IN THE CLAIMS:

1. A method comprising:

providing a substrate to a reaction chamber; and performing one or more deposition cycles to deposit a silicon-containing film, each cycle comprising:

(a) exposing the substrate to a vapor phase flow of a nitrogen-containing reactant;

(b) exposing the substrate to a vapor phase flow of a silicon-containing reactant; and

(c) exposing the vapor phase flow of the nitrogen-containing reactant, but not the vapor phase flow of the silicon-containing reactant, to ultraviolet radiation.

2. The method of claim 1, wherein the substrate is exposed to the vapor phase flow of the nitrogen-containing reactant during exposure to the vapor phase flow of the silicon-containing precursor.

3. The method of claim 1, wherein the substrate is not exposed to the vapor phase flow of the nitrogen-containing reactant during exposure to the vapor phase of the silicon-containing precursor.

4. The method of any one of claims 1-3, wherein the vapor phase flow of the nitrogen-containing reactant is exposed to ultraviolet radiation in the reaction chamber.

5. The method of any one of claims 1-3, wherein the vapor phase flow of the nitrogen-containing reactant is exposed to ultraviolet radiation upstream of the chamber.

6. The method of any one of claims 1-~~5~~3, wherein the silicon-containing reactant is selected from the group consisting of a silane, a halosilane, and an aminosilane, and mixtures thereof.

7. The method of claim 6, wherein the silicon-containing reactant is an aminosilane including carbon-containing substituents on a Si and on an amino group.

8. The method of any one of claims 1-~~7~~3, wherein the nitrogen-containing reactant is selected from the group consisting of ammonia, a hydrazine, an amine, and mixtures thereof.

9. The method of any one of claims 1-~~8~~3, wherein the silicon-containing film is selected from the group consisting of SiN, SiCN, SiON or SiONC.

10. The method of claim 9, wherein the silicon-containing film is SiCN.

11. A method comprising:

providing a substrate to a reaction chamber; and

performing one or more deposition cycles to deposit a silicon-containing film, each cycle comprising:

(a) activating a vapor phase flow of a nitrogen-containing reactant with a remote plasma source;

(b) exposing the substrate to the activated nitrogen-containing reactant; and

(c) exposing the substrate to a vapor phase flow of a silicon-containing reactant.

12. The method of claim 11, wherein the substrate is exposed to the vapor phase flow of the nitrogen-containing reactant during exposure to the vapor phase flow of the silicon-containing precursor.

13. The method of claim 11, wherein the substrate is not exposed to the vapor phase flow of the nitrogen-containing reactant during exposure to the vapor phase of the silicon-containing precursor.

14. The method of any one of claims 11-13, wherein the silicon-containing reactant is selected from the group consisting of a silane, a halosilane, and an aminosilane, and mixtures thereof.

15. The method of claim 14, wherein the silicon-containing reactant is an aminosilane

including carbon-containing substituents on a Si and on an amino group.

16. The method of any one of claims 11-~~15~~13, wherein the nitrogen-containing reactant is selected from the group consisting of ammonia, a hydrazine, an amine, and mixtures thereof.

17. The method of any one of claims 11-~~16~~13, wherein the silicon-containing film is selected from the group consisting of SiN, SiCN, SiON or SiONC.

18. The method of ~~any one of~~ claims ~~11-~~ 17, wherein the silicon-containing film is SiCN.

19. An apparatus for depositing a silicon nitride film on a semiconductor wafer, the apparatus comprising:

(a) a reaction chamber;

(b) an ultraviolet radiation source;

(c) a reactant inlet; and

(d) a controller comprising instructions for:

flowing ~~to~~ a vapor phase flow of a nitrogen-containing reactant into the reaction chamber;

flowing ~~the~~ a vapor phase flow of a silicon-containing reactant into the reaction chamber; and

exposing the vapor phase flow of the nitrogen-containing reactant, but not the vapor phase flow of the silicon-containing reactant, to ultraviolet radiation.

20. The apparatus of ~~a~~ claim 19, wherein the vapor phase flow of the nitrogen-containing reactant is exposed to ultraviolet radiation in the reaction chamber.

21. The apparatus of ~~a~~ claim 19, wherein the vapor phase flow of the nitrogen-containing reactant is exposed to ultraviolet radiation upstream of the reaction chamber.

22. The apparatus of any one of claims 19-21, wherein the vapor phase flow of the nitrogen-containing reactant is flowed during the vapor phase flow of the silicon-containing precursor.

23. The apparatus of any one of claims 19-21, wherein the vapor phase flow of the nitrogen-containing reactant is not flowed during the vapor phase flow of the silicon-containing precursor.

24. An apparatus for depositing a silicon nitride film on a semiconductor wafer, the apparatus comprising:

(a) a reaction chamber;

(b) a plasma source remote to the reaction chamber;

(c) a reactant inlet; and

(d) a controller comprising instructions for:

flowing ~~to~~ a vapor phase flow of a nitrogen-containing reactant into the remote plasma chamber;

flowing activated nitrogen-containing species from the remote plasma generator to the reaction chamber; and

flowing a vapor phase flow of a silicon-containing reactant into the reaction chamber.

25. The apparatus of claim 24, wherein the vapor phase flow of the nitrogen-containing reactant is flowed during the vapor phase flow of the silicon-containing precursor.

26. The apparatus of claim ~~25~~ 24, wherein the vapor phase flow of the nitrogen-containing reactant is not flowed during the vapor phase of the silicon-containing precursor.