CLAIMS

1. A collimator assembly, comprising:

a collimator portion, comprising:

a first surface and an opposed second surface facing away from the first surface, the second surface having a first portion a first distance from the first surface, a second portion a second distance from the first surface, and a third portion extending between the first and second portions and in a direction of the first surface;

a honeycomb structure having walls defining and separating individual apertures extending from the first surface to the second surface, wherein the individual apertures include:

a first plurality of hexagonal apertures in a central region each of the first plurality of hexagonal apertures having a first aspect ratio and extending from the first surface to the second portion of the second surface;

a second plurality of apertures in a peripheral region each of the second plurality of apertures having a second aspect ratio less than the first aspect ratio and extending from the first surface to the first portion of the second surface; and

a third plurality of apertures in a transitional region disposed from the peripheral region to the central region,

wherein at least one of the walls defining each of the third plurality of apertures of the transitional region comprises the third portion of the second surface and the third portion of the second surface lies along a conical projection; and

a shield portion coupled with the collimator portion, the shield portion comprising:

a top ring;

a support ledge below the top ring, the support ledge extending radially outward; and

a cylindrical band extending downward from the support ledge to an elevation below the second plurality of apertures, wherein the cylindrical band, comprises:

a first substantially vertical portion;

a radially inward sloped portion extending downward from the first substantially vertical portion; and

a second substantially vertical portion extending downward from the radially inward sloped portion,

wherein the second substantially vertical portion does not extend to an elevation below the first plurality of hexagonal apertures, and

wherein the radially inward sloped portion extends across a portion of the second plurality of apertures in the peripheral region.

2. The collimator assembly of claim 1, wherein the radially inward sloped portion has an angle from about 40 to about 50 degrees relative to the first substantially vertical portion.

3. The collimator assembly of claim 1, wherein the first plurality of hexagonal apertures, the second plurality of apertures, and the third plurality of apertures are textured.

4. The collimator assembly of claim 1, wherein an upper portion of the walls includes an entrance angle portion.

5. The collimator assembly of claim 4, wherein the entrance angle portion has a predetermined angle of from about 2 degrees to about 16 degrees.

6. The collimator assembly of claim 5, wherein the predetermined angle is about 2.5 degrees and has a length of about 2.54 centimeters.

7. The collimator assembly of claim 1, wherein the first aspect ratio of the first plurality of hexagonal apertures is from about 2.5:1 to about 3:1.

8. The collimator assembly of claim 7, wherein the second aspect ratio is from about 1:1 to about 2:1.

9. A substrate-processing chamber, comprising:

a chamber body defining an inner volume;

a sputtering target disposed in an upper portion of the inner volume;

a substrate support disposed below the sputtering target;

a collimator assembly for encircling the sputtering target, comprising:

a collimator portion, comprising:

a first surface and an opposed second surface facing away from the first surface, the second surface having a first portion a first distance from the first surface, a second portion a second distance from the first surface, and a third portion extending between the first and second portions and in a direction of the first surface;

a honeycomb structure having walls defining and separating individual apertures extending from the first surface to the second surface, wherein the individual apertures include:

a first plurality of hexagonal apertures in a central region each of the first plurality of hexagonal apertures having a first aspect ratio and extending from the first surface to the second portion of the second surface;

a second plurality of apertures in a peripheral region each of the second plurality of apertures having a second aspect ratio less than the first aspect ratio and extending from the first surface to the second portion of the second surface; and

a third plurality of apertures in a transitional region disposed from the peripheral region to the central region,

wherein at least one of the walls defining each of the third plurality of apertures of the transitional region comprises the third portion of

the second surface and the third portion of the second surface lies along a conical projection; and

a shield portion coupled with the collimator portion, comprising:

a top ring;

a support ledge below the top ring, the support ledge extending radially outward; and

a cylindrical band extending downward from the support ledge to an elevation below the second plurality of apertures, wherein the cylindrical band comprises:

a first substantially vertical portion;

a radially inward sloped portion extending downward from the first substantially vertical portion; and

a second substantially vertical portion extending downward from the radially inward sloped portion,

wherein the second substantially vertical portion does not extend to an elevation below the first plurality of hexagonal apertures, and

wherein the radially inward sloped portion extends across a portion of the second plurality of apertures in the peripheral region.

10. The substrate-processing chamber of claim 9, wherein the radially inward sloped portion has an angle from about 40 to about 50 degrees relative to the first substantially vertical portion.

11. The substrate-processing chamber of claim 9, wherein the first plurality of hexagonal apertures, the second plurality of apertures, and the third plurality of apertures are textured.

12. The substrate-processing chamber of claim 9, wherein an upper portion of the walls includes an entrance angle portion.

13. The substrate-processing chamber of claim 12, wherein the entrance angle portion has a predetermined angle of from about 2 degrees to about 16 degrees.

14. The substrate-processing chamber of claim 13, wherein the predetermined angle is about 2.5 degrees and has a length of about 2.54 centimeters.

15. The substrate-processing chamber of claim 9, wherein the first aspect ratio of the first plurality of hexagonal apertures is from about 2.5:1 to about 3:1.

16. The substrate-processing chamber of claim 15, wherein the second aspect ratio is from about 1:1 to about 2:1.

17. The collimator assembly of claim 1, wherein the first aspect ratio is defined by a depth, which is the first distance from the first surface to the first portion of the second surface divided by a width, which is a distance between opposing walls of the hexagonal aperture.

18. The collimator assembly of claim 17, wherein the second aspect ratio is defined by a depth, which is the second distance extending from the first surface to the second portion of the second surface divided by a width between opposing walls of the aperture of the second plurality of apertures.

19. The substrate-processing chamber of claim 9, wherein the first aspect ratio is defined by a depth, which is the first distance from the first surface to the first portion of the second surface divided by a width, which is a distance between opposing walls of the hexagonal aperture.

20. The substrate-processing chamber of claim 19, wherein the second aspect ratio is defined by a depth, which is the second distance extending from the first surface to the second portion of the second surface divided by a width between opposing walls of the aperture of the second plurality of apertures.