CLAIMS

1. A deposition method, comprising:

flowing a silicon-containing precursor into a processing region of a semiconductor processing chamber;

striking a plasma in the silicon-containing precursor in the processing region between a faceplate and a pedestal of the semiconductor processing chamber, the pedestal supporting a substrate comprising a patterned photoresist;

maintaining a temperature of the substrate less than or equal to 200 °C; and

depositing a silicon-containing film along the patterned photoresist.

2. The deposition method of claim 1, further comprising:

maintaining the semiconductor processing chamber at a process pressure greater than or equal to 0.5 Torr.

3. The deposition method of claim 1, wherein the patterned photoresist defines a top, a sidewall, and a bottom of a feature, and wherein the silicon-containing film is characterized by a thickness overlying the top at least 40% of a thickness on the sidewall.

4. The deposition method of claim 3, wherein the silicon-containing film is characterized by the thickness on the sidewall at least 50% of a thickness on the bottom.

5. The deposition method of claim 1, wherein the plasma is struck by a pulsed power source operating at a pulsing frequency greater than or equal to 5 kHz, a duty cycle less than 10%, and a power less than or equal to 300 W.

6. The deposition method of claim 1, wherein a spacing between the faceplate and the pedestal is greater than or equal to 400 mils.

7. The deposition method of claim 1, further comprising:

flowing hydrogen with the silicon-containing precursor, wherein the hydrogen is introduced at a flowrate greater than or equal to 300 sccm.

8. A deposition method, comprising:

flowing a silicon-containing precursor into a processing region of a semiconductor processing chamber;

striking a plasma in the processing region between a faceplate and a pedestal of the semiconductor processing chamber, the pedestal supporting a substrate comprising a patterned photoresist;

maintaining a temperature of the substrate less than or equal to 200 °C; and

depositing an amorphous silicon film along the patterned photoresist.

9. The deposition method of claim 8, wherein the temperature of the substrate is maintained at less than or equal to 100 °C.

10. The deposition method of claim 8, wherein the patterned photoresist defines a top, a sidewall, and a bottom of a feature, and wherein the amorphous silicon film is characterized by a thickness overlying the top at least 40% of a thickness on the sidewall.

11. The deposition method of claim 10, wherein the amorphous silicon film is characterized by the thickness on the sidewall at least 50% of a thickness on the bottom.

12. The deposition method of claim 8, wherein the plasma is struck by a pulsed power source operating at a pulsing frequency greater than or equal to 5 kHz, a duty cycle less than 10%, and a power less than or equal to 300 W.

13. The deposition method of claim 8, wherein a spacing between the faceplate and the pedestal is greater than or equal to 400 mils.

14. The deposition method of claim 8, further comprising:

flowing hydrogen with the silicon-containing precursor, wherein the hydrogen is introduced at a flowrate greater than or equal to 300 sccm.

15. A deposition method, comprising:

flowing a silicon-containing precursor into a processing region of a semiconductor processing chamber, the silicon-containing precursor comprising oxygen;

striking a plasma in the silicon-containing precursor in the processing region between a faceplate and a pedestal of the semiconductor processing chamber, the pedestal supporting a substrate comprising a patterned photoresist;

maintaining a temperature of the substrate less than or equal to 200 °C; and

depositing a silicon oxide film along the patterned photoresist.

16. The deposition method of claim 15, wherein the temperature of the substrate is maintained at less than or equal to 100 °C.

17. The deposition method of claim 15, wherein the plasma is struck by a pulsed power source operating at a pulsing frequency greater than or equal to 5 kHz, a duty cycle less than 10%, and a power less than or equal to 300 W.

18. The deposition method of claim 15, wherein a spacing between the faceplate and the pedestal is greater than or equal to 400 mils.

19. The deposition method of claim 15, wherein flowing the silicon-containing precursor comprises flowing nitric oxide and silane into the processing region at a volumetric flow ratio less than or equal to 2:1.

20. The deposition method of claim 15, further comprising:

flowing hydrogen with the silicon-containing precursor, wherein the hydrogen is introduced at a flowrate greater than or equal to 300 sccm.