

WHAT IS CLAIMED IS:

1. A substrate processing apparatus, comprising:
 - a process vessel including a plasma generation space in which a processing gas is plasma-excited and a substrate processing space communicating with the plasma generation space;
 - a plasma generation part including a coil disposed to surround the plasma generation space and installed to be wound around an outer periphery of the process vessel, and a high-frequency power source configured to supply high-frequency power to the coil;
 - a gas supply part configured to supply the processing gas to the plasma generation space;
 - a temperature sensor installed outside the process vessel and configured to detect a temperature of the process vessel; and
 - a control part configured to control the plasma generation part and the gas supply part such that the temperature of the process vessel detected by the temperature sensor falls within a range of a target temperature defined by a preset upper limit value and a preset lower limit value, by executing a pre-processing recipe, prior to execution of a process recipe for processing substrates,wherein the pre-processing recipe is configured to supply the high-frequency power for plasma-exciting the processing gas to the coil, and not to transfer the substrates.
2. The apparatus according to Claim 1, wherein the process vessel comprises an upper vessel and a lower vessel, and the temperature sensor is configured to be installed at the upper vessel.
3. The apparatus according to Claim 1, wherein, when the temperature detected by the temperature sensor is lower than the lower limit value of a range of the target temperature,

the control part is configured to supply the high-frequency power to the coil so as to raise the temperature of the process vessel.

4. The apparatus according to Claim 1, wherein, when the temperature detected by the temperature sensor is higher than the upper limit value of the range of the target temperature, the control part is configured not to supply the high-frequency power to the coil.

5. The apparatus according to Claim 1, wherein the control part is configured to supply the high-frequency power to the coil by turning on the high-frequency power source so as to raise the temperature of the process vessel when the temperature detected by the temperature sensor is lower than the lower limit value of the range of the target temperature, while lowering the temperature of the process vessel by turning off the high-frequency power source when the temperature detected by the temperature sensor exceeds the upper limit value of the range of the target temperature.

6. A substrate processing apparatus, comprising:

- a process vessel including a plasma generation space in which a processing gas is plasma-excited and a substrate processing space communicating with the plasma generation space;

- a plasma generation part including a coil disposed to surround the plasma generation space and installed to be wound around an outer periphery of the process vessel, and a high-frequency power source configured to supply high-frequency power to the coil;

- a gas supply part configured to supply the processing gas to the plasma generation space;

- a temperature sensor installed outside the process vessel and configured to detect a temperature of the process vessel; and

- a control part configured to control the plasma generation part and the gas supply

part such that the temperature of the process vessel detected by the temperature sensor falls within a range of a target temperature defined by a preset upper limit value and a preset lower limit value, by executing a pre-processing recipe to supply the high-frequency power for plasma-exciting the processing gas to the coil, prior to execution of a process recipe for processing substrates,

wherein, when the temperature detected by the temperature sensor is higher than the lower limit value of the range of the target temperature and lower than the upper limit value of the range of the target temperature, the control part is configured to complete the pre-processing recipe.

7. A substrate processing apparatus, comprising:

at least one process vessel including a plasma generation space in which a processing gas is plasma-excited and a substrate processing space communicating with the plasma generation space;

a plasma generation part including a coil disposed to surround the plasma generation space and installed to be wound around an outer periphery of the at least one process vessel, and a high-frequency power source configured to supply high-frequency power to the coil;

a gas supply part configured to supply the processing gas to the plasma generation space;

at least one temperature sensor installed outside the at least one process vessel and configured to detect a temperature of the at least one process vessel; and

a control part configured to control the plasma generation part and the gas supply part such that the temperature of the at least one process vessel detected by the at least one temperature sensor falls within a range of a target temperature defined by a preset upper limit value and a preset lower limit value, by executing a pre-processing recipe to supply the high-frequency power for plasma-exciting the processing gas to the coil, prior to execution of a process recipe for processing substrates,

wherein the at least one process vessel includes a plurality of process vessels, and
wherein, when the temperature detected by the at least one temperature sensor
respectively installed at the process vessels is higher than the lower limit value of the range of
the target temperature and lower than the upper limit value of the range of the target
temperature, the control part is configured to complete the pre-processing recipe.

8. The apparatus according to Claim 7, wherein the control part is configured to
distributively transfer the substrates to respective substrate process chambers in the process
vessels so as to execute the process recipe for each of the substrates.

