CLAIMS

What is claimed is:

1. A method for processing substrates, the method comprising:

providing a semiconductor substrate to a reaction chamber;

performing cycles of atomic layer deposition to deposit a film, each cycle comprising:

introducing a first reactant in vapor phase into the reaction chamber to adsorb the first reactant onto a surface of the semiconductor substrate;

introducing a dose of a second reactant in vapor phase into the reaction chamber for a dose time; and

generating a first plasma in the reaction chamber while the second reactant in vapor phase is in the reaction chamber; and

after every n cycles of the atomic layer deposition, exposing the film to a second plasma generated from flowing argon and a second gas,

wherein either

(1) the second gas is selected from the group consisting of hydrogen, oxygen, and combinations thereof and a ratio of flow rate of argon to the second gas is between about 50:1 and about 1:1, or

(2) the second gas is nitrous oxide and a ratio of flow rate of argon to the second gas is between about 10:1 and about 20:1.

2. The method of claim 1, further comprising flowing one or more additional gases during the exposing of the film to the second plasma, the one or more additional gases selected from the group consisting of oxygen, nitrous oxide, and helium.

3. A method for processing substrates, the method comprising:

providing a semiconductor substrate to a reaction chamber;

performing cycles of atomic layer deposition to deposit a film, each cycle comprising:

introducing a first reactant in vapor phase into the reaction chamber to adsorb the first reactant onto a surface of the semiconductor substrate;

introducing a dose of a second reactant in vapor phase into the reaction chamber for a dose time; and

generating a first plasma in the reaction chamber while the second reactant in vapor phase is in the reaction chamber; and

after every n cycles of the atomic layer deposition, exposing the film to a second plasma generated from flowing argon and a second gas having an argon to second gas

flow rate ratio of between about 50:1 and about 1:1 to achieve a wet etch rate of less than about 40 A/min in 100:1 HF.

4. The method of claim 3, wherein the second gas is selected from the group consisting of hydrogen and oxygen and combinations thereof.

5. The method of claim 3, further comprising flowing a third gas during the exposing of the film to the second plasma, wherein the third gas is selected from the group consisting of nitrous oxide, helium, and combinations thereof.

6. The method of claim 5, wherein ratio of flow rate of argon to flow rate of the third gas is between about 10:1 and about 20:1.

7. The method of claim 1, wherein the second plasma is generated at a power between about 750W and about 1625W per substrate.

8. The method of any of claims 1-7, wherein the film comprises silicon oxide.

9. The method of any of claims 1-7, wherein the exposing of the film to the second plasma and the performing of the cycles of the atomic layer deposition are performed without breaking vacuum.

10. The method of any of claims 1-7, wherein the exposing of the film to the second plasma comprises pulsing the second plasma.