Claims:

1. A substrate processing system, comprising:

a process chamber having a substrate support disposed therein, wherein, optionally, the substrate support may rotate about a central axis;

a light source disposed above the process chamber to direct energy towards the substrate support; and

a window assembly disposed between the light source and the substrate support to allow light energy provided by the light source to enter the process chamber towards the substrate support, wherein the window assembly includes an inlet to receive a process gas and one or more outlets to distribute the process gas into the process chamber.

2. The system of claim 1, wherein at least one of the one or more outlets has at least one of the following:

a varying cross-section along an axis parallel to the direction of gas flow; or

a central axis that is non-perpendicular to a support surface of the substrate support.

3. The system of claims 1-2, wherein the window assembly further comprises:

an upper window; and

a lower window disposed below the upper window and defining a gap therebetween to flow the process gas provided from the inlet, wherein the one or more outlets are disposed in the lower window.

4. The system of claim 3, wherein the one or more outlets are disposed in two or more zones.

5. The system of claim 3, wherein the one or more outlets are symmetrically arranged in a region opposite the substrate support, or wherein the one or more outlets are asymmetrically arranged in a region opposite the substrate support.

6. The system of any of claim 3, wherein the one or more outlets are disposed in a linear arrangement.

7. The system of any of claims 1-2, wherein the window assembly further comprises:

an upper window; and

a conduit disposed below the upper window and having the inlet disposed at a first end thereof to receive the process gas, wherein the conduit has one or more outlets to flow the process gas into the process chamber.

8. The system of claim 7, wherein the conduit extends along a line which intersects a central axis of the substrate support.

9. The system of claim 7, wherein the conduit extends across only a portion of the upper window.

10. The system of claim 7, wherein the window assembly further comprises:

a second conduit disposed below the upper window to flow a second process gas therethrough and having one or more second outlets disposed therethrough to facilitate the flow of the second process gas into the process chamber.

11. A method for providing a process gas to a substrate, comprising:

providing a gas to an inlet of a window assembly disposed in a process chamber between a substrate support and a light source configured to direct energy towards the substrate support;

flowing the gas through the window assembly; and

flowing the gas into the process chamber through one or more outlets disposed in the window assembly.

12. The method of claim 11, wherein flowing the gas through the window assembly further comprises at least one of:

flowing the gas through a gap disposed between an upper window and a lower window of the window assembly, wherein the one or more outlets are disposed in the lower window; or

flowing the gas through a conduit disposed beneath an upper window of the window assembly, wherein the one or more outlets are disposed in the conduit.

13. The method of claim 11, wherein flowing the gas through the window assembly further comprises flowing the gas through a conduit disposed beneath an upper window, wherein the one or more outlets are disposed in the conduit, and further comprising:

flowing a second gas through a second conduit disposed beneath the upper window and having one or more outlets are disposed in the second conduit to facilitate flow of the second gas into the process chamber.

14. The method of any of claims 11-13, wherein the one or more outlets disposed in the window assembly are asymmetrically arranged, and further comprising:

rotating the substrate support to provide uniform distribution of the process gas across a surface of a substrate disposed on the substrate support.

15. The method of any of claims 11-13, further comprising:

directing energy from the light source into the process chamber through the window assembly while flowing the gas through the window assembly.

Claims

1. A substrate processing system, comprising:

a process chamber having a substrate support disposed therein;

a light source disposed above the process chamber to direct energy towards the substrate support; and

a window assembly disposed between the light source and the substrate support to allow light energy provided by the light source to enter the process chamber towards the substrate support, wherein the window assembly includes an inlet to receive a process gas, one or more outlets to distribute the process gas into the process chamber, an upper window, and a conduit disposed below the upper window and having the inlet disposed at a first end thereof to receive the process gas, wherein the conduit has one or more outlets to flow the process gas into the process chamber.

2. The system of claim 1, wherein at least one of the one or more outlets are round, rectangular, square, oval, polygonal, slotted, or combinations thereof.

3. The system of claim 1, wherein at least one of the one or more outlets has a varying cross-section along an axis parallel to the direction of gas flow.

4. The system of claim 1, wherein at least one of the one or more outlets has a central axis that is non-perpendicular to a support surface of the substrate support.

5. The system of claim 1, wherein the substrate support rotates about a central axis.

6. The system of claim 1, wherein the one or more outlets are disposed in two or more zones.

7. The system of claim 1, wherein the one or more outlets are symmetrically arranged in a region opposite the substrate support.

8. The system of claim 1, wherein the one or more outlets are asymmetrically arranged in a region opposite the substrate support.

9. The system of claim 1, wherein the one or more outlets are disposed in a linear arrangement.

10. The system of claim 1, wherein the conduit extends along a line which intersects a central axis of the substrate support.

11. The system of claim 1, wherein the conduit extends across only a portion of the upper window.

12. The system of claim 1, wherein the window assembly further comprises:

a second conduit disposed below the upper window to flow a second process gas therethrough and having one or more second outlets disposed therethrough to facilitate the flow of the second process gas into the process chamber.

13. A method for providing a process gas to a substrate, comprising:

providing a gas to an inlet of a window assembly disposed in a process chamber between a substrate support and a light source configured to direct energy towards the substrate support;

flowing the gas through a conduit disposed beneath an upper window of the window assembly; and

flowing the gas into the process chamber through one or more outlets disposed in the window assembly, wherein the one or more outlets are disposed in the conduit.

14. The method of claim 13, further comprising:

flowing a second gas through a second conduit disposed beneath the upper window and having one or more outlets are disposed in the second conduit to facilitate flow of the second gas into the process chamber.

15. The method of claim 13, wherein the one or more outlets disposed in the window assembly are asymmetrically arranged, and further comprising:

rotating the substrate support to provide uniform distribution of the process gas across a surface of a substrate disposed on the substrate support.

16. The method of claim 13, further comprising:

directing energy from the light source into the process chamber through the window assembly while flowing the gas through the window assembly.

17. A substrate processing system, comprising:

a process chamber having a substrate support disposed therein;

a light source disposed above the process chamber to direct energy towards the substrate support; and

a window assembly disposed between the light source and the substrate support to allow light energy provided by the light source to enter the process chamber towards the substrate support, wherein the window assembly includes an inlet to receive a process gas and one or more outlets asymmetrically arranged in a region opposite the substrate support to distribute the process gas into the process chamber.

18. The substrate processing system of claim 17, further comprising a substrate support which rotates about a central axis.

19. A method for providing a process gas to a substrate, comprising:

providing a gas to an inlet of a window assembly disposed in a process chamber between a substrate support and a light source configured to direct energy towards the substrate support;

flowing the gas through the window assembly;

flowing the gas into the process chamber through one or more asymmetrically arranged outlets disposed in the window assembly; and

rotating the substrate support to provide uniform distribution of the process gas across a surface of a substrate disposed on the substrate support.

20. A substrate processing system, comprising:

a process chamber having a substrate support disposed therein;

a light source disposed above the process chamber to direct energy towards the substrate support; and

a window assembly disposed between the light source and the substrate support to allow light energy provided by the light source to enter the process chamber towards the substrate support, wherein the window assembly includes an inlet to receive a process gas and one or more outlets to distribute the process gas into the process chamber, wherein the one or more outlets are either symmetrically or asymmetrically arranged in a region opposite the substrate support, and wherein at least one of the one or more outlets has at least one of a varying cross-section along an axis parallel to the direction of gas flow or a central axis that is non-perpendicular to a support surface of the substrate support.