WHAT IS CLAIMED IS:

1. A high pressure heat treatment apparatus, the apparatus comprising:

an internal chamber formed to accommodate an object to be heat-treated;

an external chamber including a housing and a partition plate partitioning the housing into a high-temperature zone accommodating the internal chamber and a low-temperature zone having a lower temperature than the high-temperature zone, the partition plate including a discharge hole for allowing the high-temperature zone and the low-temperature zone to communicate with each other;

a gas supply module configured to supply a process gas for the heat treatment to the internal chamber to reach a first pressure higher than that of the atmosphere, and supply a protective gas to the external chamber to reach a second pressure set in relation to the first pressure; and

a discharge module configured to open the discharge hole to discharge the protective gas in the high-temperature zone to the low-temperature zone.

2. The apparatus of claim 1, wherein the housing includes a cover part defining the low-temperature zone together with the partition plate, and

at least one of the cover part and the partition plate is formed to accommodate a cooling medium for cooling the protective gas discharged to the low-temperature zone.

3. The apparatus of claim 2, wherein the cover part is disposed above the partition plate while facing the partition plate, and

both the cover part and the partition plate is formed to accommodate the cooling medium for the low-temperature zone to be filled with cold air made by heat exchange with the cooling medium.

4. The apparatus of claim 3, wherein the cover part is formed to accommodate a greater amount of cooling medium than the partition plate.

5. The apparatus of claim 1, wherein the external chamber is formed to allow the protective gas to circulate to the high-temperature zone after being cooled in the low-temperature zone by exchanging heat with a cooling medium.

6. The apparatus of claim 1, wherein the discharge module includes

a hole cover positioned to correspond to the discharge hole, and

a driving unit configured to move the hole cover between a closing position for closing the discharge hole and an opening position for opening the discharge hole.

7. The apparatus of claim 6, wherein the discharge module further includes a hinge for rotatably coupling the hole cover to the partition plate.

8. The apparatus of claim 7, wherein the driving unit includes

an actuator configured to move forward and backward, and

a link coupled to the hole cover and rotatably coupled to the actuator.

9. The apparatus of claim 1, further comprising a gas exhaust module configured to exhaust the process gas and the protective gas from the internal chamber and the external chamber,

wherein the discharge module is configured to open the discharge hole before the gas exhaust module is operated.

10. The apparatus of claim 1, further comprising a heating module disposed in the high-temperature zone, and configured to heat the process gas and the protective gas in the high-temperature zone,

wherein the partition plate further includes a heat insulation layer disposed to face the heating module.

11. A high pressure heat treatment apparatus, the apparatus comprising:

an internal chamber formed to accommodate an object to be heat-treated;

an external chamber including a housing, the housing being partitioned into a high-temperature zone accommodating the internal chamber and a low-temperature zone having a lower temperature than the high-temperature zone;

a gas supply module configured to supply a process gas for the heat treatment to the internal chamber to reach a first pressure higher than that of the atmosphere, and supply a protective gas to the external chamber to

reach a second pressure set in relation to the first pressure;

a heating module disposed in the high-temperature zone, and configured to heat the process gas and the protective gas in the high-temperature zone; and

a discharge module configured to discharge the protective gas heated in the high-temperature zone by the heating module to the low-temperature zone,

wherein the housing includes

a partition plate partitioning the high-temperature zone and the low-temperature zone from each other, and

a cover part defining the low-temperature zone together with the partition plate,

wherein the partition plate is configured to form a passage for discharging the protective gas to the low-temperature zone.

12. The apparatus of claim 11, wherein the passage includes a discharge hole passing through the partition plate and formed to allow the high-temperature zone and the low-temperature zone to communicate with each other, and

the discharge module includes

a hole cover positioned to correspond to the discharge hole, and

a driving unit configured to move the hole cover between a closing position for closing the discharge hole and an opening position for opening the discharge hole.

13. The apparatus of claim 11, further comprising a gas exhaust module configured to exhaust the process gas and the protective gas from the internal chamber and the external chamber,

wherein the discharge module is configured to discharge the protective gas from the high-temperature zone to the low-temperature zone before the gas exhaust module is operated.

14. The apparatus of claim 11, wherein the partition plate further includes a heat insulation layer disposed above the heating module to face the heating module.