WHAT IS CLAIMED IS:

1. A method of processing a substrate comprising:

(a) forming a first film on the substrate by supplying a film-forming agent to the substrate;

(b) adding oxygen to the first film by supplying a first oxidizing agent to the substrate and oxidizing a part of the first film; and

(c) changing the oxygen-added first film into a second film including an oxide film by supplying a second oxidizing agent to the substrate and oxidizing the oxygen-added first film,

wherein the first oxidizing agent includes at least one selected from the group of O- and N-containing gas and O- and C-containing gas, and

wherein the second oxidizing agent includes at least one selected from the group of O_2 gas and O_3 gas, and at least one selected from the group of H_2 gas and $^2H_2$ gas.

2. The method of Claim 1, wherein the oxidation of the part of the first film by the first oxidizing agent in (b) is performed under a lower oxidizing power condition than the oxidation of the oxygen-added first film by the second oxidizing agent in (c).

3. The method of Claim 1, wherein in (b), the first film is oxidized in an unsaturated manner, and in (c), the oxygen-added first film is oxidized in a saturated manner.

4. The method of Claim 1, wherein the first oxidizing agent further includes O_2 gas.

5. The method of Claim 1, wherein the first oxidizing agent further includes an oxygen- and hydrogen-containing gas.

6. The method of Claim 1, wherein the first film contains a first element and a second element, and the second film contains the first element and oxygen.

7. The method of Claim 6, wherein the first element includes a metal element or a semiconductor element, and the second element includes nitrogen.

8. The method of Claim 7, wherein the film-forming agent includes a precursor containing the first element and a halogen element, and a reactant containing the second element, and

in (a), supplying the precursor to the substrate and supplying the reactant to the substrate are alternately performed.

9. The method of Claim 8, wherein the precursor is a halosilane-based gas, and the reactant is a hydrogen-nitride-based gas.

10. The method of Claim 1, wherein a temperature of the substrate in (a) is equal to or lower than the temperature of the substrate in (c).

11. The method of Claim 1, wherein a temperature of the substrate in (a) is lower than the temperature of the substrate in (c).

12. The method of Claim 1, wherein a temperature of the substrate in (a) is 500 degrees C or lower, and the temperature of the substrate in (c) is 500 degrees C or lower.

13. The method of Claim 1, wherein a temperature of the substrate in (a) is 450 degrees C or lower, and the temperature of the substrate in (c) is 450 degrees C or lower.

14. The method of Claim 1, wherein a cycle including (a), (b), and (c) is performed multiple times.

15. The method of Claim 1, wherein a cycle that includes performing a set including (a) and (b) multiple times and performing (c) is performed a predetermined number of times.

16. A method of manufacturing a semiconductor device, comprising:

(a) forming a first film on a substrate by supplying a film-forming agent to the substrate;

(b) adding oxygen to the first film by supplying a first oxidizing agent to the substrate and oxidizing a part of the first film; and

(c) changing the oxygen-added first film into a second film including an oxide film by supplying a second oxidizing agent to the substrate and oxidizing the oxygen-added first film,

wherein the first oxidizing agent includes at least one selected from the group of O- and N-containing gas and O- and C-containing gas, and

wherein the second oxidizing agent includes at least one selected from the group of O_2 gas and O_3 gas, and at least one selected from the group of H_2 gas and $^2H_2$ gas.

17. A substrate processing system, comprising:

a film-forming part configured to form a first film on a substrate by supplying a film-forming agent to the substrate;

a first oxidation part configured to add oxygen to the first film by supplying a first oxidizing agent to the substrate and oxidizing a part of the first film; and

a second oxidation part configured to change the oxygen-added first film into a second film including an oxide film by supplying a second oxidizing agent to the substrate and oxidizing the oxygen-added first film,

wherein the first oxidizing agent includes at least one selected from the group of O- and N-containing gas and O- and C-containing gas, and

wherein the second oxidizing agent includes at least one selected from the group of O_2 gas and O_3 gas, and at least one selected from the group of H_2 gas and $^2H_2$ gas.

18. A program that causes, by a computer, a substrate processing system to perform:

(a) forming a first film on a substrate by supplying a film-forming agent to the substrate;

(b) adding oxygen to the first film by supplying a first oxidizing agent to the substrate and oxidizing a part of the first film; and

(c) changing the oxygen-added first film into a second film including an oxide film by supplying a second oxidizing agent to the substrate and oxidizing the oxygen-added first film,

wherein the first oxidizing agent includes at least one selected from the group of O- and N-containing gas and O- and C-containing gas, and

wherein the second oxidizing agent includes at least one selected from the group of O_2 gas and O_3 gas, and at least one selected from the group of H_2 gas and $^2H_2$ gas.

19. The method of Claim 1, wherein a temperature of the substrate in (b) is equal to or lower than a temperature of the substrate in at least one selected from the group of (a) and (c).

20. The method of Claim 1, wherein a temperature of the substrate in (b) is lower than a temperature of the substrate in at least one selected from the group of (a) and (c).

21. The method of Claim 1, wherein a temperature of the substrate in (b) is lower than a temperature of the substrate in each of (a) and (c).

22. The method of Claim 1, wherein a film quality of the first film is poorer than a film quality of the second film, and wherein the first film contains more N-H bonds than the second film.

23. The method of Claim 14, wherein a thickness of the first film formed for the first time while the cycle is performed multiple times is thinner than a thickness of the first film formed for each of the second and subsequent times while the cycle is performed multiple times.

24. The method of Claim 15, wherein a thickness of the first film formed for the first time while the cycle is performed multiple times is thinner than a thickness of the first film formed for each of the second and subsequent times while the cycle is performed multiple times.