CLAIMS

1. A system for processing a substrate, comprising:

a processing chamber including a pedestal to support a substrate; and

a controller configured to:

a) supply precursor to the processing chamber;

b) purge the processing chamber;

c) perform radio frequency (RF) plasma activation;

d) purge the processing chamber; and

e) prior to purging the processing chamber in at least one of (b) or (d), set a vacuum pressure of the processing chamber to a first predetermined pressure that is less than a vacuum pressure during the at least one of (a) or (c) for a first predetermined period.

2. The system of claim 1, wherein the first predetermined period is greater than or equal to 0.5 seconds and less than or equal to 5 seconds.

3. The system of claim 1, wherein the controller is configured to perform (e) before (b) and (d).

4. The system of claim 1, wherein the controller is configured to perform (e) before (d), and wherein the controller is configured to wait a predetermined period after (c) and before (e).

5. The system of claim 1, wherein the controller is configured to flow oxidants during (e).

6. The system of claim 5, wherein the oxidants comprise one of molecular oxygen and nitrous oxide.

7. The system of claim 1, wherein the RF plasma activation comprises RF plasma oxidation.

8. The system of claim 1, wherein the controller is configured to set vacuum pressure in the processing chamber greater than or equal to 1 Torr and less than or equal to 15 Torr during (a), (b), (c) and (d).

9. The system of claim 8, wherein the controller is configured to set vacuum pressure in the processing chamber during (a), (b), (c) and (d) to be approximately isobaric.

10. The system of claim 8, wherein the controller is configured to set vacuum pressure in the processing chamber during (f) greater than or equal to 5 mTorr and less than or equal to 2 Torr.

11. The system of claim 1, wherein the controller is configured to set vacuum pressure in the processing chamber greater than or equal to 3 Torr and less than or equal to 8 Torr during (a), (b), (c) and (d).

12. The system of claim 11, wherein the controller is configured to set vacuum pressure in the processing chamber during (a), (b), (c) and (d) to be approximately isobaric.

13. The system of claim 11, wherein the controller is configured to set vacuum pressure in the processing chamber during (e) greater than or equal to 5 mTorr and less than or equal to 500 mTorr.

14. The system of claim 1, wherein plasma-enhanced chemical vapor deposition is performed in the processing chamber.

15. The system of claim 1, wherein performing plasma-enhanced atomic layer deposition is performed in the processing chamber.

CLAUSES

1. A method for processing a substrate, comprising:

a) arranging a substrate on a pedestal in a processing chamber;

b) supplying precursor to the processing chamber;

c) purging the processing chamber;

d) performing radio frequency (RF) plasma activation;

e) purging the processing chamber; and

f) prior to purging the processing chamber in at least one of (c) or (e), setting a vacuum pressure of the processing chamber to a first predetermined pressure that is less than a vacuum pressure during at least one of (b) or (d) for a first predetermined period.

2. The method of clause 1, wherein the first predetermined period is greater than or equal to 0.5 seconds and less than or equal to 5 seconds.

3. The method of clause 1, wherein (f) is performed before both (c) and (e).

4. The method of clause 1, wherein (f) is performed before (e), and further comprising waiting a predetermined period after (d) and before (f).

5. The method of clause 1, further comprising flowing oxidants during (f).

6. The method of clause 5, wherein the oxidants comprise one of molecular oxygen and nitrous oxide.

7. The method of clause 1, wherein the RF plasma activation comprises RF plasma oxidation.

8. The method of clause 1, wherein vacuum pressure in the processing chamber is greater than or equal to 1 Torr and less than or equal to 15 Torr during (b), (c), (d) and (e).

9. The method of clause 8, wherein vacuum pressure in the processing chamber during (b), (c), (d) and (e) is approximately isobaric.

10. The method of clause 8, wherein vacuum pressure in the processing chamber during (f) is greater than or equal to 5 mTorr and less than or equal to 2 Torr.

