and the vacuum valve is opened again to evacuate the interior volume. In some embodiments, the vacuum valve is closed, the gas inlet valve is opened to refill the interior volume with additional inert gas, and the gas inlet valve is closed when refill is complete. The pump down and refill process may be repeated in in the above-described manner one or more times until the partial pressure of one or more of oxygen gas, water vapor, sulfur dioxide gas, or ammonium in the interior volume is at a desired level.

[0032] At 408, the method 400 includes baking the substrate via convection using a heater (*e.g.,* heater 208) disposed in the interior volume of the baking chamber to dissociate residue on the substrate. In some embodiments, an atmospheric pressure is maintained in the interior volume during baking. In some embodiments, baking the substrate comprises heating the substrate to a temperature of about 70 to about 150 degrees Celsius. In some embodiments, the baking time may be about 1 minutes to about 15 minutes. Once baking is complete, the substrate may be removed from the baking chamber via the transfer slot.

Claims:

1. A baking chamber for baking a photomask, comprising:

a chamber body enclosing an interior volume;

a heater disposed in the interior volume, wherein the heater is configured to have a surface temperature of about 100 to about 400 degrees Celsius during use;

a substrate support configured to support a substrate having a given diameter and disposed in the interior volume, wherein the substrate support has a direct line of sight with the heater such that the heater heats the substrate support via convection; and

a gas inlet and a gas outlet coupled to the interior volume on opposing sides of the chamber body.

2. The baking chamber of claim 1, further comprising an edge ring disposed on the substrate support and configured to surround the substrate.

3. The baking chamber of claim 2, wherein the edge ring has a width from an outer sidewall of the edge ring to the central opening of about 1.5 inches to about 3.0 inches.

4. The baking chamber of claim 2, wherein the substrate is a photomask and the edge ring has a square central opening configured to receive the photomask during use.

5. The baking chamber of claim 1, wherein the substrate support is configured to support the substrate via gravity and does not comprise an electrostatic chuck or vacuum chuck.

6. The baking chamber of claim 1, wherein the heater comprises a hot plate including one or more resistive heating elements.

7. The baking chamber of claim 1, wherein the heater has an outer diameter greater than the given diameter of the substrate.

8. The baking chamber of claim 1, wherein the heater comprises one or more infrared (IR) lamps.

9. The baking chamber of any of claims 1 to 8, wherein the substrate support is configured to support the photomask about 0.2 mm to about 3 mm from the heater.

10. The baking chamber of any of claims 1 to 8, wherein the heater is configured to heat the photomask to about 70 to about 150 degrees Celsius.

11. The baking chamber of any of claims 1 to 8, wherein the substrate support includes one or more lift pin openings.

12. A multi-chamber process tool for processing a substrate, comprising:

a wet clean chamber for cleaning the substrate; and

the baking chamber of any of claims 1 to 8 configured to heat the substrate to remove residue or haze left over after a wet clean process performed in the wet clean chamber.

13. The multi-chamber process tool of claim 12, further comprising:

a vacuum pump coupled to the gas outlet;

a vacuum valve disposed between the vacuum pump and the gas outlet;

a gas supply coupled to the gas inlet; and

a gas inlet valve disposed between the gas supply and gas inlet.

14. The multi-chamber process tool of claim 12, wherein the gas inlet is disposed vertically above the gas outlet.

15. The multi-chamber process tool of claim 12, wherein the gas supply comprises essentially of an inert gas.

16. A method of baking a substrate in a baking chamber, comprising:

placing a substrate on a support in an interior volume of the baking chamber;

opening a vacuum valve to pump down the interior volume of the baking chamber to a vacuum pressure via a vacuum pump;

closing the vacuum valve and opening a gas inlet valve to fill the interior volume with an inert gas; and

baking the substrate via convection using a heater disposed in the interior volume of the baking chamber to dissociate residue on the substrate.

17. The method of claim 16, wherein baking the substrate comprises heating the substrate to a temperature of about 70 to about 150 degrees Celsius.

18. The method of claim 16, further comprising:

prior to baking the substrate, opening the vacuum valve after filling the interior volume with the inert gas and subsequently using the vacuum pump to evacuate the inert gas;

closing the vacuum valve;

opening the gas inlet valve and refilling the interior volume with additional inert gas; and

closing the gas inlet valve.

19. The method of any of claims 16 to 18, further comprising maintaining an atmospheric pressure in the interior volume during baking.

20. The method of any of claims 16 to 18, wherein filling the interior volume with inert gas further comprises maintaining a concentration of one or more of oxygen gas, water vapor, sulfur dioxide gas, or ammonium in the interior volume at or below 1 part per million (ppm).