9. A substrate processing apparatus, comprising:

at least one process vessel including a plasma generation space in which a
processing gas is plasma-excited and a substrate processing space communicating with the
plasma generation space;

a plasma generation part including a coil disposed to surround the plasma generation
space and installed to be wound around an outer periphery of the at least one process vessel,
and a high-frequency power source configured to supply high-frequency power to the coil;

a gas supply part configured to supply the processing gas to the plasma generation
space;

at least one temperature sensor installed outside the at least one process vessel and
configured to detect a temperature of the at least one process vessel; and

a control part configured to control the plasma generation part and the gas supply
part such that the temperature of the at least one process vessel detected by the at least one
temperature sensor falls within a range of a target temperature defined by a preset upper limit
value and a preset lower limit value, by executing a pre-processing recipe to supply the high-
frequency power for plasma-exciting the processing gas to the coil, prior to execution of a
process recipe for processing substrates,

wherein the at least one process vessel includes a plurality of process vessels, and
the at least one temperature sensor includes a plurality of temperature sensors, and

wherein, when the temperature detected by at least one of the temperature sensors
respectively installed at the process vessels is higher than the upper limit value of the range of
the target temperature or lower than the lower limit value of the range of the target
temperature, the control part is configured to continue the pre-processing recipe.

10. The substrate processing apparatus according to any one of Claims 1, 6, 7 and 9,
wherein the control part is configured to execute an idle recipe, and
wherein the pre-processing recipe is configured to be executed after the idle recipe.

11. A method of manufacturing a semiconductor device, comprising:
executing a pre-processing recipe including:

detecting a temperature of a process vessel including a plasma generation
space in which a processing gas is plasma-excited and a substrate processing space
communicating with the plasma generation space;

supplying the processing gas to the plasma generation space; and

plasma-exciting the processing gas supplied to the plasma generation space
by supplying high-frequency power to a coil disposed to surround the plasma
generation space and installed to be wound around an outer periphery of the process
vessel; and

processing a substrate disposed in the substrate processing space while supplying the
processing gas to the substrate via the plasma generation space, by executing a process
recipe,

wherein the act of executing the pre-processing recipe is configured to supply the
high-frequency power for plasma-exciting the processing gas to the coil and not to transfer
the substrate so that a temperature of the process vessel falls within a range of a target

temperature defined by a preset upper limit value and a preset lower limit value.

12. A program that causes, by a computer, a substrate processing apparatus to perform a pre-processing recipe, the pre-processing recipe comprising:

detecting a temperature of a process vessel including a plasma generation space in which a processing gas is plasma-excited and a substrate processing space communicating with the plasma generation space;

supplying the processing gas to the plasma generation space;

plasma-exciting the processing gas supplied to the plasma generation space by supplying high-frequency power to a coil disposed to surround the plasma generation space and installed to be wound around an outer periphery of the process vessel; and

supplying the high-frequency power for plasma-exciting the processing gas to the coil and not transferring the substrates so that a temperature of the process vessel to fall within a range of a target temperature defined by a preset upper limit value and a preset lower limit value.

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

executing a pre-processing recipe including:

detecting a temperature of a process vessel, which includes a plasma generation space in which a processing gas is plasma-excited and a substrate processing space communicating with the plasma generation space;

supplying the processing gas to the plasma generation space; and

plasma-exciting the processing gas supplied to the plasma generation space by supplying high-frequency power to a coil disposed to surround the plasma generation space and installed to be wound around an outer periphery of the process vessel; and

processing a substrate disposed in the substrate processing space while supplying the

processing gas to the substrate via the plasma generation space, by executing a process recipe,

wherein the act of executing the pre-processing recipe is configured to supply the high-frequency power for plasma-exciting the processing gas to the coil so that the temperature of the process vessel to fall within a range of a target temperature defined by a preset upper limit value and a preset lower limit value, and

wherein the act of executing the pre-processing recipe is configured to complete the pre-processing recipe when a temperature detected by a temperature sensor installed at the process vessel is higher than the lower limit value of the target temperature and lower than the upper limit value of the target temperature.

14. A program that causes, by a computer, a substrate processing apparatus to perform a pre-processing recipe, the pre-processing recipe comprising:

detecting a temperature of a process vessel, which includes a plasma generation space in which a processing gas is plasma-excited and a substrate processing space communicating with the plasma generation space;

supplying the processing gas to the plasma generation space;

plasma-exciting the processing gas supplied to the plasma generation space by supplying high-frequency power to a coil disposed to surround the plasma generation space and installed to be wound around an outer periphery of the process vessel; and

supplying the high-frequency power for plasma-exciting the processing gas to the coil so that a temperature of the process vessel to fall within a range of a target temperature defined by a preset upper limit value and a preset lower limit value,

wherein the act of supplying the high-frequency power to the coil is configured to complete the pre-processing recipe when a temperature detected by a temperature sensor installed at the process vessel is higher than the lower limit value of the target temperature and lower than the upper limit value of the target temperature.

