WHAT IS CLAIMED IS:

1. A substrate processing apparatus comprising:

(a) a process chamber configured to accommodate a plurality of substrates arranged vertically, provided with a product region and a dummy region, which is provided on at least one selected from the group of an upper side of the product region and a lower side of the product region, in the process chamber, and including a main exhauster on a lateral side of the process chamber;

(b) a first injector extending vertically within the process chamber on an opposite side from the main exhauster, and configured to supply a first precursor toward the substrates accommodated in the product region and the dummy region;

(c) a second injector installed on an upstream side of a center of the plurality of substrates accommodated inside the process chamber in a flow of the first precursor and configured to supply an assist gas for diluting the first precursor toward substrates accommodated in the dummy region at a larger amount than substrates accommodated in the product region;

(d) a third injector installed on a downstream side of the center of the substrates in the flow of the first precursor and configured to supply an inert gas toward the substrates accommodated in the product region and the substrates accommodated in the dummy region; and

(e) a fourth injector arranged on the downstream side of the center of the accommodated substrates in the flow of the first precursor and configured to supply an inert gas only to the dummy region.

2. A substrate processing apparatus comprising:

(a) a process chamber configured to accommodate a plurality of substrates arranged vertically, provided with a product region and a dummy region, which is provided on at least

one selected from the group of an upper side of the product region and a lower side of the product region, in the process chamber, and including a main exhauster on a lateral side of the process chamber;

(b) a first injector extending vertically within the process chamber on an opposite side from the main exhauster, and configured to supply a first precursor toward the substrates accommodated in the product region and the dummy region;

(c) at least one selected from the group of a second injector and a third injector, wherein the second injector is installed on an upstream side of a center of the plurality of substrates accommodated inside the process chamber in a flow of the first precursor and configured to supply an assist gas for diluting the first precursor toward substrates accommodated in the dummy region at a larger amount than substrates accommodated in the product region, and the third injector is installed on a downstream side of the center of the substrates in the flow of the first precursor and configured to supply an inert gas toward the substrates accommodated in the product region and the substrates accommodated in the dummy region;

(d) a fourth injector configured to supply an inert gas only to the dummy region; and

(e) a fifth injector arranged on the upstream side of the center of the accommodated substrates in the flow of the first precursor and including an injection hole configured to supply an assist gas toward the substrates accommodated in a lower dummy region which is the dummy region arranged on the lower side,

wherein the second injector has an injection hole for supplying an assist gas only to the substrates accommodated in an upper dummy region which is the dummy region arranged on the upper side.

3. A substrate processing apparatus comprising:

(a) a process chamber configured to accommodate a plurality of substrates arranged vertically, provided with a product region and a dummy region, which is provided on at least

one selected from the group of an upper side of the product region and a lower side of the product region, in the process chamber, and including a main exhauster on a lateral side of the process chamber;

(b) a first injector extending vertically within the process chamber on an opposite side from the main exhauster, and configured to supply a first precursor toward the substrates accommodated in the product region and the dummy region;

(c) at least one selected from the group of a second injector and a third injector, wherein the second injector is installed on an upstream side of a center of the plurality of substrates accommodated inside the process chamber in a flow of the first precursor and configured to supply an assist gas for diluting the first precursor toward substrates accommodated in the dummy region at a larger amount than substrates accommodated in the product region, and the third injector is installed on a downstream side of the center of the substrates in the flow of the first precursor and configured to supply an inert gas toward the substrates accommodated in the product region and the substrates accommodated in the dummy region;

(d) a fourth injector configured to supply an inert gas only to the dummy region;

(e) a sixth injector extending in a vertical direction, arranged inside the process chamber to face the main exhauster, and configured to supply a second precursor toward at least the substrates accommodated in the product region; and

(f) a seventh injector extending in the vertical direction, arranged on the upstream side of the center of the accommodated substrates in the flow of the first precursor, and configured to supply an assist gas, which is different from the first precursor and the second precursor, toward at least the substrates accommodated in the product region.

4. The substrate processing apparatus of Claim 1, wherein the third injector is installed as a pair of third injectors on both sides of an imaginary vertical plane connecting the main exhauster and the center of the accommodated substrates.

5. The substrate processing apparatus of Claim 3, wherein the seventh injector supplies the assist gas when the first precursor is supplied from the first injector or when the second precursor is supplied from the sixth injector.

