WHAT IS CLAIMED IS:

1. A method of processing a substrate, comprising:

(a) supplying a first gas containing a predetermined element to the substrate;

(b) supplying a second gas containing carbon and nitrogen to the substrate;

(c) supplying a nitrogen and hydrogen-containing gas activated by plasma-excitation of the nitrogen and hydrogen-containing gas to the substrate;

(d) supplying an oxygen-containing gas to the substrate; and

(e) forming a film containing at least the predetermined element, oxygen, carbon, and nitrogen on the substrate by:

performing a cycle a first number of times of two or more, the cycle performing (a) to (d); or

performing a cycle once or more, the cycle performing (a) to (d) in this order.

2. The method of Claim 1, further comprising (f) forming a film containing at least the predetermined element, carbon, and nitrogen without supplying the nitrogen and hydrogen-containing gas activated by plasma-excitation of the nitrogen and hydrogen-containing gas to the substrate,

wherein the film containing at least the predetermined element, oxygen, carbon, and nitrogen is formed by performing a cycle a second number of times of one or more, the cycle performing (e) and (f).

3. The method of Claim 2, wherein the first number of times and the second number of times are different.

4. The method of Claim 2, wherein a ratio of carbon and nitrogen contained in the film

containing at least the predetermined element, oxygen, carbon, and nitrogen is changed by regulating the first number of times and the second number of times.

5. The method of Claim 2, further comprising (g) forming a film containing at least the predetermined element, carbon, oxygen, and nitrogen on the substrate without supplying the nitrogen and hydrogen-containing gas activated by plasma-excitation of the nitrogen and hydrogen-containing gas to the substrate,

wherein the film containing at least the predetermined element, oxygen, carbon, and nitrogen is formed on the substrate by performing a cycle a third number of times of one or more, the cycle non-simultaneously performing (e), (f), and (g).

6. The method of Claim 5, wherein the first number of times and the third number of times are different.

7. The method of Claim 5, a ratio of carbon and nitrogen contained in the film containing at least the predetermined element, oxygen, carbon, and nitrogen is changed by regulating the first number of times and the third number of times.

8. The method of Claim 1, wherein in (e), when the cycle performing (a) to (d) is performed at least twice, concentrations of carbon contained in the films containing the predetermined element, oxygen, carbon, and nitrogen formed in each of at least two of the cycles are different.

9. The method of Claim 1, wherein in (e), when the cycle performing (a) to (d) is performed at least twice, concentrations of nitrogen contained in the films containing the predetermined element, oxygen, carbon, and nitrogen formed in each of at least two of the cycles

are different.

10. The method of Claim 2, wherein (e) is performed after (f).

11. The method of Claim 10, wherein in (e), (a) to (d) are performed at least twice or more.

12. The method of Claim 5, wherein (g) is performed after (f).

13. The method of Claim 12, wherein (f) is performed after (g).

14. The method of Claim 2, wherein in (e), (a) to (d) are performed a plurality of times, and (f) is performed between each of the plurality of times of (a) to (d).

15. The method of Claim 1, wherein the second gas further contains hydrogen.

16. The method of Claim 15, wherein the second gas includes at least one selected from the group of an amine-based gas and an organic hydrazine-based gas.

17. A substrate processing apparatus comprising:

a first supply system configured to supply a first gas containing a predetermined element to a substrate;

a second supply system configured to supply a second gas containing carbon and nitrogen to the substrate;

a third supply system configured to supply a nitrogen and hydrogen-containing gas activated by plasma-excitation of the nitrogen and hydrogen-containing gas to the substrate;

a fourth supply system configured to supply an oxygen-containing gas to the substrate;

and

a controller configured to be capable of controlling the first supply system, the second supply system, the third supply system, and the fourth supply system to perform a process, the process including:

(a) supplying the first gas to the substrate;

(b) supplying the second gas to the substrate;

(c) supplying the nitrogen and hydrogen-containing gas activated by plasma-excitation of the nitrogen and hydrogen-containing gas to the substrate;

(d) supplying the oxygen-containing gas to the substrate; and

(e) forming a film containing at least the predetermined element, oxygen, carbon, and nitrogen on the substrate by:

performing a cycle a first number of times of two or more, the cycle performing (a) to (d); or

performing a cycle once or more, the cycle performing (a) to (d) in this order.

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

(a) supplying a first gas containing a predetermined element to a substrate;

(b) supplying a second gas containing carbon and nitrogen to the substrate;

(c) supplying a nitrogen and hydrogen-containing gas activated by plasma-excitation of the nitrogen and hydrogen-containing gas to the substrate;

(d) supplying an oxygen-containing gas to the substrate; and

(e) forming a film containing at least the predetermined element, oxygen, carbon, and nitrogen on the substrate by:

performing a cycle a first number of times of two or more, the cycle performing (a) to (d); or

performing a cycle once or more, the cycle performing (a) to (d) in this order.

19. A program that causes, by a computer, a substrate processing apparatus to perform a process in a process chamber of the substrate processing apparatus, the process comprising:

(a) supplying a first gas containing a predetermined element to a substrate;

(b) supplying a second gas containing carbon and nitrogen to the substrate;

(c) supplying a nitrogen and hydrogen-containing gas activated by plasma-excitation of the nitrogen and hydrogen-containing gas to the substrate;

(d) supplying an oxygen-containing gas to the substrate; and

(e) forming a film containing at least the predetermined element, oxygen, carbon, and nitrogen on the substrate by:

performing a cycle a first number of times of two or more, the cycle performing (a) to (d); or

performing a cycle once or more, the cycle performing (a) to (d) in this order.