CLAIMS

1. An optical sensor system suitable for measuring a process condition or a chamber condition within a chamber interior volume of a plasma processing chamber, the optical sensor system comprising:

a housing, wherein the housing is suitable for extending through a chamber wall of the plasma processing chamber and into the chamber interior volume of the plasma processing chamber;

an optical path through the housing, wherein the optical path comprises a first end and a second end;

a reflector at the first end of the optical path, wherein a reflector surface of the reflector is configured to be positioned within the chamber interior volume and is configured to be exposed to a processing environment of the chamber interior volume;

an opening through the housing between the second end of the optical path and the reflector, wherein the opening provides an unobstructed path through the housing;

a light source optically coupled to the optical path, wherein the light source is a broad band light source; and

a sensor optically coupled to the optical path, wherein the sensor is configured to be positioned outside of the chamber interior volume and is configured to not be exposed to the processing environment of the chamber interior volume.

2. The optical sensor system of claim 1, wherein the light source and the sensor are optically coupled to the optical path by a fiber optic cable.

3. The optical sensor system of claim 2, wherein the fiber optic cable comprises a splitter.

4. The optical sensor system of claim 1, further comprising:

a band pass filter at a location along an optical path between the sensor and the opening.

5. The optical sensor system of claim 1, wherein the sensor is a spectrometer or a photodiode.

6. The optical sensor system of claim 1, wherein the light source and the sensor are integrated into the housing.

7. The optical sensor system of claim 1, wherein the housing is transparent.

8. The optical sensor system of claim 1, wherein the reflector is removable.

9. The optical sensor system of claim 1, wherein the reflector surface is selected to substantially match a deposition on an interior surface of the chamber wall.

~~9. A method for measuring a process condition or a chamber condition in a processing chamber, comprising:~~

~~obtaining a reference signal, wherein obtaining the reference signal comprises:~~

~~emitting electromagnetic radiation from a source outside of the chamber, wherein the electromagnetic radiation is propagated along an optical path between the source and a reflector in the chamber;~~

~~reflecting the electromagnetic radiation back along the optical path with the reflector; and~~

~~sensing the reflected electromagnetic radiation with a sensor that is optically coupled to the optical path;~~

~~obtaining a process signal, wherein obtaining the process signal comprises:~~

~~sensing electromagnetic radiation emitted in the processing chamber that travels along the optical path with the sensor; and~~

~~comparing the process signal with the reference signal.~~

~~10. The method of claim 9, wherein the reference signal is obtained when no process is being implemented in the chamber.~~

~~11. The method of claim 9, wherein the reference signal is obtained during a process in in the chamber.~~

~~12. The method of claim 9, wherein the process signal is obtained when the source is off.~~

~~13. The method of claim 9, wherein the process signal is obtained when the source is on.~~

~~14. The method of claim 9, wherein the reference signal and the process signal are obtained during the processing of one or more substrates in the chamber.~~

10. A plasma processing chamber including a chamber wall with a perimeter, a chamber interior volume, and an optical sensing array,

(a) wherein the optical sensing array includes a plurality of optical sensor systems oriented around the perimeter of the chamber wall;

(b) wherein each optical sensor system comprises:

a housing, wherein the housing extends through the chamber wall and into the chamber interior volume;

an optical path through the housing, wherein the optical path comprises a first end and a second end;

a reflector at the first end of the optical path, wherein a reflector surface of the reflector is positioned within the chamber interior volume and is exposed to a processing environment of the chamber interior volume;

an opening through the housing between the second end of the optical path and the reflector, wherein the opening provides an unobstructed path through the housing;

a light source optically coupled to the optical path, wherein the light source is a broad band light source; and

a sensor optically coupled to the optical path, wherein the sensor is positioned outside of the chamber interior volume and is not exposed to the processing environment of the chamber interior volume; and

(c) wherein each optical sensor system is suitable for measuring a process condition or a chamber condition within the chamber interior volume.

~~15. An optical sensing array for a plasma processing chamber, comprising:~~

~~a plurality of optical sensing systems oriented around a perimeter of the processing chamber, wherein each of the plurality of optical sensing systems comprises:~~

~~a housing;~~

~~an optical path through the housing, wherein the optical path comprises a first end and a second end;~~

~~a reflector at the first end of the optical path;~~

~~an opening through the housing between the second end of the optical path and the reflector, wherein the opening provides an unobstructed path through the housing; and~~

~~a light source optically coupled to the optical path, wherein the light source is a broad band light source; and~~

~~a sensor optically coupled to the optical path.~~

~~16~~11. The plasma processing chamber~~optical sensing array~~ of claim ~~15~~10, wherein the plurality of optical sensing systems are configured to provide uniformity data of a plasma condition, a wall condition, or a plasma condition and a wall condition.

~~17~~12. The plasma processing chamber ~~optical sensing array~~ of claim ~~15~~10, wherein the plurality of optical sensing systems are configured to provide chamber drift monitoring.

13. The plasma processing chamber of claim 10, wherein the reflector surface is selected to substantially match a deposition on an interior surface of the chamber wall.

~~18. An optical sensor system, comprising:~~

~~a housing;~~

~~an optical path through the housing, wherein the optical path comprises a first end and a second end;~~

~~a reflector at the first end of the optical path;~~

~~an opening through the housing between the second end of the optical path and the reflector, wherein the opening provides an unobstructed path through the housing;~~

~~a light source optically coupled to the optical path; and~~

~~a sensor optically coupled to the optical path, wherein the light source and the sensor are optically coupled to the optical path by a fiber optic cable.~~

~~19. An optical sensor system, comprising:~~

~~a housing;~~

~~an optical path through the housing, wherein the optical path comprises a first end and a second end;~~

~~a reflector at the first end of the optical path;~~

an opening through the housing between the second end of the optical path and the reflector, wherein the opening provides an unobstructed path through the housing;

a light source optically coupled to the optical path;

a sensor optically coupled to the optical path; and

a band pass filter at a location along an optical path between the sensor and the opening.

20. An optical sensor system, comprising:

a housing;

an optical path through the housing, wherein the optical path comprises a first end and a second end;

a reflector at the first end of the optical path;

an opening through the housing between the second end of the optical path and the reflector, wherein the opening provides an unobstructed path through the housing;

a light source optically coupled to the optical path; and

a sensor optically coupled to the optical path, wherein the sensor is a spectrometer or a photodiode.