Claims

1. A method of processing a substrate, comprising:

exposing the substrate positioned in a processing volume of a processing chamber to a hydrocarbon-containing gas mixture;

exposing the substrate to a boron-containing gas mixture, wherein the hydrocarbon-containing gas mixture and the boron-containing gas mixture are flowed into the processing volume at a precursor ratio of (boron-containing gas mixture/((boron-containing gas mixture)+hydrocarbon-containing gas mixture) of ~~about~~ 0.38 to ~~about~~ 0.85; and

generating a radio frequency (RF) plasma in the processing volume to deposit a boron-carbon film on the substrate, wherein the boron-carbon film has at least 75 atomic percentage to 95 atomic percentage of boron.

2. The method of claim 1, wherein the hydrocarbon-containing gas mixture comprises an alkane.

3. The method of claim 2, wherein the hydrocarbon-containing gas mixture comprises propylene (C_3H_6).

4. The method of claim 1, wherein the boron-containing gas mixture comprises ~~about~~ 9 weight percentage (wt. %) diborane (B_2H_6) diluted in hydrogen gas (H_2).

5. The method of claim 1, wherein a ratio of the hydrocarbon-containing gas mixture to the boron-containing gas mixture is in a range between ~~about~~ 0.7:1 and ~~about~~ 0.12:1.

6. The method of claim 1, wherein the generating the RF plasma comprises applying a high frequency of ~~about~~ 12 MHz to ~~about~~ 14 MHz and a low frequency of ~~about~~ 0.1 kHz to ~~about~~ 1 kHz.

7. The method of claim 6, wherein the applying a high and low frequency is applied at a power level between ~~about~~ 50 W and ~~about~~ 2,500 W.

8. A method of processing a substrate, comprising:

exposing the substrate positioned in a processing volume of a processing chamber to a hydrocarbon-containing gas mixture;

exposing the substrate to a boron-containing gas mixture, wherein the hydrocarbon-containing gas mixture and the boron-containing gas mixture are flowed into the processing volume at a precursor ratio of (boron-containing gas mixture/((boron-containing gas mixture)+hydrocarbon-containing gas mixture) of ~~about~~ 0.38 to ~~about~~ 0.85; and

generating a radio frequency (RF) plasma in the processing volume to deposit a boron-carbon film on the substrate, wherein the boron-carbon film has at least 75 atomic percentage to 95 atomic percentage of boron.

9. The method of claim 8, wherein the generating the RF plasma comprises applying a high frequency of ~~about~~ 12 MHz to ~~about~~ 14 MHz and a low frequency of ~~about~~ 0.1 kHz to ~~about~~ 1 kHz.

10. The method of claim 9, wherein the applying a high and low frequency is applied at a power level between ~~about~~ 50 W and ~~about~~ 2,500 W.

11. The method of claim 8, wherein the substrate is secured to an electrostatic chuck (ESC).

12. A non-transient computer readable medium, the medium containing program instructions for causing a computer to perform a method of:

exposing a substrate positioned in a processing volume of a processing chamber to a hydrocarbon-containing gas mixture;

exposing the substrate to a boron-containing gas mixture, wherein the hydrocarbon-containing gas mixture and the boron-containing gas mixture are flowed into the processing volume at a precursor ratio of (boron-containing gas mixture/((boron-containing gas mixture)+hydrocarbon-containing gas mixture) of ~~about~~ 0.38 to ~~about~~ 0.85; and

generating a radio frequency (RF) plasma in the processing volume to deposit a boron-carbon film on the substrate, wherein the boron-carbon film has at least 75 atomic percentage to 95 atomic percentage of boron.

13. The non-transient computer readable medium of claim 12, wherein the hydrocarbon-containing gas mixture comprises an alkane.

14. The non-transient computer readable medium of claim 12, wherein the boron-containing gas mixture comprises ~~about~~ 9 weight percentage (wt. %) diborane (B_2H_6) diluted in hydrogen gas (H_2).

15. The non-transient computer readable medium of claim 12, wherein a ratio of the hydrocarbon-containing gas mixture to the boron-containing gas mixture is in a range between ~~about~~ 0.7:1 and ~~about~~ 0.12:1.

16. The method of claim 1, wherein a pressure in the processing volume is between 2 Torr and 10 Torr.

17. The method of claim 1, wherein the substrate is maintained at a temperature from ~~about~~ 450 °C to ~~about~~ 650 °C.

18. The method of claim 8, wherein the boron-containing gas mixture comprises ~~about~~ 9 weight percentage (wt. %) diborane (B_2H_6) diluted in hydrogen gas (H_2).

19. The method of claim 8, wherein a ratio of the hydrocarbon-containing gas mixture to the boron-containing gas mixture is in a range between ~~about~~ 0.07:1 and ~~about~~ 0.12:1.

20. The non-transient computer readable medium of claim 12, wherein the hydrocarbon-containing gas mixture comprises propylene (C_3H_6).