What is claimed:

1. A plasma source (10) for a processing system, comprising:

at least one gas source configured to provide at least one gas;

a plasma source body (12) defining at least one gas inlet (30) in fluid communication with the at least one gas source and at least one gas outlet (32), the plasma source (10) having at least one passage (40) having at least one passage surface (86) formed within the plasma source body (12), the at least one passage (40) in fluid communication with the at least one gas inlet and the at least one gas outlet and configured to have at least one plasma region formed therein;

wherein at least a portion of the at least one gas flowing within the passage (40) is disassociated by the at least one plasma region to form at least one disassociated gas within the at least one passage (40), the portion of at least one disassociated gas evacuated from the plasma source body (12) via the at least one gas outlet (32);

a first thermal sensor receiver (80) formed within the plasma source body (12) proximate to the at least one passage surface (86) of the at least one passage (40);

a first thermal sensor (62) positioned within the first thermal sensor receiver (80), the first thermal sensor (62) configured to measure a first temperature of the at least one passage surface (86) of the at least one passage (40) at a first location proximate to the at least one plasma region;

a second thermal sensor receiver (82) formed within the plasma source body (12) proximate to the at least one passage surface (86) of the at least one passage (40), the second thermal sensor receiver (82) formed within the plasma source body (12) proximate to the at least one gas outlet (32); ~~and~~

a second thermal sensor (66) positioned within the second thermal sensor receiver (82), the second thermal sensor (66) configured to measure a second

temperature of the at least one passage surface (86) of the at least one passage (40) at a second location distal to the at least one plasma region; and

a processing control system (170) in communication with the first thermal sensor (62), the second thermal sensor (66) and the at least one gas source, and configured to monitor a radical output of the plasma source by comparing the first temperature measured by the at least one first thermal sensor (62) to the second temperature measured by the second thermal sensor (66).

2. The plasma source (10) of claim 1, further comprising at least one power source (122; 124) surrounding at least a portion of the plasma source body (12) and configured to generate the at least one plasma region within the plasma source body (12), ~~the at least one plasma region configured to disassociate the at least one gas flowing within the passage forming at least one disassociated gas~~.

3. The plasma source (10) of claim 1, further comprising at least one ~~at least one~~ thermal regulating device (100; 104) coupled to the plasma source body (12).

4. The plasma source (10) of claim 3, further comprising a first thermal regulating device (100) and at least a second thermal regulating device (104) coupled to the plasma source body (12).

5. The plasma source (10) of claim 1, ~~wherein the at least one first thermal sensor receiver formed within the plasma source body proximate to the at least one plasma region formed within the plasma source body,~~ wherein the ~~at least one~~ first thermal sensor (62) is configured to measure a first temperature of at least one disassociated gas within the at least one plasma region.

6. The plasma source (10) of claim 1, ~~wherein the at least one second thermal sensor receiver formed within the plasma source body distally to the at least one plasma region formed within the plasma source body,~~ wherein the ~~at least one~~ second thermal sensor (66) is configured to measure a second temperature of at least one re-disassociated gas not within the at least one plasma region.

7. The plasma source (10) of claim 1, further comprising:

at least one ~~optional~~ additional thermal sensor receiver formed within the plasma source body (12) proximate to the at least one passage surface (86) of the at least one passage (40), the at least one ~~optional~~ additional thermal sensor receiver formed within the plasma source body (12) proximate to the at least one gas outlet; and

at least one ~~optional~~ additional thermal sensor positioned within the at least one ~~optional~~ additional thermal sensor receiver, the at least one ~~optional~~ additional thermal sensor configured to measure a temperature of the at least one passage surface (86) of the at least one passage (40) at a location within the plasma source body (12).

8. The plasma source (10) of claim 1, further comprising ~~at~~ the least one processing control system (170) in communication with ~~at least one of the at least one gas source,~~ at least one processing system, ~~at least one first sensor, at least one second sensor,~~ and at least one ~~optional~~ additional thermal sensor.

