CLAIMS

1. A substrate heat-treating apparatus, comprising:

a VCSEL device;

a process chamber in which a flat substrate to be heat-treated is placed; and

an irradiation module configured to irradiate a laser beam to the flat substrate, the irradiation module comprising a device array plate and sub-irradiation modules placed on an upper surface of the device array plate, each of sub-irradiation modules including a device region on which the VCSEL device is mounted and a terminal region located a front side or a rear side of the device region;

wherein, in the irradiation module, the device regions and the terminal regions are disposed in a x-axial direction, respectively, and the device regions and the terminal regions are alternately disposed in a y-axial direction perpendicular to the x-axial direction;

wherein the process chamber comprises an outer housing, an inner housing disposed inside the outer housing and formed to have a height smaller than that of the outer housing, a beam transmitting plate placed above the inner housing, and a lower plate coupled to lower sides of the outer housing and the inner hosing;

wherein the process chamber further comprises an upper accommodation space formed inside the outer housing and above the inner housing to provide a space in which the flat substrate is placed, and a lower accommodation space formed between an outer surface of the inner housing and an inner surface of the outer housing,

wherein the process chamber further comprises a substrate support supporting an outer side of the flat substrate and formed to extend into the lower accommodation space, and

wherein the substrate heat-treating apparatus further comprises a substrate rotating module having an inner rotating means having a ring shape in which N poles and S poles are alternately arranged in a circumferential direction and being coupled to a lower portion of the substrate

support within the lower accommodation space, and an outer rotating means placed outside the outer housing to face the inner rotating means and configured to generate a magnetic force to rotate the inner rotating means.

2. The substrate heat-treating apparatus of claim 1, wherein

in the sub-irradiation module, the device region is formed in a quadrangular shape and the terminal regions protrude from the other side of a front end and one end side of a rear end of the device region, respectively, and

in the irradiation module, the device regions and the terminal regions are sequentially disposed in the x-axial direction, respectively, and the device regions and the terminal regions are alternately disposed in the y-axial direction.

3. The substrate heat-treating apparatus of claim 1, wherein

in the sub-irradiation module, the device region is formed in a quadrangular shape and the terminal region is formed at the entire front end of the device region, and

in the irradiation module, the device regions and the terminal regions are sequentially disposed in the x-axial direction, respectively, and the device regions and the terminal regions are alternately disposed in the y-axial direction.

4. The substrate heat-treating apparatus of claim 1, wherein

the sub-irradiation module is formed in a quadrangular shape, the terminal regions are formed on the other side of the front end and one side of the rear end of the quadrangular shape, respectively, and have a rectangular shape having a predetermined length and a width corresponding to half the entire width of the sub-irradiation module, the device region is formed on a region excluding the terminal regions, and

the irradiation module comprises a region in which the device regions and the terminal

regions are alternately arranged in the x-axial direction and a region in which only the device regions are arranged, and the device regions and the terminal regions are alternately arranged in the y-axial direction.

5. The substrate heat-treating apparatus of claim 1, wherein the sub-irradiation modules are formed to be independently supplied with power.

6. The substrate heat-treating apparatus of claim 1, wherein the sub-irradiation module comprises a device substrate on which the VCSEL device and an electrode terminal are mounted, and a cooling block coupled to a lower portion of the device substrate to cool the device substrate and the VCSEL device, wherein the cooling block has a cooling passage, through which cooling water flows, formed therein.

7. The substrate heat-treating apparatus of claim 1, wherein

the irradiation module is positioned below the beam transmitting plate to irradiate a laser beam to a lower surface of the flat substrate.

8. The substrate heat-treating apparatus of claim 1, wherein the substrate heat-treating apparatus further comprises a substrate rotating module configured to support and rotate the flat substrate.

9. The substrate heat-treating apparatus of claim 1, wherein the irradiation module is formed such that the device region is located at a center of the flat substrate.

10. The substrate heat-treating apparatus of claim 1, wherein the irradiation module is formed such that the terminal region is located at a center of the flat substrate.