WHAT IS CLAIMED IS:

1. A method of cleaning an interior of a process container, comprising:

removing a substance adhering to the interior of the process container by performing a cycle a predetermined number of times under a first temperature, the cycle including:

(a) supplying a first gas selected from the group of a nitrogen- and hydrogen-containing gas and a fluorine-containing gas into the process container after a substrate is processed; and

(b) supplying a second gas selected from the group of the nitrogen- and hydrogen-containing gas and the fluorine-containing gas into the process container where the first gas remains, the second gas being different from the first gas,

wherein (b) includes:

(b1) supplying the second gas into the process container in a state where exhaust of the interior of the process container is stopped; and

(b2) supplying the second gas into the process container in a state where the exhaust of the interior of the process container is performed.

2. The method of Claim 1, wherein in (a), the interior of the process container is filled with the first gas, and

wherein in (b), the second gas is mixed with the first gas that has filled the interior of the process container.

3. The method of Claim 1 or 2, wherein in (b), after the supply of the first gas into the process container is stopped, the supply of the second gas into the process container is started.

4. The method of any one of Claims 1 to 3, wherein in (a), the first gas is supplied into the process container in a state where exhaust of the interior of the process container is performed.

5. The method of any one of Claims 1 to 4, wherein the cycle further includes (c) exhausting the interior of the process container in a state where the supply of the nitrogen- and

hydrogen-containing gas and the fluorine-containing gas into the process container is stopped.

6. The method of any one of Claims 1 to 5, further comprising (d) heating and exhausting the interior of the process container under a second temperature equal to or higher than the first temperature.

7. The method of any one of Claims 1 to 6, wherein an internal pressure of the process container in (a) is set as a first pressure,

wherein an internal pressure of the process container in (b1) is set as a second pressure higher than the first pressure, and

wherein an internal pressure of the process container in (b2) is set as a third pressure equal to or higher than the second pressure.

8. The method of any one of Claims 1 to 6, wherein the cycle further includes (c) exhausting the interior of the process container in a state where the supply of the nitrogen- and hydrogen-containing gas and the fluorine-containing gas into the process container is stopped,

wherein an internal pressure of the process container in (a) is set as a first pressure,

wherein an internal pressure of the process container in (b1) is set as a second pressure higher than the first pressure,

wherein an internal pressure of the process container in (b2) is set as a third pressure equal to or higher than the second pressure, and

wherein an internal pressure of the process container in (c) is set as a fourth pressure lower than the third pressure.

9. The method of any one of Claims 1 to 6, wherein the cycle further includes (c) exhausting the interior of the process container in a state where the supply of the nitrogen- and hydrogen-containing gas and the fluorine-containing gas into the process container is stopped,

wherein the method further comprises (d) heating and exhausting the interior of the

process container under a second temperature equal to or higher than the first temperature,

wherein an internal pressure of the process container in (a) is set as a first pressure,

wherein an internal pressure of the process container in (b1) is set as a second pressure higher than the first pressure,

wherein an internal pressure of the process container in (b2) is set as a third pressure equal to or higher than the second pressure,

wherein an internal pressure of the process container in (c) is set as a fourth pressure lower than the third pressure, and

wherein an internal pressure of the process container in (d) is set as a fifth pressure lower than the third pressure.

10. The method of any one of Claims 1 to 9, wherein a supply flow rate of the first gas in (a) is larger than a supply flow rate of the second gas in (b).

11. The method of any one of Claims 1 to 10, wherein a supply time of the second gas in (b) is longer than a supply time of the first gas in (a).

12. The method of any one of Claims 1 to 11, wherein at least a portion of the substance adhering to the interior of the process container is removed by performing the cycle the predetermined number of times, and a portion of a by-product produced at that time is removed.

13. The method of Claim 6 or 9, wherein at least a portion of the substance adhering to the interior of the process container is removed by performing the cycle the predetermined number of times, and a portion of a by-product produced at that time is removed, and

wherein in (d), the by-product remaining in the process container is sublimated.

