held, the rear surface of the substrate is absorbed. However, there is a problem that when the substrate is held by adsorption, if the substrate is partially placed on an adsorption surface of the conveyancing unit, the substrate cannot be absorbed.

[0005]

Other problems to be solved and novel features will become apparent from descriptions in this specification and accompanying drawings.

Solution to Problem

[0006]

A laser irradiation apparatus according to an embodiment includes: a laser generation device configured to generate laser light; a levitation unit configured to levitate an object to be processed to which the laser light is applied; and a conveyance unit configured to convey the levitated object to be processed. The conveyance unit includes: a holding mechanism for holding the object to be processed by absorbing the object to be processed; and a moving mechanism for moving the holding mechanism in a conveyance direction. The holding mechanism includes a base with a plurality of through holes formed therein; a plurality of pipes each of which is connected to a respective one of the plurality of through holes; and a plurality of absorption assistance valves each of which is disposed in the middle of a respective one of the plurality of pipes, each of the plurality of absorption assistance valves being configured to be closed when a flow rate of a gas flowing into the pipe through the through hole becomes equal to or higher than a threshold.

Advantageous Effects of Invention

[0007]

According to the embodiment, it is possible to provide an excellent laser irradiation apparatus, a laser irradiation method, and a method for manufacturing a semiconductor device.

have substantially the same size as each other. In the xy-plane view, the irradiation area 60e and the monitoring area 60f may be rectangular and have substantially the same size. In this case, the first and fourth areas 60a and 60d are arranged side by side in the y-direction. The second and third areas 60b and 60c are arranged side by side in the y-direction. The irradiation area 60e and the monitoring area 60f are arranged side by side in the y-direction.

[0080]

Further, an alignment mechanism 69 is provided in the first area 60a. The alignment mechanism 69 adsorbs and holds an object to be processed 66 in a manner similar to that of the holding mechanism 12 according to the first embodiment. Further, the alignment mechanism 69 adjusts the position and the rotation angle of the object to be processed 66. For example, there is a possibility that the position and the rotation angle of the object to be processed 66 are slightly deviated due to a carrying-in operation, a conveyance operation, and a rotation operation of the object to be processed 66. The alignment mechanism 69 corrects deviations in the position and the rotation angle. In this way, it is possible to accurately control the irradiation place of laser light on the object to be processed 66.

[0081]

Further, a rotation mechanism 68 is provided in the fourth area 60d. The rotation mechanism 68 absorbs and holds the object to be processed 66 in a manner similar to that of the holding mechanism 12 according to the first embodiment. Further, the rotation mechanism 68 rotates the object to be processed 66 around a rotation axis parallel to the z-direction (hereinafter referred to as the z-axis). Further, the rotation mechanism 68 includes an actuator such as a motor that rotates the object to be processed 66 around the z-axis.

[0082]

Further, auxiliary levitation units 67 are provided on outer sides of the fourth area 60d. The auxiliary levitation units 67 are disposed on the y-direction negative side and the x-direction positive side, respectively, of the fourth area 60d. When a part of the object to be