CLAIMS

1. A method comprising:

flowing a silicon-containing precursor, a nitrogen-containing precursor, and diatomic hydrogen into a processing region of a semiconductor processing chamber, wherein a substrate is housed within the processing region of the semiconductor processing chamber;

forming a plasma of the silicon-containing precursor, the nitrogen-containing precursor, and the diatomic hydrogen, wherein the plasma is formed at a frequency above 15 MHz; and

depositing a silicon nitride material on the substrate, wherein the silicon nitride material comprises less than or equal to 10% of hydrogen.

2. The method of claim 1, wherein the silicon nitride material is characterized by a density above or equal to 2.85 g/cm^3.

3. The method of claim 1, wherein the silicon nitride material is characterized by a tensile stress above or equal to 400 MPa.

4. The method of claim 1, wherein the silicon nitride material is characterized by a refractive index above or equal to 1.75.

5. The method of claim 1, wherein greater than or equal to 100 sccm of the diatomic hydrogen is flowed into the processing region of the semiconductor processing chamber.

6. The method of claim 5, wherein less than or equal to 5000 sccm of the diatomic hydrogen is flowed into the processing region of the semiconductor processing chamber.

7. The method of claim 1, wherein the plasma is formed at a temperature below or equal to 550 °C.

8. The method of claim 1, wherein the frequency is above or equal to 27 MHz.