CLAIMS

1. A gas distribution apparatus comprising:

a remote plasma source having a faceplate;

an ion blocker having a back surface facing the faceplate and a front surface defining a thickness, the back surface of the ion blocker spaced a distance from the faceplate to form a gap, the ion blocker comprising a plurality of openings extending through the thickness;

a showerhead having a back surface and a front surface, the back surface of the showerhead facing and spaced from the front surface of the ion blocker, the showerhead comprising a plurality of apertures to allow radicals from the remote plasma source to flow through the showerhead; and

a voltage regulator connected to the ion blocker and the showerhead to polarize the ion blocker relative to the showerhead;

wherein the ion blocker is polarized relative to the showerhead so that there are substantially no plasma gas ions passing through the showerhead.

2. The gas distribution apparatus of claim 1, wherein the showerhead is a dual channel showerhead having a first gas channel and a second gas channel.

3. The gas distribution apparatus of claim 2, wherein the first gas channel of the dual channel showerhead is in fluid communication with the gap between the ion blocker and the faceplate so that the plurality of apertures in the showerhead comprises a first plurality of apertures that extend from the front surface to the back surface of the showerhead.

4. The gas distribution apparatus of claim 3, wherein the second gas channel of the dual channel showerhead is in fluid communication with a second plurality of apertures in the front surface of the showerhead and none of the second plurality of apertures directly connects the second gas channel with the back surface of the showerhead.

5. The gas distribution apparatus of claim 3, wherein at least some of the openings in the ion blocker are aligned with at least some of the first plurality of openings in the showerhead.

6. The gas distribution apparatus of claim 3, wherein each of the openings in the ion blocker are aligned with one of the first plurality of openings in the showerhead.

7. The gas distribution apparatus of claim 1, wherein voltage regulator is configured to provide a direct current (DC) polarization of the ion blocker relative to the showerhead in the range of about ±2V to about ±100V.

8. The gas distribution apparatus of claim 1, wherein the voltage regulator is configured to provide a direct current (DC) polarization of the ion blocker relative to the showerhead in the range of about ±5V to about ±50V.

9. The gas distribution apparatus of claim 1, wherein the openings in the ion blocker have a diameter in the range of about 1/8” to about 1/2".

10. A processing chamber comprising the gas distribution apparatus of claim 1.

11. The processing chamber of claim 10, further comprising a substrate support having a support surface facing the front surface of the showerhead.

12. The processing chamber of claim 11, further comprising a controller having one or more configurations selected from a configuration to: rotate the substrate support around a central axis; provide a flow of gas into the remote plasma source; generate a plasma in the remote plasma source; provide a voltage differential between the ion blocker and the showerhead.

13. A method of providing radicals to a processing chamber, the method comprising:

generating a plasma comprising a first amount of ions and radicals in a plasma cavity bounded by an ion blocker;

polarizing the ion blocker to decrease ions passing through openings in the ion blocker from the first amount of ions to a second amount and generate a flow of radicals; and

passing the flow of radicals through a shower head adjacent to and spaced from the ion blocker, the showerhead comprising a plurality of apertures to allow the radicals to pass through the showerhead,

wherein the ion blocker is polarized relative to the showerhead so that there are substantially no plasma gas ions passing through the showerhead.

14. The method of claim 13, wherein the plasma gas comprises one or more of oxygen (O_2) or argon (Ar).

15. The method of claim 13, wherein the ion blocker is polarized relative to the showerhead so that there are substantially no plasma gas ions passing through the showerhead.

16. The method of claim 13, wherein the ion blocker is polarized with a voltage regulator configured to provide a direct current (DC) polarization of the ion blocker relative to the showerhead in the range of about ±2V to about ±100V.

17. The gas distribution apparatus of claim 1, wherein the voltage regulator is configured to provide a direct current (DC) polarization of the ion blocker relative to the showerhead in the range of about ±5V to about ±50V.

18. The method of claim 13, wherein the openings in the ion blocker have a diameter in the range of about 1/8” to about 1/2".

19. A non-transitory computer readable medium including instructions, that, when executed by a controller of a processing chamber, cause the processing chamber to perform operations of:

generating a plasma comprising a first amount of ions and radicals in a plasma cavity;

polarizing an ion blocker relative to a showerhead so that there are substantially no plasma gas ions passing through the showerhead; and

providing a flow of plasma gas into a plasma cavity bounded by an ion blocker.