15. A method of manufacturing a semiconductor device, comprising:
executing a pre-processing recipe including:
detecting a temperature of each of a plurality of process vessels, each of which includes a plasma generation space in which a processing gas is plasma-excited and a substrate processing space communicating with the plasma generation space;
supplying the processing gas to the plasma generation space; and
plasma-exciting the processing gas supplied to the plasma generation space by supplying high-frequency power to a coil disposed to surround the plasma generation space and installed to be wound around an outer periphery of the process vessels; and
processing a substrate disposed in the substrate processing space while supplying the processing gas to the substrate via the plasma generation space, by executing a process recipe,
wherein the act of executing the pre-processing recipe is configured to supply the high-frequency power for plasma-exciting the processing gas to the coil so that the temperature of each of the process vessels falls within a range of a target temperature defined by a preset upper limit value and a preset lower limit value, and
wherein the act of executing the pre-processing recipe is configured to complete the pre-processing recipe when a temperature detected by a temperature sensor installed at each of the process vessels is higher than the lower limit value of the range of the target temperature and lower than the upper limit value of the range of the target temperature.
16. A program that causes, by a computer, a substrate processing apparatus to perform a pre-processing recipe, the pre-processing recipe comprising:
detecting a temperature of each of a plurality of process vessels, each of which includes a plasma generation space in which a processing gas is plasma-excited and a

substrate processing space communicating with the plasma generation space;
supplying the processing gas to the plasma generation space;
plasma-exciting the processing gas supplied to the plasma generation space by
supplying high-frequency power to a coil disposed to surround the plasma generation space
and installed to be wound around an outer periphery of the process vessels; and

supplying the high-frequency power for plasma-exciting the processing gas to the
coil so that the temperature of each of the process vessels falls within a range of a target
temperature defined by a preset upper limit value and a preset lower limit value,

wherein the act of supplying the high-frequency power to the coil is configured to
complete the pre-processing recipe when a temperature detected by a temperature sensor
installed at each of the process vessels is higher than the lower limit value of the range of the
target temperature and lower than the upper limit value of the range of the target temperature.

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

executing a pre-processing recipe including:

detecting a temperature of each of a plurality of process vessels, each of
which includes a plasma generation space in which a processing gas is plasma-
excited and a substrate processing space communicating with the plasma generation
space;

supplying the processing gas to the plasma generation space; and

plasma-exciting the processing gas supplied to the plasma generation space
by supplying high-frequency power to a coil disposed to surround the plasma
generation space and installed to be wound around an outer periphery of the process
vessels; and

processing a substrate disposed in the substrate processing space while supplying the
processing gas to the substrate via the plasma generation space, by executing a process
recipe,

wherein the act of executing the pre-processing recipe is configured to supply the high-frequency power for plasma-exciting the processing gas to the coil so that the temperature of each of the process vessels falls within a range of a target temperature defined by a preset upper limit value and a preset lower limit value, and

wherein the act of executing the pre-processing recipe is configured to continue the pre-processing recipe when a temperature detected by at least one of temperature sensors respectively installed at the process vessels is higher than the upper limit value of the range of the target temperature or lower than the lower limit value of the range of the target temperature, the control part is configured to continue the pre-processing recipe.

18. A program that causes, by a computer, a substrate processing apparatus to perform a pre-processing recipe, the pre-processing recipe comprising:

detecting a temperature of each of a plurality of process vessel, each of which includes a plasma generation space in which a processing gas is plasma-excited and a substrate processing space communicating with the plasma generation space;

supplying the processing gas to the plasma generation space;

plasma-exciting the processing gas supplied to the plasma generation space by supplying high-frequency power to a coil disposed to surround the plasma generation space and installed to be wound around an outer periphery of the process vessels; and

supplying the high-frequency power for plasma-exciting the processing gas to the coil so that the temperature of each of the process vessels falls within a range of a target temperature defined by a preset upper limit value and a preset lower limit value,

wherein the act of supplying the high-frequency power to the coil is configured to continue the pre-processing recipe when a temperature detected by at least one of temperature sensors respectively installed at the process vessels is higher than the upper limit value of the range of the target temperature or lower than the lower limit value of the range of the target temperature.