Claims:

1. A process kit, comprising:

a deposition ring configured to be disposed on a substrate support, the deposition ring comprising:

an annular band configured to rest on a lower ledge of the substrate support, the annular band having an upper surface and a lower surface, the lower surface including a step between a radially inner portion and a radially outer portion, the step extending downward from the radially inner portion to the radially outer portion so that a thickness of annular band increases from the radially inner portion to the radially outer portion;

an inner lip extending upwards from the upper surface of the annular band and adjacent an inner surface of the annular band, wherein an inner surface of the inner lip and the inner surface of the annular band together form a central opening of the deposition ring, and wherein a depth between an upper surface of the annular band and a horizontal portion of the upper surface of the inner lip is between 6.0 mm and 12.0 mm;

a channel disposed radially outward of and beneath the annular band; and

an outer lip extending upwardly and disposed radially outward of the channel.

2. The process kit of claim 1, wherein the channel is defined by a first leg extending downwardly from adjacent an outer surface of the annular band, a second leg extending radially outward from a bottom portion of the first leg, and the outer lip extending upwardly from the second leg.

3. The process kit of claim 1, wherein the depth between the upper surface of the annular band and the upper surface of the inner lip is between 7.0 mm and 10.0 mm.

4. The process kit of claim 1, wherein the annular band includes the upper surface that is generally flat.

5. The process kit of claim 1, wherein a width of the radially inner portion is between 10.0 mm to 13.0 mm.

6. The process kit of any of claims 1 to 5, wherein a width of the outer lip is greater than a width of the inner lip.

7. The process kit of any of claims 1 to 5, wherein the inner lip of the deposition ring has a width of 1.0 mm to 2.0 mm from a vertical portion of an outer surface of the inner lip to the inner surface of the inner lip, and wherein a width of the outer lip is 2.0 mm to 3.0 mm.

8. The process kit recited in any of claims 1 to 5, wherein a thickness of the annular band from the upper surface to the radially outer portion of the lower surface is 3.75 mm to 4.75 mm.

9. The process kit recited in any of claims 1 to 5, wherein the inner lip includes a plurality of tabs that protrude radially inward.

10. The process kit of any of claims 1 to 5, further comprising a clamp assembly having a clamp that rests within slots disposed in the outer lip of the deposition ring.

11. The process kit of any of claims 1 to 5, further comprising:

a one-piece process kit shield having a cylindrical body having an upper portion and a lower portion and a cover ring section extending radially inward from the lower portion, wherein the cover ring section includes a protrusion extending into the channel of the deposition ring and a recess into which the outer lip extends to define a tortuous flow path between the cover ring section and the deposition ring.

12. The process kit of claim 11, wherein the one-piece process kit shield further comprises:

an adapter section extending radially outward from the upper portion; and

a heat transfer channel extending through the adapter section.

13. A process chamber, comprising:

a chamber wall defining an inner volume within the process chamber;

a target disposed in an upper section of the inner volume;

a substrate support disposed in the inner volume opposite the target;

the process kit of any of claims 1 to 5, wherein the deposition ring is disposed on the substrate support; and

a one-piece process kit shield having a cylindrical body having an upper portion and a lower portion and a cover ring section extending radially inward from the lower portion, wherein the upper portion includes an adapter section extending radially outward from the upper portion, the adapter section supported by the chamber wall, and a heat transfer channel disposed in the adapter section, and wherein the cover ring section includes a protrusion extending into the channel of the deposition ring and a recess into which the outer lip extends to define a tortuous flow path between the cover ring section and the deposition ring.

14. The process chamber of claim 13, further comprising a clamp assembly to clamp the deposition ring to the substrate support, the claim assembly having a base plate coupled to the substrate support and a clamp rotatably disposed within an opening in the base plate.

15. The process chamber of claim 14, wherein the clamp includes a shaft and a tab that extends radially outwards from a top portion of the shaft, the tab configured to rest within a slot of the deposition ring, and wherein the clamp assembly optionally further includes a bushing disposed about the clamp above the base plate and a fastener that couples the clamp to a washer disposed about the clamp below the base plate.