6. The substrate processing apparatus of Claim 3, wherein the sixth injector and the seventh injector are arranged such that the first injector is interposed between the sixth injector and the seventh injector, and

wherein the seventh injector supplies the assist gas when the first precursor, which is a precursor gas containing a Group 14 element, is supplied from the first injector.

7. The substrate processing apparatus of Claim 1, wherein the fourth injector is arranged outside an imaginary vertical plane connecting the main exhauster and the center of the accommodated substrates and is configured to inject an inert gas toward an upstream region, which is located outside the center of the accommodated substrates and between a peripheral edge of the accommodated substrates on a side where the fourth injector is arranged and the center of the accommodated substrates.

8. The substrate processing apparatus of Claim 1, wherein a partition plate for blocking a flow of gas in a vertical direction is installed below a lower dummy region which is the dummy region arranged on the lower side.

9. The substrate processing apparatus of Claim 4, wherein the fourth injector is installed adjacent to one of the third injectors, and

wherein the process chamber includes sub-exhausters between the third injectors and the fourth injector.

10. A substrate processing apparatus comprising:

(a) a process chamber configured to accommodate a plurality of substrates arranged vertically, provided with a product region and a dummy region, which is provided on at least one selected from the group of an upper side of the product region and a lower side of the product region, in the process chamber, and including a main exhauster on a lateral side of the process chamber;

(b) a first injector extending vertically within the process chamber on an opposite side from the main exhauster, and configured to supply a first precursor toward the substrates accommodated in the product region and the dummy region;

(c) at least one selected from the group of a second injector and a third injector, wherein the second injector is installed on an upstream side of a center of the plurality of substrates accommodated inside the process chamber in a flow of the first precursor and configured to supply an assist gas for diluting the first precursor toward substrates accommodated in the dummy region at a larger amount than substrates accommodated in the product region, and the third injector is installed on a downstream side of the center of the substrates in the flow of the first precursor and configured to supply an inert gas toward the substrates accommodated in the product region and the substrates accommodated in the dummy region; and

(d) a fourth injector configured to supply an inert gas only to the dummy region,

wherein an opening width of the main exhauster along a circumferential direction of the process chamber becomes narrower along a direction from the upper side to the lower side, or

wherein an exhaust flow rate adjuster, which protrudes outward from a side wall of the process chamber and has a protrusion length decreasing along a direction from the upper side to the lower side, is installed in a portion of the side wall of the process chamber, which forms the main exhauster.

11. The substrate processing apparatus of Claim 1, wherein the fourth injector is arranged at a position closer to the main exhauster than the third injector.

12. A substrate processing apparatus comprising:

(a) a process chamber configured to accommodate a plurality of substrates arranged vertically, provided with a product region and a dummy region, which is provided on at least one selected from the group of an upper side of the product region and a lower side of the product region, in the process chamber, and including a main exhauster on a lateral side of the process chamber;

(b) a first injector extending vertically within the process chamber on an opposite side from the main exhauster, and configured to supply a first precursor toward the substrates accommodated in the product region and the dummy region;

(c) at least one selected from the group of a second injector and a third injector, wherein the second injector is installed on an upstream side of a center of the plurality of substrates accommodated inside the process chamber in a flow of the first precursor and configured to supply an assist gas for diluting the first precursor toward substrates accommodated in the dummy region at a larger amount than substrates accommodated in the product region, and the third injector is installed on a downstream side of the center of the substrates in the flow of the first precursor and configured to supply an inert gas toward the substrates accommodated in the product region and the substrates accommodated in the dummy region; and

(d) a fourth injector configured to supply an inert gas only to the dummy region,

wherein the fourth injector includes an upper injection hole opened toward at least one substrate excluding an uppermost substrate among the plurality of substrates accommodated in an upper dummy region, which is the dummy region on the upper side, and a lower injection hole opened toward at least two substrates excluding a lowermost stage among the plurality of substrates accommodated in a lower dummy region, which is the

dummy region on the lower side.

