[CLAIMS]

[Claim 1]

A substrate processing apparatus comprising:

a process chamber capable of accommodating a plurality of substrates;

a gas supplier configured to supply a process gas to the plurality of the substrates in the process chamber;

a gas exhauster configured to discharge the process gas from the process chamber;

a plurality of disks interposed between the plurality of the substrates, respectively, and in vicinity of back surfaces of the plurality of the substrates; and

a substrate retainer where the plurality of the substrates is placed,

wherein the substrate retainer comprises a plurality of support columns provided with a plurality of the substrate supports configured to support the plurality of the substrates, respectively,

wherein the plurality of the disks is placed at the plurality of the support columns in a manner that the plurality of the disks is located respectively beneath the plurality of the substrate supports without a gap therebetween,

wherein each of the plurality of disks do not protrude outside the plurality of support columns and an edge of each of the plurality of disks is located so as to contact and aligned with an outer edge of the plurality of support columns, and

wherein the substrate retainer is configured such that a distance between an edge of each of the substrates and an inner sidewall of each of the support columns is greater than a distance between a back surface of each of the substrates and an upper surface of each of the disks.

[Claim 2]

The substrate processing apparatus of claim 1, wherein the plurality of the disks is fixed to the plurality of the support columns.

[Claim 3]

The substrate processing apparatus of claim 1, wherein the plurality of the substrate supports is provided at the plurality of the support columns such that a space above an upper surface of each of the substrates is greater than a space below the back surface of each of the substrates.

[Claim 4]

The substrate processing apparatus of claim 1, wherein the inner sidewall of each of the support columns is separated from the edge of each of the substrates by 26 mm to 30 mm.

[Claim 5]

The substrate processing apparatus of claim 1, wherein a distance between adjacent substrates among the plurality of the substrates is greater than a distance between the edge of each of the disks and a wall of the process chamber.

[Claim 6]

The substrate processing apparatus of claim 5, wherein the distance between the adjacent substrates is 50 mm to 60 mm or more.

[Claim 7]

The substrate processing apparatus of claim 1, wherein the substrate retainer and the

process chamber are configured such that a distance between adjacent substrates among the plurality of the substrates is greater than a distance between the edge of each of the substrates and a wall of the process chamber when forming a film by a reaction involving a small amount of decomposition of the process gas.

[Claim 8]

The substrate processing apparatus of claim 3, wherein the substrate retainer and the process chamber are configured such that a distance between adjacent substrates among the plurality of the substrates is greater than a distance between the edge of each of the substrates and a wall of the process chamber when forming a film by a reaction involving a small amount of decomposition of the process gas.

[Claim 9]

The substrate processing apparatus of claim 4, wherein the substrate retainer and the process chamber are configured such that a distance between adjacent substrates among the plurality of the substrates is greater than a distance between the edge of each of the substrates and a wall of the process chamber when forming a film by a reaction involving a small amount of decomposition of the process gas.

[Claim 10]

The substrate processing apparatus of claim 1, wherein the substrate retainer and the process chamber are configured such that a distance between adjacent substrates among the plurality of the substrates is smaller than a distance between the edge of each of the substrates and a wall of the process chamber when forming a film by a reaction involving a large amount of decomposition of the process gas.

[Claim 11]

The substrate processing apparatus of claim 3, wherein the substrate retainer and the process chamber are configured such that a distance between adjacent substrates among the plurality of the substrates is smaller than a distance between the edge of each of the substrates and a wall of the process chamber when forming a film by a reaction involving a large amount of decomposition of the process gas.

[Claim 12]

The substrate processing apparatus of claim 4, wherein the substrate retainer and the process chamber are configured such that a distance between adjacent substrates among the plurality of the substrates is smaller than a distance between the edge of each of the substrates and a wall of the process chamber when forming a film by a reaction involving a large amount of decomposition of the process gas.

[Claim 13]

The substrate processing apparatus of claim 1, wherein the gas supplier comprises a nozzle provided with a plurality of holes through which a reactive gas is supplied to the plurality of the substrates, and

wherein the gas supplier and the substrate retainer are configured such that each of the holes is located substantially halfway between one of the substrates and one of the disks.

