Claims:

1. An apparatus for treating a substrate, comprising:

a body portion;

a substrate support coupled to the body portion;

a source of electromagnetic radiation disposed in a radiation assembly, the radiation assembly coupled to the body portion;

one or more power supplies coupled to the radiation assembly; and

a controller coupled to the power supply to direct at least 30 pulses of electromagnetic energy toward the substrate support, each pulse having energy density of at least 0.2 J/cm^2.

2. The apparatus of claim 1, wherein the source of electromagnetic radiation comprises one or more lasers.

3. The apparatus of claim 1, wherein the controller is configured to generate pulses of power from the power supply to the source of electromagnetic radiation.

4. The apparatus of claim 1, wherein the controller directs at least 100 pulses of electromagnetic energy toward the substrate support.

5. The apparatus of claim 1, wherein the controller is configured to operate an optical switch disposed between the radiation assembly and the body portion.

6. A method of annealing a substrate, comprising:

disposing the substrate on a substrate support; and

directing at least 30 pulses of electromagnetic energy toward the substrate, each pulse having energy density at least 0.2 J/cm^2.

7. The method of claim 6, wherein each pulse is between 1 nsec and 10 msec in duration.

8. The method of claim 6, wherein each pulse has the same energy and duration.

9. The method of claim 9, wherein the pulses of electromagnetic energy are generated by one or more lasers.

10. The method of claim 6, wherein the pulses are generated by interrupting a continuous beam of electromagnetic radiation using an optical switch.

11. The apparatus of claim 1, wherein the controller comprises a switch.

12. The apparatus of claim 11, wherein the switch is an optical switch disposed between the radiation assembly and the substrate support.

13. The method of claim 6, wherein at least 100 pulses of electromagnetic energy are directed toward the substrate.

14. The method of claim 6, wherein the substrate comprises a plurality of portions, and at least 100 pulses of electromagnetic energy are delivered to each portion, each pulse having energy density at least 0.2 J/cm^2.

Claims

1. An apparatus for treating a substrate, comprising:

a body portion;

a substrate support coupled to the body portion;

a plurality of lasers disposed in a radiation assembly, the radiation assembly coupled to the body portion;

one or more power supplies coupled to the radiation assembly; and

a controller coupled to the power supply to direct at least 30 temporally tailored pulses of electromagnetic energy from the radiation assembly toward the substrate support, each pulse having energy density of at least 0.2 J/cm^2.

2. The apparatus of claim 1, wherein the controller is configured to generate pulses of power from the power supply to the lasers.

3. The apparatus of claim 1, wherein the controller directs at least 100 pulses of electromagnetic energy toward the substrate support.

4. The apparatus of claim 1, wherein the controller is configured to operate a switch disposed between the radiation assembly and the body portion.

5. A method of annealing a substrate, comprising:

disposing the substrate on a substrate support; and

directing at least 30 pulses of electromagnetic energy toward the substrate, each pulse having a temporally tailored energy profile and energy density at least 0.2 J/cm^2.

6. The method of claim 5, wherein each pulse is between 1 nsec and 10 msec in duration.

7. The method of claim 5, wherein each pulse has the same energy and duration.

8. The method of claim 5, wherein each pulse of electromagnetic energy is generated by a plurality of lasers.

9. The method of claim 5, wherein the pulses are generated by interrupting a continuous beam of electromagnetic radiation using a switch.

10. The apparatus of claim 1, wherein the controller comprises a switch.

11. The apparatus of claim 10, wherein the switch is an optical switch disposed between the radiation assembly and the substrate support.

12. The method of claim 5, wherein at least 100 pulses of electromagnetic energy are directed toward the substrate.

13. The method of claim 5, wherein the substrate comprises a plurality of portions, and at least 30 pulses of electromagnetic energy are delivered to each portion, each pulse having energy density at least 0.2 J/cm^2.

14. The method of claim 5, wherein each pulse partially anneals the substrate.