11. The method of clause 1, wherein vacuum pressure in the processing chamber is greater than or equal to 3 Torr and less than or equal to 8 Torr during (b), (c), (d) and (e).

12. The method of clause 11, wherein vacuum pressure in the processing chamber during (b), (c), (d) and (e) is approximately isobaric.

13. The method of clause 11, wherein vacuum pressure in the processing chamber during (f) is greater than or equal to 5 mTorr and less than or equal to 500 mTorr.

14. The method of clause 1, further comprising performing plasma-enhanced chemical vapor deposition in the processing chamber.

15. The method of clause 1, further comprising performing plasma-enhanced atomic layer deposition in the processing chamber.

16. The method of clause 1, further comprising flowing process gas during (f).

17. A method for processing a substrate, comprising:

a) arranging a substrate on a pedestal in a processing chamber;

b) supplying precursor to the processing chamber;

c) purging the processing chamber;

d) performing radio frequency (RF) plasma activation;

e) purging the processing chamber; and

f) prior to purging the processing chamber in at least one of (c) or (e), setting a vacuum pressure of the processing chamber to a first predetermined pressure that is less than a vacuum pressure during at least one of (b) or (d) for a first predetermined period,

wherein vacuum pressure in the processing chamber is greater than or equal to 3 Torr and less than or equal to 8 Torr during (b), (c), (d) and (e) and is approximately isobaric during (b), (c), (d) and (e), and

vacuum pressure in the processing chamber during (f) is greater than or equal to 5 mTorr and less than or equal to 2 Torr.

18. A system for processing a substrate, comprising:

a processing chamber including a pedestal to support a substrate; and

a controller configured to:

a) supply precursor to the processing chamber;

b) purge the processing chamber;

c) perform radio frequency (RF) plasma activation;

d) purge the processing chamber; and

e) prior to purging the processing chamber in at least one of (b) or (d), set a vacuum pressure of the processing chamber to a first predetermined pressure that is less than a vacuum pressure during the at least one of (a) or (c) for a first predetermined period.

19. The system of clause 18, wherein the first predetermined period is greater than or equal to 0.5 seconds and less than or equal to 5 seconds.

20. The system of clause 18, wherein the controller is configured to perform (e) before (b) and (d).

21. The system of clause 18, wherein the controller is configured to perform (e) before (d), and wherein the controller is configured to wait a predetermined period after (c) and before (e).

22. The system of clause 18, wherein the controller is configured to flow oxidants during (e).

23. The system of clause 22, wherein the oxidants comprise one of molecular oxygen and nitrous oxide.

24. The system of clause 18, wherein the RF plasma activation comprises RF plasma oxidation.

25. The system of clause 18, wherein the controller is configured to set vacuum pressure in the processing chamber greater than or equal to 1 Torr and less than or equal to 15 Torr during (a), (b), (c) and (d).

26. The system of clause 25, wherein the controller is configured to set vacuum pressure in the processing chamber during (a), (b), (c) and (d) to be approximately isobaric.

27. The system of clause 25, wherein the controller is configured to set vacuum pressure in the processing chamber during (f) greater than or equal to 5 mTorr and less than or equal to 2 Torr.

28. The system of clause 18, wherein the controller is configured to set vacuum pressure in the processing chamber greater than or equal to 3 Torr and less than or equal to 8 Torr during (a), (b), (c) and (d).

29. The system of clause 28, wherein the controller is configured to set vacuum pressure in the processing chamber during (a), (b), (c) and (d) to be approximately isobaric.

30. The system of clause 28, wherein the controller is configured to set vacuum pressure in the processing chamber during (e) greater than or equal to 5 mTorr and less than or equal to 500 mTorr.

31. The system of clause 18, wherein plasma-enhanced chemical vapor deposition is performed in the processing chamber.

32. The system of clause 18, wherein performing plasma-enhanced atomic layer deposition is performed in the processing chamber.