

[CLAIMS]

[Claim 1]

5 A cooling method of cooling ~~one or more~~a substrates accommodated in a substrate retainer after processing the substrate, the cooling method comprising:

(a) performing a first cooling process of cooling atthe substrate by supplying a gas toward the substrate retainer located at a predetermined reference position;

(b) stopping supplying the gas and measuring a temperature of the substrate accommodated in the substrate retainer; and

10 (c) performing a second cooling process of cooling the substrate accommodated in a lower region of the substrate retainer by supplying the gas if the temperature measured in (b) is lower than a predetermined temperature and omitting the second cooling process if the temperature measured in (b) is higher than or equal to the predetermined temperature.

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[Claim 2]

The cooling method of claim 1, wherein (b) further comprises ~~at least one among:~~
~~— (b-1) measuring a temperature of the substrate accommodated in the substrate retainer; and~~

20 (b-~~1~~2) checking a placement state of the substrate.

~~[Claim 3]~~

~~— The cooling method of claim 2, wherein (c) is performed only when a temperature of the substrate is equal to or higher than a temperature set in advance.~~

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[Claim 4~~3~~]

The cooling method of claim 1, wherein, in (a), the gas is supplied to a top plate of the substrate retainer, a substrate accommodating region of the substrate retainer in

which the substrate is loaded, and a boundary of the substrate accommodating region of the substrate retainer.

[Claim 54]

5 The cooling method of claim 1, wherein (a) is performed until a temperature of another substrate accommodated in a center region of the substrate retainer becomes equal to or less than 100 °C.

[Claim 65]

10 The cooling method of claim 1, wherein (b) further comprises:
 (b-23) moving the substrate retainer from the reference position to a position at which the substrate is transferable.

[Claim 76]

15 The cooling method of claim 65, wherein (b-32) further comprises at least one among:
 measuring a temperature of the substrate accommodated in the substrate retainer;
 and
 checking a placement state thereof.

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[Claim 87]

 The cooling method of claim 65, wherein (b-23) further comprises ~~at least one among:~~
~~measuring a temperature of the substrate accommodated in the lower region of~~
25 ~~the substrate retainer; and~~
 checking a placement state thereof.

[Claim 98]

The cooling method of claim ~~6~~5, wherein (b-~~2~~3) further comprises ~~at least one among:~~

~~checking at least a placement state~~ measuring a temperature of the another substrate accommodated at a lower end of the substrate retainer; ~~and~~
5 ~~checking a placement state thereof.~~

[Claim ~~4~~9]

The cooling method of claim 1, wherein a flow rate of the gas supplied in (c) is smaller than a flow rate of the gas supplied in (a).

[Claim ~~4~~10]

The cooling method of claim 1, wherein a supply time of the gas supplied in (c) is shorter than a supply time of the gas supplied in (a).

[Claim ~~4~~11]

The cooling method of claim 1, wherein, in (c), the gas is supplied to at least one among: a substrate accommodating region of the substrate retainer; a heat insulating region of the substrate retainer; and a boundary between the substrate accommodating region and the heat insulating region.

[Claim ~~4~~12]

The cooling method of claim 1, wherein, in (a) and (c), the gas is supplied to a top plate of the substrate retainer and a boundary of a substrate accommodating region of the substrate retainer in which the substrate is loaded.

[Claim ~~4~~13]

The cooling method of claim 1, wherein in (c), the gas is supplied to a substrate accommodating region of the substrate retainer in which the substrate is loaded and a boundary of a heat insulating region of the substrate retainer.

~~[Claim 15]~~

~~———— The cooling method of claim 1, wherein (c) is performed only when a temperature of the substrate is equal to or higher than a pre-set temperature.~~

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~~[Claim 14]~~

The cooling method of claim 1, further comprising:

(d) ~~performing either one of:~~

~~———— measuring a temperature of the substrate accommodated in the substrate retainer;~~

10 ~~and~~

~~———— checking a placement state of the substrate before (c).~~

~~[Claim 15]~~

The cooling method of claim 1, wherein (b) further comprises ~~either one of:~~

15 ~~———— (b-1) measuring a temperature of the substrate accommodated in the substrate retainer when a pre-set time has elapsed; and~~

~~(b-2) checking a placement state of the substrate when the a pre-set time has elapsed.~~

20 ~~[Claim 18]~~

~~———— The cooling method of claim 16, wherein (c) is performed when the temperature of the substrate is equal to or higher than a predetermined temperature.~~

~~[Claim 16]~~

25 A method of manufacturing a semiconductor device, comprising:

(A) cooling a substrate accommodated in a substrate retainer after processing the substrate,

wherein (A) comprises:

(a) performing a first cooling process of cooling the substrate by supplying a gas toward the substrate retainer located at a predetermined reference position;

(b) stopping supplying the gas and measuring a temperature of the substrate accommodated in the substrate retainer; and

(c) performing a second cooling process of cooling the substrate accommodated in a lower region of the substrate retainer by supplying the gas if the temperature measured in (b) is lower than a predetermined temperature, and omitting the second cooling process if the temperature measured in (b) is higher than or equal to the predetermined temperature.

[Claim ~~20~~17]

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

(A) cooling a substrate accommodated in a substrate retainer after processing the substrate,

wherein (A) comprises:

(a) performing a first cooling process of cooling the substrate by supplying a gas toward the substrate retainer located at a predetermined reference position;

(b) stopping supplying the gas and measuring a temperature of the substrate accommodated in the substrate retainer; and

(c) performing a second cooling process of cooling the substrate accommodated in a lower region of the substrate retainer by supplying the gas if the temperature measured in (b) is lower than a predetermined temperature, and omitting the second cooling process if the temperature measured in (b) is higher than or equal to the predetermined temperature.

[Claim ~~24~~18]

A substrate processing apparatus comprising:

a cooling structure configured to cool a substrate accommodated in a substrate retainer; and

5 a controller configured to be capable of controlling the cooling structure to perform:

 (a) performing a first cooling process of cooling the substrate by supplying a gas toward the substrate retainer located at a predetermined reference position;

10 (b) stopping supplying the gas and measuring a temperature of the substrate accommodated in the substrate retainer; and

 (c) performing a second cooling process of cooling the substrate accommodated in a lower region of the substrate retainer by supplying the gas if the temperature measured in (b) is lower than a predetermined temperature, and omitting the second cooling process if the temperature measured in (b) is higher than or equal to the predetermined temperature.

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