13. A substrate processing apparatus comprising:

(a) a process chamber configured to accommodate a plurality of substrates arranged vertically, provided with a product region and a dummy region, which is provided on at least one selected from the group of an upper side of the product region and a lower side of the product region, in the process chamber, and including a main exhauster on a lateral side of the process chamber;

(b) a first injector extending vertically within the process chamber on an opposite side from the main exhauster, and configured to supply a first precursor toward the substrates accommodated in the product region and the dummy region;

(c) at least one selected from the group of a second injector and a third injector, wherein the second injector is installed on an upstream side of a center of the plurality of substrates accommodated inside the process chamber in a flow of the first precursor and configured to supply an assist gas for diluting the first precursor toward substrates accommodated in the dummy region at a larger amount than substrates accommodated in the product region, and the third injector is installed on a downstream side of the center of the substrates in the flow of the first precursor and configured to supply an inert gas toward the substrates accommodated in the product region and the substrates accommodated in the dummy region; and

(d) a fourth injector configured to supply an inert gas only to the dummy region,

wherein the at least one selected from the group of the second injector and the third injector includes the third injector, and

wherein the third injector includes a plurality of horizontal injection holes opened substantially parallel to surfaces of the accommodated substrates and an inclined injection hole provided at a position higher than an uppermost horizontal injection hole among the plurality of horizontal injection holes and opened obliquely upward.

14. The substrate processing apparatus of Claim 1, wherein the first injector includes one or more injection holes arranged along a direction substantially parallel to surfaces of the accommodated substrates.

15. The substrate processing apparatus of Claim 1, wherein the first injector is a nozzle array in which a plurality of linear circular pipes are arranged along a circumferential direction of the process chamber.

16. The substrate processing apparatus of Claim 3, wherein the first injector and the sixth injector are arranged such that the seventh injector is interposed between the first injector and the sixth injector from both sides of the seventh injector,

wherein the first injector is configured to supply one of an oxidizing gas and a reducing gas and the sixth injector is configured to supply the other of the oxidizing gas and the reducing gas, so that active oxygen species or hydroxyl radicals are generated inside the process chamber, and

wherein the seventh injector is configured to supply an inert gas when at least one selected from the group of the first injector and the sixth injector supplies a gas.

17. The substrate processing apparatus of Claim 1, wherein among the substrates accommodated in the product region, in-plane uniformity of a substrate located at an end portion on the dummy region side is 0.2% or less.

18. A method of manufacturing a semiconductor device, comprising:

(A) accommodating a plurality of substrates in a process chamber in a state arranged along a vertical direction, wherein the process chamber is provided with a product region and a dummy region, which is provided on at least one selected from the group of an upper side of

the product region and a lower side of the product region, in the process chamber and has a main exhauster on a lateral side of the process chamber;

(B) supplying a first precursor toward the substrates accommodated in the product region and the dummy region by using a first injector extending in a vertical direction and arranged inside the process chamber on an opposite side from ~~to face~~ the main exhauster;

(C) supplying an assist gas for diluting the first precursor toward the substrates accommodated in the dummy region at a larger amount than the substrates accommodated in the product region by using a second injector, which is installed on an upstream side of a center of the substrates accommodated inside the process chamber in a flow of the first precursor;

(D) supplying an inert gas toward the substrates accommodated in the product region and the substrates accommodated in the dummy region by using a third injector, which is installed on a downstream side of the center of the substrates in the flow of the first precursor; and

(E) supplying an inert gas only to the dummy region by using a fourth injector, which is arranged on the downstream side of the center of the accommodated substrates in the flow of the first precursor.

19. A program that causes, by a computer, a substrate processing apparatus to perform a process comprising:

(α) accommodating a plurality of substrates in a process chamber in a state arranged along a vertical direction, wherein the process chamber is provided with a product region and a dummy region, which is provided on at least one selected from the group of an upper side of the product region and a lower side of the product region, in the process chamber and has a main exhauster on a lateral side of the process chamber;

(β) supplying a first precursor toward the substrates accommodated in the product region and the dummy region by using a first injector extending in a vertical direction and

arranged inside the process chamber on an opposite side from the main exhauster;

(γ) supplying an assist gas for diluting the first precursor toward the substrates accommodated in the dummy region at a larger amount than the substrates accommodated in the product region by using a second injector, which is installed on an upstream side of a center of the substrates accommodated inside the process chamber in a flow of the first precursor;

(δ) supplying an inert gas toward the substrates accommodated in the product region and the substrates accommodated in the dummy region by using a third injector, which is installed on a downstream side of the center of the substrates in the flow of the first precursor; and

(ε) supplying an inert gas only to the dummy region by using a fourth injector, which is arranged on the downstream side of the center of the accommodated substrates in the flow of the first precursor.