14. The method of any one of Claims 1 to 13, wherein the first gas is the nitrogen- and hydrogen-containing gas, and the second gas is the fluorine-containing gas.

15. The method of any one of Claims 1 to 14, wherein the nitrogen- and hydrogen-containing gas includes at least one selected from the group of a NH_3 gas, a N_2H_2 gas, a N_2H_4 gas, and a N_3H_8 gas, and

wherein the fluorine-containing gas includes at least one selected from the group of a F_2 gas, a ClF_3 gas, a ClF gas, a NF_3 gas, and a HF gas.

16. The method of any one of Claims 1 to 14, wherein the nitrogen- and hydrogen-containing gas includes a NH_3 gas, and the fluorine-containing gas includes a HF gas.

17. The method of any one of Claims 1 to 16, wherein the substance adhering to the interior of the process container contains silicon and oxygen.

18. The method of Claim 6 or 9, wherein the act of removing the substance adhering to the interior of the process container and (d) are performed one or more times.

19. The method of any one of Claims 1 to 18, wherein the act of removing the substance adhering to the interior of the process container is performed under a non-plasma atmosphere.

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

processing a substrate in a process container by supplying a processing gas to the substrate; and

cleaning an interior of the process container after the substrate is processed,

wherein the act of cleaning the interior of the process container includes:

removing a substance adhering to the interior of the process container by performing a cycle a predetermined number of times under a first temperature, the cycle including:

(a) supplying a first gas selected from the group of a nitrogen- and

hydrogen-containing gas and a fluorine-containing gas into the process container after the substrate is processed; and

(b) supplying a second gas selected from the group of the nitrogen- and hydrogen-containing gas and the fluorine-containing gas into the process container where the first gas remains,

the second gas being different from the first gas,

wherein (b) includes:

(b1) supplying the second gas into the process container in a state where exhaust of the interior of the process container is stopped; and

(b2) supplying the second gas into the process container in a state where the exhaust of the interior of the process container is performed.

21. A substrate processing apparatus comprising:

a process container in which a substrate is processed;

a nitrogen- and hydrogen-containing gas supply system configured to supply a nitrogen- and hydrogen-containing gas into the process container;

a fluorine-containing gas supply system configured to supply a fluorine-containing gas into the process container;

a temperature regulator configured to regulate an internal temperature of the process container;

an exhaust system configured to exhaust an interior of the process container; and

a controller configured to be capable of controlling the nitrogen- and hydrogen-containing gas supply system, the fluorine-containing gas supply system, the exhaust system, and the temperature regulator to perform a process including:

removing a substance adhering to the interior of the process container by performing a cycle a predetermined number of times under a first temperature, the cycle including:

(a) supplying a first gas selected from the group of the nitrogen- and

hydrogen-containing gas and the fluorine-containing gas into the process container after the substrate is processed; and

(b) supplying a second gas selected from the group of the nitrogen- and hydrogen-containing gas and the fluorine-containing gas into the process container where the first gas remains,

the second gas being different from the first gas,

wherein (b) includes:

(b1) supplying the second gas into the process container in a state where exhaust of the interior of the process container is stopped; and

(b2) supplying the second gas into the process container in a state where the exhaust of the interior of the process container is performed.

22. A program that causes, by a computer, a substrate processing apparatus to perform a process comprising:

removing a substance adhering to an interior of a process container of the substrate processing apparatus by performing a cycle a predetermined number of times under a first temperature, the cycle including:

(a) supplying a first gas selected from the group of a nitrogen- and hydrogen-containing gas and a fluorine-containing gas into the process container after a substrate is processed; and

(b) supplying a second gas selected from the group of the nitrogen- and hydrogen-containing gas and the fluorine-containing gas into the process container where the first gas remain, the second gas being different from the first gas,

wherein (b) includes:

(b1) supplying the second gas into the process container in a state where exhaust of the interior of the process container is stopped; and

(b2) supplying the second gas into the process container in a state where the exhaust of the interior of the process container is performed.