CLAIMS

1. A handheld laser system, comprising:

a laser source configured to generate laser radiation at a wavelength for performing a material processing operation on a workpiece material with a laser beam of the generated laser radiation;

a plasma sensor configured to detect plasma emitted from the workpiece material during a material processing operation; and

a controller coupled to the plasma sensor and configured to:

compare an optical intensity value obtained by the plasma sensor to a threshold value at a time when a predetermined time period has elapsed after the material processing operation has commenced; and

produce a control command based on the comparison.

2. The handheld laser system of claim 1, wherein the control command

turns off power to the laser source when the optical intensity value is lower than the threshold value, and

maintains power to the laser source when the optical intensity value is at or greater than the threshold value.

3. The handheld laser system of claim 1, further comprising at least one optical filter configured to block light at the wavelength of the emitted laser light from reaching the plasma sensor.

4. The handheld laser system of claim 1, further comprising an air-cooling system coupled to the laser source for dissipating heat.

5. The handheld laser system of claim 1, further comprising a housing configured as a handheld apparatus having an outlet for the laser beam.

6. The handheld laser system of claim 5, wherein the handheld apparatus is of one-piece construction.

7. The handheld laser system of claim 5, wherein the handheld apparatus is configured with a modular attachment system for a nozzle.

8. The handheld laser system of claim 5, wherein the handheld apparatus is configured to be gas-cooled.

9. The handheld laser system of claim 5, wherein the handheld apparatus is configured to weigh less than about 1 kilogram (kg).

10. The handheld laser system of claim 5, further comprising an optical fiber coupling the handheld apparatus to the laser source.

11. The handheld laser system of claim 5, further comprising at least one movable mirror positioned within the housing, the at least one movable mirror configured to wobble the laser beam.

12. The handheld laser system of claim 1, wherein the laser beam has a power of at least 1 kW.

13. The handheld laser system of claim 1, wherein the laser beam has a power within a range of 500 W to 3 kW inclusive.

14. A method, comprising:

directing a laser beam from a laser source onto a workpiece material;

activating a plasma sensor configured to detect plasma emitted from the workpiece material during a material processing operation;

comparing an optical intensity value obtained by the plasma sensor to a threshold value at a time when a predetermined time period has elapsed after the material processing operation has commenced; and

producing a control command based on the comparison.

15. The method of claim 14, wherein the control command powers off the laser source when the optical intensity value is lower than the threshold value and maintains power to the laser source when the optical intensity value is at or greater than the threshold value.

16. The method of claim 14, further comprising providing a housing configured as a handheld apparatus having an outlet for the laser beam.

17. The method of claim 14, further comprising wobbling the laser beam.

18. A handheld laser system, comprising:

a laser source configured to generate laser radiation at a wavelength for performing a material processing operation on a workpiece material with a laser beam of the generated laser radiation; and

a housing configured as a handheld apparatus having an outlet for the laser beam, the handheld apparatus configured to be gas-cooled.

19. The handheld laser system of claim 18, further comprising an optical fiber coupling the handheld apparatus to the laser source.

20. The handheld laser system of claim 18, wherein the handheld apparatus is of one-piece construction.

21. The handheld laser system of claim 18, wherein the handheld apparatus is configured with a modular attachment system for a nozzle.

22. The handheld laser system of claim 18, further comprising an air-cooling system coupled to the laser source for dissipating heat.

23. The handheld laser system of claim 18, wherein the laser beam has a power of at least 1 kW.