The shaft 126 extends through a central column 128. The shaft 126 includes a second end 130 attached to the central column 128 and a first end 132 positioned proximate a center region 134 of the semiconductor wafer 114. The shaft 126 has a shaft diameter 136 of about 5 millimeters (mm) to about 20 mm.

[0029] The shaft 126 is connected to a suitable rotation mechanism (not shown) for rotation of the shaft 126, susceptor 120, and semiconductor wafer 114 about a longitudinal axis X with respect to the apparatus 100. The outside edge of the susceptor 120 and inside edge of the preheat ring 118 (shown in FIG. 3) are separated by a gap 138 to allow rotation of the susceptor. The semiconductor wafer 114 is rotated to prevent an excess of material from being deposited on the wafer leading edge and provide a more uniform epitaxial layer.

[0030] The apparatus 100 also includes a cap 140 positioned on the shaft 126 within the reaction chamber 102 for reducing heat absorbed by the center region 134 of the semiconductor wafer 114. The cap 140 is attached to the first end 132 of the shaft 126 proximate the center region 134 of the semiconductor wafer 114 to block radiant heat from the lower high intensity lamp 124 from heating the center region of the semiconductor wafer. Reducing radiant heat to the center region 134 of the semiconductor wafer 114 reduces a temperature of the center region while maintaining a temperature of outer radial regions 142 of the semiconductor wafer 114, generating a uniform temperature profile of the semiconductor wafer.

[0031] The cap 140 includes a tube 144 and a disc 146 attached to the tube. In the illustrated embodiment, the tube 144 and the disc 146 are integrally formed together such that the cap 140 has a unitary construction. In alternative embodiments, the tube 144 and the disc 146 may be formed separately and attached to each other. The tube 144 includes a cylindrical wall 148 having a first end 150, a second end 152, and a tube length 154 and defining a tube conduit 156 and a tube diameter 158. The first end 150 defines a first end opening 160, and the second end 152 defines a second end opening 162. The tube diameter 158 is larger than the shaft diameter 136 such that the first end 132 of the shaft 126 is inserted into the first end opening 160 and the first end 150 circumscribes the first end of the shaft. The second end 152 is attached to the disc 146.

[0032] The disc 146 includes an annular disc 164 defining a disc hole 166, an inner diameter 168, an outer diameter 170, and a disc thickness 172. The tube diameter 158 and the inner diameter 168 are the same, or substantially equal, such that the cylindrical wall 148 is substantially flush with the disc hole 166 and the tube conduit 156 and the disc hole define a cap conduit 174 extending through the cap 140. In alternative embodiments, the tube diameter 158 is larger than the inner diameter 168, and the tube conduit 156 and the disc hole 166 define the cap conduit 174.

[0033] The annular disc 164 has a first side 176 and a second side 178, and the first side of the annular disc is attached to the second end 152 of the tube 144. The first side 176 of the annular disc 164 is

CLAIMS:

1. A reaction apparatus for contacting a process gas on a semiconductor wafer during a wafering process, the semiconductor wafer defining a center region, the reaction apparatus comprising:

an upper dome;

a lower dome attached to the upper dome, the upper dome and the lower dome defining a reaction chamber;

a shaft for supporting the semiconductor wafer within the reaction chamber; and

a cap positioned on the shaft within the reaction chamber for reducing heat absorbed by the center region of the semiconductor wafer, the cap attached to a first end of the shaft, the cap comprising:

a tube defining a tube diameter larger than a shaft diameter of the shaft, wherein the tube circumscribes the first end of the shaft; and

a disc attached to the tube, wherein the disc is opaque to absorb radiant heat and is positioned to block radiant heat from heating the center region of the semiconductor wafer, wherein the disc is positioned a distance below the center region of the susceptor, the disc comprising an annular disc defining a disc hole and having an inner diameter, the inner diameter being the same as the tube diameter.

2. The reaction apparatus of claim 1 further comprising a lower high intensity lamp positioned below the cap within the reaction chamber for heating the

semiconductor wafer, wherein the disc blocks radiant heat from the lower high intensity lamp from heating the center region of the semiconductor wafer.

3. The reaction apparatus of claim 1, wherein the wafering process is epitaxial chemical vapor deposition.

4. The reaction apparatus of claim 1, wherein the distance the disc is positioned below the center region of the semiconductor wafer is less than 5 millimeters.

5. A method of manufacturing a semiconductor wafer in a reaction apparatus, the reaction apparatus including an upper dome and a lower dome defining a reaction chamber and a shaft for supporting the semiconductor wafer, the reaction apparatus further including a cap positioned on the shaft within the reaction chamber for reducing heat absorbed by a center region of the semiconductor wafer, the cap including a tube and a disc attached to the tube, the method comprising:

channeling a process gas into the reaction chamber;

heating the semiconductor wafer with a high intensity lamp;

blocking radiant heat from the high intensity lamp from heating the center region of the semiconductor wafer with the disc, the disc being made of an opaque material to absorb radiant heating produced by the high intensity lamp, wherein the disc generates a uniform

temperature distribution on the semiconductor wafer, the disc comprising an annular disc defining a disc hole and having an inner diameter, the inner diameter being the same as a diameter of the tube; and

depositing a layer on the semiconductor wafer with the process gas, wherein the uniform temperature distribution forms a uniform thickness of the layer on the semiconductor wafer.

6. The method of claim 5, wherein the step of depositing is performed by epitaxial chemical vapor deposition.

7. The method of claim 5, further comprising the steps of rotating the semiconductor wafer with respect to the reaction apparatus.

8. A reaction apparatus for contacting a process gas on a semiconductor wafer during a wafering process, the semiconductor wafer defining a center region, the reaction apparatus comprising:

an upper dome;

a lower dome attached to the upper dome, the upper dome and the lower dome defining a reaction chamber;

a susceptor for supporting the semiconductor wafer within the reaction chamber, wherein the susceptor is supported by a shaft;

a cap positioned on the shaft within the reaction chamber for reducing heat absorbed by the center

region of the semiconductor wafer, the cap attached to a first end of the shaft, the cap comprising:

a tube defining a tube outer diameter and a tube inner diameter larger than a shaft diameter of the shaft, wherein the tube circumscribes the first end of the shaft; and

a disc attached to the tube, the disc defining a disc outer diameter, the disc outer diameter being greater than the tube outer diameter, wherein the disc is generally opaque to absorb radiant heat and is positioned to block the radiant heat from heating the center region of the semiconductor wafer, wherein the disc is positioned a distance below the center region of the semiconductor wafer and the susceptor; and

a temperature sensor mounted on the reaction chamber, the temperature sensor being separate from the cap.

9. The reaction apparatus of claim 8 further comprising a lower high intensity lamp positioned below the cap within the reaction chamber for heating the semiconductor wafer, wherein the disc blocks radiant heat from the lower high intensity lamp from heating the center region of the semiconductor wafer.

10. The reaction apparatus of claim 8, wherein the wafering process is epitaxial chemical vapor deposition.

11. The reaction apparatus of claim 8, wherein the disc includes an annular disc defining a disc hole,

the disc hole having a diameter, the disc outer diameter being larger than the diameter of the disc hole.

12. The reaction apparatus of claim 11, wherein the inner tube diameter is substantially equal to the diameter of the disc hole.

13. The reaction apparatus of claim 8, wherein the disc is positioned below the center region of the semiconductor wafer a distance less than 5 millimeters.