9. The plasma source (10) of claim 1, wherein the plasma source (10) ~~comprising~~ comprises a remote plasma source.

~~10. A plasma source for a processing system, comprising:~~

~~at least one gas source configured to provide at least one gas;~~

~~a plasma source body defining at least one gas inlet in fluid communication with the at least one gas source and at least one gas outlet, the plasma source having at least one passage having at least one passage surface formed within the plasma source body, the at least one passage in fluid communication with the at least one gas inlet and the at least one gas outlet;~~

~~at least one power source surrounding at least a portion of the plasma source body, the at least one power source in communication with at least one power supply, the at least one power source configured to generate at least one plasma~~

region within the plasma source body, the at least one plasma region configured to disassociate the at least one gas flowing within the passage forming at least one disassociated gas, the at least one disassociated gas evacuated from plasma source body via the at least one outlet;

a first thermal sensor receiver formed within the plasma source body proximate to the at least one passage surface of the at least one passage;

a first thermal sensor positioned within the first thermal sensor receiver, the first thermal sensor configured to measure a first temperature of at least one passage surface of the at least one passage at a first location;

a second thermal sensor receiver formed within the plasma source body proximate to the at least one passage surface of the at least one passage, the second thermal sensor receiver formed within the plasma source body proximate to the at least one gas outlet;

a second thermal sensor positioned within the second thermal sensor receiver, the second thermal sensor configured to measure a second temperature of the at least one passage surface of the at least one passage at a second location; and

at least one thermal regulating device coupled to the plasma source body.

11. The plasma source of claim 10 further comprising at least one at least one thermal regulating device coupled to the plasma source body.

12. The plasma source of claim 11 further comprising a first thermal regulating device and at least a second thermal regulating device coupled to the plasma source body.

13. The plasma source of claim 10 wherein the at least one first thermal sensor receiver formed within the plasma source body proximate to the at least one plasma region formed within the plasma source body, wherein the at least one first sensor is configured to measure a first temperature of at least one disassociated gas within the at least one plasma region.

~~14. The plasma source of claim 10 wherein the at least one second thermal sensor receiver formed within the plasma source body distally to the at least one plasma region formed within the plasma source body, wherein the at least one second sensor is configured to measure a second temperature of at least one re-disassociated gas not within the at least one plasma region.~~

~~15. The plasma source of claim 10 further comprising:~~

~~at least one optional thermal sensor receiver formed within the plasma source body proximate to the at least one passage surface of the at least one passage, the at least one optional thermal sensor receiver formed within the plasma source body proximate to the at least one gas outlet; and~~

~~at least one optional thermal sensor positioned within the at least one optional thermal sensor receiver, the at least one optional thermal sensor configured to measure a temperature of the at least one passage surface of the at least one passage at a location within the plasma source body.~~

~~16. The plasma source of claim 10 further comprising at least one processing control system in communication with at least one of the at least one gas source, at least one processing system, at least one first sensor, at least one second sensor, and at least one optional sensor.~~

~~17. The plasma source of claim 10 wherein the plasma source comprising a remote plasma source.~~

~~18~~ 10. A method of monitoring the radical output from a plasma source (10), comprising:

providing a plasma source body (12) defining at least one gas inlet (30) in fluid communication with at least one gas source and at least one gas outlet (32), the plasma source (10) having at least one passage (40) defined by at least one passage surface (86) formed within the plasma source body (12), the at least one passage

(40) in fluid communication with the at least one gas inlet and the at least one gas outlet (32);

flowing at least one input gas from the at least one gas source into the at least one passage (40) via the at least one inlet (30);

forming at least one plasma region within the plasma source body (12) with at least one power source;

disassociating at least a portion of the at least one input gas flowing thought the at least one passage (40) to form at least one disassociated gas;

measuring a first temperature resulting from recombination of the at least one disassociated gas with at least a first thermal sensor (62) positioned proximate to the at least one plasma region; and

measuring at least a second temperature of at least one re-disassociated gas with at least a second thermal sensor (66) positioned distally from the at least one plasma region; and

monitoring the radical output of the plasma source by comparing the first temperature of the recombination of the disassociated gas measured by the at least one first thermal sensor (66) to the second temperature of the at least one re-disassociated gas measured with the at least one second thermal sensor (62).

~~19~~ 11. The method of claim ~~18~~ 9, further comprising regulating a temperature of at least one ~~or~~ of the plasma source body (12), the at least one plasma region, and the input gas with at least one thermal regulating body.

~~20~~ 12. The method of claim ~~18~~ 9, further comprising measuring at least a third temperature of at least one of the at least one input gas, at least one disassociated gas, and at least one re-disassociated gas within the plasma source body (12) with at least one ~~optional~~ additional temperature sensor.

~~21~~ 13. The method of claim ~~20~~ 11, further comprising selectively varying the generation of a radial output from a plasma source (10) by selectively controlling at least one of the at least one gas source and at least one power source configured to form the at least one plasma region based on data received from at least one of the at least one first thermal sensor (62), at least one second thermal sensor (66), and at least one ~~optional~~ additional sensor.