

[CLAIMS]

[Claim 1]

- A substrate processing apparatus comprising:
- 5 a process chamber in which a substrate is accommodated;
- a gas supply system configured to supply a process gas containing a compound capable of reacting with a metal into the process chamber;
- a gas exhaust system configured to exhaust an inner atmosphere of the process chamber,
- 10 a first pressure adjusting valve; and
- a second pressure adjusting valve,
- wherein the gas exhaust system comprises:
- a common exhaust piping in communication with the process chamber;
- a first exhaust piping made of a resin incapable of reacting with the compound
- 15 and whose one end is connected to the common exhaust piping via a first valve and the first pressure adjusting valve and the other end is connected to a first exhauster; and
- a second exhaust piping made of the metal and whose one end is connected to the common exhaust piping via a second valve and the second pressure adjusting valve and the other end is connected to a second exhauster, wherein an inner surface of a
- 20 portion of the second exhaust piping located downstream of the second pressure adjusting valve is not surface-treated by the resin.

[Claim 2]

- The substrate processing apparatus of claim 1, wherein the common exhaust
- 25 piping comprises a metal piping whose inner surface is surface-treated so as not to react with the compound.

[Claim 3]

The substrate processing apparatus of one of claims 1 and 2, wherein the first
exhauster is configured to exhaust an inside of the first exhaust piping to a
predetermined first pressure range, and the second exhauster is configured to exhaust an
5 inside of the second exhaust piping to a predetermined second pressure range lower than
the first pressure range.

[Claim 4]

The substrate processing apparatus of any one of claims 1 through 3, wherein
10 the first exhauster is made of a resin incapable of reacting with the compound.

[Claim 5]

The substrate processing apparatus of any one of claims 1 through 4, further
comprising:

15 a first pressure sensor configured to measure an inner pressure of the common
exhaust piping within a first pressure range;

a second pressure sensor configured to measure the inner pressure of the
common exhaust piping within the first pressure range and a second pressure range
lower than the first pressure range,

20 wherein the first pressure adjusting valve is provided on the first exhaust piping
more upstream of the first exhauster, and an opening degree of the first pressure
adjusting valve is controlled based on a pressure measured by the first pressure sensor,
and

the second pressure adjusting valve is provided on the second exhaust piping
25 more upstream of the second exhauster, and an opening degree of the second pressure
adjusting valve is controlled based on a pressure measured by the second pressure
sensor.

[Claim 6]

The substrate processing apparatus of claim 5, wherein a pressure range measured by the first pressure sensor is narrower than a pressure range measured by the
5 second pressure sensor.

[Claim 7]

The substrate processing apparatus of claim 6, wherein the first pressure sensor is configured to measure the pressure ranging from 600 Torr to an atmospheric pressure
10 at most, the second pressure sensor is configured to measure the pressure ranging from 0 Torr to a pressure less than the atmospheric pressure at most.

[Claim 8]

The substrate processing apparatus of any one of claims 1 through 4, wherein:
15 the second pressure adjusting valve is provided on the second exhaust piping more upstream of the second exhauster, and a portion of the second exhaust piping between the second pressure adjusting valve and the second exhauster is configured as a metal piping.

20 [Claim 9]

The substrate processing apparatus of claim 8, wherein a portion of the second exhaust piping between the second valve and the second pressure adjusting valve is configured as a metal piping whose inner surface is surface-treated so as not to react with the compound.

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[Claim 10]

The substrate processing apparatus of any one of claims 5 through 7, further

comprising:

a controller configured to control the gas supply system, the first valve and the second valve to perform:

(a) supplying the process gas into the process chamber by controlling the gas supply system while exhausting the inner atmosphere of the process chamber by the first exhauster with the first valve open and the second valve closed; and

(b) exhausting the inner atmosphere of the process chamber by the second exhauster with the first valve closed and the second valve open.

10 [Claim 11]

The substrate processing apparatus of claim 10, wherein the controller is further configured to control the first pressure adjusting valve such that the pressure measured by the first pressure sensor reaches a predetermined first process pressure in (a), and to control the second pressure adjusting valve such that the pressure measured by the second pressure sensor reaches a predetermined second process pressure lower than the first process pressure in (b).

[Claim 12]

The substrate processing apparatus of claim 11, wherein the first process pressure is a predetermined pressure ranging from 600 Torr to an atmospheric pressure at most.

[Claim 13]

The substrate processing apparatus of any one of claims 1 through 12, wherein the process gas comprises a gas containing hydrogen peroxide as the compound.

[Claim 14]

A method of manufacturing a semiconductor device comprising:

(a) placing a substrate in a process chamber;

(b) supplying a process gas containing a compound capable of reacting with a metal into the process chamber and exhausting an inner atmosphere of the process chamber by a common exhaust piping in communication with the process chamber, a first exhaust piping made of a resin incapable of reacting with the compound and whose one end is connected to the common exhaust piping via a first valve and a first pressure adjusting valve and a first exhauster connected to the first exhaust piping; and

(c) exhausting the inner atmosphere of the process chamber by the common exhaust piping, a second exhaust piping made of the metal and whose one end is connected to the common exhaust piping via a second valve and a second pressure adjusting valve and a second exhauster connected to the second exhaust piping, wherein an inner surface of a portion of the second exhaust piping located downstream of the second pressure adjusting valve is not surface-treated by the resin.

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[Claim 15]

A program that causes, by a computer, a substrate processing apparatus to perform:

(a) placing a substrate in a process chamber;

(b) supplying a process gas containing a compound capable of reacting with a metal into the process chamber and exhausting an inner atmosphere of the process chamber by a common exhaust piping in communication with the process chamber, a first exhaust piping made of a resin incapable of reacting with the compound and whose one end is connected to the common exhaust piping via a first valve and a first pressure adjusting valve and a first exhauster connected to the first exhaust piping; and

(c) exhausting the inner atmosphere of the process chamber by the common exhaust piping, a second exhaust piping made of the metal and whose one end is

connected to the common exhaust piping via a second valve and a second pressure adjusting valve and a second exhauster connected to the second exhaust piping, wherein an inner surface of a portion of the second exhaust piping located downstream of the second pressure adjusting valve is not surface-treated by the resin.