CLAIMS

1. A sensor assembly for a processing chamber, comprising:

a sensor tube comprising silicon carbide and having an optical path therein;

a sensor window comprising crystalline silicon carbide and having a proximal side coupled to a distal end of the sensor tube, wherein the sensor window covers the optical path, and wherein a distal side of the sensor window facing away from the proximal side is perpendicular to a center axis of the optical path; and

a sleeve disposed around a proximal end of the sensor tube, the sleeve comprising a vent formed in a wall of the sleeve, the vent including an opening extending from an outer surface of the wall and to an inner surface of the wall.

2. The sensor assembly of claim 1, wherein the sensor tube comprises sintered silicon carbide.

3. The sensor assembly of claim 1, wherein the crystalline silicon carbide of the sensor window comprises at least one of a 6H, 4H, or 3C crystalline structure.

4. The sensor assembly of claim 1, wherein the sleeve comprises at least one of silicon carbide, black quartz, or opaque quartz.

5. The sensor assembly of claim 1, wherein the sensor tube and the sleeve are movable relative to each other in a direction parallel to the center axis of the optical path.

6. The sensor assembly of claim 5, further comprising a radial gap disposed between overlapping portions of the sensor tube and sleeve.

7. The sensor assembly of claim 1, wherein a joint couples the sensor window to the sensor tube, and the joint has a filler material.

8. The sensor assembly of claim 7, wherein the filler material comprises silicon carbide.

9. The sensor assembly of claim 1, further comprising one or more fiber optic cables disposed in tubing, the one or more fiber optic cables operable to transmit light.

10. The sensor assembly of claim 1, wherein the opening of the vent is formed below the proximal end of the sensor tube.

11. A processing chamber, comprising:

a chamber body, comprising:

an upper window, a lower window, and a side wall defining a processing region;

a process gas inlet formed through the side wall;

a susceptor disposed in the processing region and having a substrate-receiving top surface;

a rotatable shaft supporting the susceptor; and

a sensor assembly, comprising:

a sensor tube comprising silicon carbide and having an optical path therein; and

a sensor window comprising crystalline silicon carbide and having a proximal side coupled to a distal end of the sensor tube, wherein the sensor window covers the optical path, and wherein a distal side of the sensor window facing away from the proximal side is perpendicular to a center axis of the optical path;

a sleeve disposed around a proximal end of the sensor tube, the sensor tube extending into a distal end of the sleeve, and the sleeve and the sensor tube disposed between the lower window and the upper window of the chamber body; and

one or more fiber optic cables disposed in tubing, the one or more fiber optic cables operable to transmit light, and the tubing and the one or more fiber optic cables disposed outside of the lower window.

12. The processing chamber of claim 11, wherein a proximal end of the sleeve is coupled to an inside of the lower window.

13. The processing chamber of claim 11, wherein the sensor tube is disposed through a body of a pre-heat ring surrounding the susceptor, and wherein the distal side of the sensor window is parallel to a plane of the pre-heat ring.

14. The processing chamber of claim 11, wherein the sensor tube is disposed through a body of a pre-heat ring surrounding the susceptor, and wherein the distal side of the sensor window is perpendicular to a plane of the pre-heat ring.

15. The processing chamber of claim 11, wherein the one or more fiber optic cables are optically coupled to the optical path of the sensor tube.

16. The processing chamber of claim 11, wherein:

the tubing comprises a T-connector coupled to the sidewall and in fluid communication between a process gas source and the process gas inlet, and

the one or more fiber optic cables are disposed through a straight path of the T-connector and optically coupled to the optical path of the sensor tube.

17. The processing chamber of claim 11, wherein:

the sensor tube is disposed through a body of the susceptor,

the distal side of the sensor window is parallel to a plane of the susceptor, and

the optical path extends at least partially through the rotatable shaft.

18. The sensor assembly of claim 1, further comprising one or more fiber optic cables disposed in tubing, the one or more fiber optic cables operable to transmit light.

19. The sensor assembly of claim 1, wherein the vent includes an opening formed below the proximal end of the sensor tube.

20. A sensor assembly for a processing chamber suitable for use in semiconductor manufacturing, comprising:

a sensor tube comprising silicon carbide and having an optical path therein;

a sensor window comprising crystalline silicon carbide and having a proximal side coupled to a distal end of the sensor tube, wherein the sensor window covers the optical path, and wherein a distal side of the sensor window facing away from the proximal side is perpendicular to a center axis of the optical path;

a sleeve disposed around a proximal end of the sensor tube, the sensor tube extending into a distal end of the sleeve; and

one or more fiber optic cables disposed in tubing, the one or more fiber optic cables operable to transmit light, and the one or more fiber optic cables positioned at a spacing from the sleeve.

21. The sensor assembly of claim 20, wherein the sensor tube and the sleeve are movable relative to each other in a direction parallel to the center axis of the optical path.

22. The sensor assembly of claim 21, further comprising a radial gap disposed between overlapping portions of the sensor tube and sleeve.