[Claim 14]

The substrate processing apparatus of claim 1, wherein the process chamber comprises a heat insulating region below a process region where the substrate retainer is provided, and the

heat insulating region comprises a heat insulating material and is isolated from the process region.

[Claim 15]

The substrate processing apparatus of claim 1, wherein the substrate retainer and the process chamber are configured such that a distance between adjacent disks among the plurality of the disks is greater than a distance between the edge of each of the disks and a wall of the process chamber.

[Claim 16]

The substrate processing apparatus of claim 1, wherein the substrate retainer is configured such that a distance between the back surface of each of the substrates and a disk adjacent thereto among the plurality of the disks is greater than a distance between the edge of each of the disks and a wall of the process chamber.

[Claim 17]

The substrate processing apparatus of claim 1, wherein the substrate retainer is configured such that the substrate supports protrude from inner side surfaces of the support columns.

[Claim 18]

A method of manufacturing a semiconductor device, comprising:

(a) loading a substrate retainer where a plurality of substrates is placed into a process chamber, wherein the substrate retainer comprises:

a plurality of disks interposed between the plurality of the substrates,

respectively, and in vicinity of back surfaces of the plurality of the substrates and placed at a plurality of support columns in a manner that the plurality of the disks is located respectively beneath a plurality of substrate supports without a gap therebetween; and

the plurality of the support columns configured to place the plurality of the disks thereat and provided with the plurality of the substrate supports configured to support the plurality of the substrates, respectively,

wherein each of the plurality of disks do not protrude outside the plurality of support columns and an edge of each of the plurality of disks is located so as to contact and aligned with an outer edge of the plurality of support columns, and

wherein the substrate retainer is configured such that a distance between an edge of each of the substrates and an inner sidewall of each of the support columns is greater than a distance between a back surface of each of the substrates and an upper surface of each of the disks;

(b) supplying a process gas to the plurality of the substrates; and

(c) exhausting the process gas.

[Claim 19]

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

(a) loading a substrate retainer where a plurality of substrates is placed into a process chamber, wherein the substrate retainer comprises:

a plurality of disks interposed between the plurality of the substrates, respectively, and in vicinity of back surfaces of the plurality of the substrates and placed at a plurality of support columns in a manner that the plurality of the disks is located respectively beneath a plurality of substrate supports without a gap therebetween; and

the plurality of the support columns configured to place the plurality of the

disks thereat and provided with the plurality of the substrate supports configured to support the plurality of the substrates, respectively,

wherein each of the plurality of disks do not protrude outside the plurality of support columns and an edge of each of the plurality of disks is located so as to contact and aligned with an outer edge of the plurality of support columns, and

wherein the substrate retainer is configured such that a distance between an edge of each of the substrates and an inner sidewall of each of the support columns is greater than a distance between a back surface of each of the substrates and an upper surface of each of the disks;

(b) supplying a process gas to the plurality of the substrates; and

(c) exhausting the process gas.

[Claim 20]

A substrate processing method, comprising:

(a) loading a substrate retainer where a plurality of substrates is placed into a process chamber, wherein the substrate retainer comprises:

a plurality of disks interposed between the plurality of the substrates, respectively, and in vicinity of back surfaces of the plurality of the substrates and placed at a plurality of support columns in a manner that the plurality of the disks is located respectively beneath a plurality of substrate supports without a gap therebetween; and

the plurality of the support columns configured to place the plurality of the disks thereat and provided with the plurality of the substrate supports configured to support the plurality of the substrates, respectively,

wherein each of the plurality of disks do not protrude outside the plurality of support columns and an edge of each of the plurality of disks is located so as to contact and

aligned with an outer edge of the plurality of support columns, and

wherein the substrate retainer is configured such that a distance between an edge of each of the substrates and an inner sidewall of each of the support columns is greater than a distance between a back surface of each of the substrates and an upper surface of each of the disks;

(b) supplying a process gas to the plurality of the substrates; and

(c) exhausting the process gas.