Claims:

1. A method comprising:

introducing a treatment gas to a process volume of a process chamber, wherein the treatment gas comprises a silane gas and an oxygen-containing gas;

energizing the silane gas using a silane flow (sccm) to power (W) ratio of less than 0.07, wherein energizing the silane gas forms a silicon oxide (SiO_x) film over a process chamber component; and

introducing a carbon-containing gas to the process volume to form a silicon-and-carbon-containing film on the process chamber component.

2. The method of claim 1, wherein introducing a carbon-containing gas comprises converting the silicon oxide film to a silicon-and-carbon-containing film comprising silicon oxycarbide (SiOC), silicon carbide (SiC), or combination thereof.

3. The method of claim 2, further comprising etching the silicon-and-carbon-containing film using oxygen plasma.

4. The method of claim 2, wherein the SiO_x film comprises one or more of:

an SiO_x density of about 1.5 g/cc to about 2.6 g/cc, as determined by X-ray reflectrometry;

an SiO_x hardness of about 5 Gpa to about 8 Gpa, as determined based on ISO 14577; and

an SiO_x modulus of about 50 Gpa to about 90 Gpa, as determined based on ISO 14577.

5. The method of claim 2, wherein the silicon-and-carbon-containing film comprises one or more of:

an SiC density of about 2.0 g/cc to about 4.5 g/cc, as determined by X-ray reflectrometry;

an SiC hardness of about 15 Gpa to about 30 Gpa, as determined based on ISO 14577; and

an SiC modulus of about 400 Gpa to about 515 Gpa, as determined based on ISO 14577.

6. The method of claim 1, wherein the silane gas comprises SiH_4, Si_2H_6, SiF_4, SiH_2Cl_2, Si_4H_{10}, Si_5H_{12}, Tetraethyl orthosilicate (TEOS), (3-aminopropyl)triethoxysilane, triethoxymethylsilane, chloropentamethyldisilane, or combination(s) thereof.

7. The method of claim 5, wherein the oxygen-containing gas comprises oxygen (O_2), ozone (O_3), water vapor (H_2O), nitrous oxide, or combination(s) thereof.

8. The method of claim 1, wherein energizing the silane gas with an RF power comprises applying an RF frequency of about 10 MHz to about 16 MHz.

9. The method of claim 7, wherein the carbon-containing gas comprises propylene, acetylene, propane, or combination(s) thereof.

10. The method of claim 5, wherein the carbon-containing gas includes a carrier gas, the carrier gas comprising nitrogen, hydrogen, helium, argon, or combination(s) thereof.

11. The method of claim 1, wherein a temperature of a pedestal is about 400 ºC to about 650 ºC and a pressure of the process volume is about 0.05 Torr to about 12 Torr.

12. The method of claim 1, wherein the treatment gas further comprises a dilution gas comprising nitrogen, argon, helium, or combination(s) thereof.

13. The method of claim 1, further comprising processing a substrate in the process volume at least partially simultaneously with introducing the carbon-containing gas to the process volume such that a carbon-containing film is deposited over the substrate and the silicon oxide (SiO_x) film over the chamber component is converted to the silicon-and-carbon-containing film simultaneously.

14. A method comprising:

introducing a treatment gas to a process volume of a process chamber, wherein the treatment gas comprises a silane gas and an oxygen-containing gas;

energizing the silane gas to form a silicon oxide (SiO_x) film over a process chamber component, wherein a surface roughness (Ra) of the SiO_x film is about 0.1 nm to about 0.4 nm, determined by measuring a surface roughness of a substrate after forming the film over the substrate and measuring the roughness based on atomic force microscopy; and

introducing a carbon-containing gas to the process volume to deposit a carbon-containing film on the process chamber component.

15. The method of claim 14, wherein the process chamber component comprises aluminum.

16. The method of claim 14, wherein the SiO_x film comprises a refractive index (RI) at 633 nm of about 0.2 to about 0.3.

17. The method of claim 14, wherein forming the silicon oxide film over the process chamber component comprises forming the silicon oxide film over an interior surface of orifices of a gas distribution plate using in situ chemical vapor deposition.

18. The method of claim 14, wherein the SiO_x film comprises one or more of:

a thickness of about 7 kA to about 35 kA.

an SiO_x density of about 1.5 g/cc to about 2.6 g/cc, as determined by X-ray reflectrometry;

an SiO_x hardness of about 5 Gpa to about 8 Gpa, as determined based on ISO 14577; and

an SiO_x modulus of about 50 Gpa to about 90 Gpa, as determined based on ISO 14577.

19. A method comprising:

introducing a treatment gas to a process volume of a process chamber, wherein the treatment gas comprises a silane gas and an oxygen-containing gas;

energizing the silane gas to form a silicon oxide (SiO_x) film over a surface of an electrode; and

introducing a carbon-containing gas to the process volume to form a silicon-carbon-containing film on the surface of the electrode, the silicon-carbon-containing film comprising silicon oxide (SiO_x), silicon oxycarbide (SiOC), and silicon carbide (SiC).

20. The method of claim 19, wherein the silicon-carbon-containing film is self-renewing and further comprises one or more of:

a density of about 2.0 g/cc to about 4.5 g/cc, as determined by X-ray reflectrometry;

a hardness of about 15 Gpa to about 30 Gpa, as determined based on ISO 14577;

an oxygen concentration of about 65 atomic % to about 66.2 atomic %; and

a modulus of about 400 Gpa to about 515 Gpa, as determined based on ISO 14577.