CLAIMS

Claim 1. A temperature control system for cooling members in a plasma processing chamber, the temperature control system comprising:

a tank configured to store a gaseous temperature control medium at normal temperature and normal pressure;

a cooling mechanism configured to liquefy the temperature control medium stored in the tank;

an outflow flow path connected to an outflow port of the tank and configured to allow the temperature control medium to flow out to a temperature control unit that cools the members by heat exchange using the temperature control medium;

an inflow flow path connected to an inflow port of the tank and configured such that the temperature control medium after heat exchange flows in from the temperature control unit;

a pump provided in the outflow flow path and configured to send the temperature control medium stored in the tank; and

a pressing mechanism configured to press the liquid temperature control medium stored in the tank.

Claim 2. The temperature control system according to claim 1, further comprising

a supply mechanism connected to the tank and configured to supply the gaseous temperature control medium.

Claim 3. The temperature control system according to claim 1 or 2, wherein

the temperature control medium includes at least one of C3F8 and C3H2F4.

Claim 4. The temperature control system according to claim 1, wherein

the pressing mechanism supplies a pressing gas into the tank to press the temperature control medium.

Claim 5. The temperature control system according to claim 4, wherein

the pressing gas is a gas having a boiling point lower than a boiling point of the temperature control medium.

Claim 6. The temperature control system according to claim 1, wherein

the pressing mechanism presses the temperature control medium by a piston.

Claim 7. The temperature control system according to claim 1, wherein

the pressing mechanism presses the temperature control medium to a vapor pressure of the temperature control medium or more.

Claim 8. The temperature control system according to claim 1 or 2, wherein

a heater is provided in at least one of the outflow flow path and the inflow flow path.

Claim 9. The temperature control system according to claim 1 or 2, wherein

at least one of a pressure gauge and a thermometer is provided in the inflow flow path.

Claim 10. The temperature control system according to claim

1 or 2, further comprising

an exhaust flow path connected to the tank and the inflow flow path and configured to exhaust the temperature control medium.

Claim 11. The temperature control system according to claim 1 or 2, wherein

the cooling mechanism is provided in the tank or the inflow flow path.

Claim 12. The temperature control system according to claim 1 or 2, further comprising

a purge mechanism connected to the outflow flow path and configured to be able to supply a purge gas into the temperature control unit.

Claim 13. A method of controlling a temperature control system for cooling members in a plasma processing chamber, the method comprising:

a process of storing a gaseous temperature control medium in a tank at normal temperature and normal pressure;

a process of liquefying the temperature control medium stored in the tank;

a process of circulating the liquefied temperature control medium to a temperature control unit that cools the members while pressing the liquefied temperature control medium;

a process of stopping circulation of the temperature control medium to the temperature control unit;

a process of closing a first valve provided in an outflow flow path on a side where the temperature control medium flows out from the tank to the temperature control unit and a second valve provided in an inflow flow path on

a side where the temperature control medium flows in from the temperature control unit to the tank; and

a process of supplying a purge gas from a purge mechanism connected to the side of the temperature control unit rather than the first valve of the outflow flow path to the outflow flow path, the temperature control unit, and the inflow flow path, and exhausting the purge gas to an exhaust flow path connected closer to the side of the temperature control unit rather than the second valve of the inflow flow path.

Claim 14. The method of controlling a temperature control system according to claim 13, further comprising

a process of increasing a temperature inside the flow path by a heater provided in at least one of the outflow flow path and the inflow flow path before the exhausting process.

Claim 15. The method of controlling a temperature control system according to claim 14, wherein

the temperature increasing process increases the temperature inside the flow path to a temperature equal to or higher than a boiling point of the temperature control medium.

Claim 16. The method of controlling a temperature control system according to claim 15, wherein

the temperature increasing process opens a third valve provided in a flow path branched from the inflow flow path and connected to an upper portion of the tank to return the vaporized temperature control medium to the tank.

Claim 17. The method of controlling a temperature control

system according to any one of claims 13 to 16, wherein

the exhausting process stops the exhaust when it is detected that the temperature control medium is exhausted from the inside of the inflow flow path on the basis of a value measured by at least one of a pressure gauge and a thermometer provided in the inflow flow path.

Claim 18. The method for controlling a temperature control system according to claim 17, wherein

the exhausting process detects that the temperature control medium is exhausted from the inside of the inflow flow path on the basis of a fact that a temperature measured by the thermometer is equal to or higher than a boiling point of the temperature control medium and a fact that a pressure measured by the pressure gauge is equal to or lower than a vapor pressure at the measured temperature.