CLAIMS

1. A system comprising:

a transparent crystal, wherein at least part of the transparent crystal is embedded within a wall and a liner of a processing chamber;

a transparent thin film deposited on a surface of the transparent crystal that is exposed to an interior of the processing chamber;

a spectrometer configured to: receive light reflected from a surface of the transparent thin film and a surface of a process film layer deposited on the transparent thin film; and

detect a first spectrum within the received light that is representative of the process film layer; and

a processing device coupled to the spectrometer and configured to:

receive, from the spectrometer, the first spectrum;

receive, from the spectrometer, a second spectrum when a source of the received light is off;

generate a reflectometry signal based on a reference spectrum and a difference between the second spectrum and the first spectrum; and

fit the reflectometry signal to a thin film optical model to determine information comprising one or more optical film property of the process film layer.

2. The system of claim 1, wherein the transparent thin film has chemical properties substantially matching those of the liner.

3. The system of claim 1, wherein the transparent thin film comprises one of yttrium oxide, aluminum oxide, or zirconium oxide and is of a known thickness.

4. The system of claim 1, wherein the transparent crystal is one of a sapphire plug, a diamond plug, a quartz plug, or a silicon carbide plug, and wherein the transparent crystal includes a proximal end and a distal end, the distal end having a distal surface that is exposed to the interior of the processing chamber.

5. The system of claim 4, further comprising a light coupling device coupled to the spectrometer and configured to:

transmit light, from a light source, through a proximal end of the transparent crystal; and

focus, into the spectrometer, light received reflected back from the combination of the distal surface, a surface of the transparent thin film, and a surface of a process film layer deposited on the transparent thin film.

6. The system of claim 1, wherein the distal surface of the transparent crystal is formed at an angle with respect to the liner, the angle being between 0.8 and 1.8 degrees.

7. The system of claim 1, wherein, to generate the reflectometry signal, the processing device is further configured to:

calculate reflectometry data via subtraction of the second spectrum from the first spectrum; and

calculate the reflectometry signal via division of the reflectometry data by the reference spectrum.

8. The system of claim 7, wherein the one or more optical film property comprises thickness, and wherein, during processing substrates within the processing chamber, the processing device is further to:

compare the thickness with a baseline measurement for the process film layer;

determine, using the comparison, a variation in a rate of deposition of the process film layer that is beyond a threshold variation; and

trigger a process within the processing chamber that is to correct the rate of deposition of the process film layer.

9. The system of claim 7, wherein the one or more optical film property comprises thickness, and wherein, after processing a substrate within the processing chamber, the processing device further to:

detect a moment in time at which the process film layer on the transparent thin film has been removed within a predetermined threshold thickness; and

in response to the detection, trigger the processing device to end a cleaning process within the processing chamber.

10. The system of claim 7, wherein the one or more optical film property comprises thickness, and wherein, during processing substrates within the processing chamber, the processing device further to:

detect a moment in time when the process film layer has reached a threshold level of thickness on the transparent thin film; and

trigger an end of a deposition process that is depositing the process film layer.

11. A processing chamber comprising:

a wall to define an interior of the processing chamber;

a liner attached to an inside surface of the wall;

a transparent crystal that is plug-shaped and comprises:

a shaft embedded within the wall and the liner, the shaft comprising a distal surface of the transparent crystal that is exposed to an interior of the processing chamber; and

a flange that abuts an outside surface of the wall and comprises a proximal end of the transparent crystal; and

a transparent thin film deposited on the distal surface of the transparent crystal,

wherein light is to pass through the transparent crystal and reflect off the distal surface and off a surface of the transparent thin film back through the proximal end of the transparent crystal.

12. The processing chamber of claim 11, wherein the transparent thin film comprises one of yttrium oxide, aluminum oxide, or zirconium oxide and is of a known thickness.

13. The processing chamber of claim 11, wherein the transparent crystal is one of a sapphire plug, a diamond plug, a quartz plug, or a silicon carbide plug.

14. The processing chamber of claim 11, wherein the distal surface of the transparent crystal is formed at an angle with respect to the liner, the angle being between 0.8 and 1.8 degrees.

15. The processing chamber of claim 11, wherein the processing chamber further comprises a seal positioned between the flange and the outside surface of the wall.

16. The processing chamber of claim 15, wherein the flange comprises an inner surface that is in physical contact with the seal, the inner surface comprising a surface roughness (Ra) of less than 20 nanometers.

17. The processing chamber of claim 15, wherein a proximal surface at the proximal end of the transparent crystal is formed at an angle with respect to the outside surface of the wall, the angle being between 2 and 5 degrees.

18. A method comprising:

providing at least part of a transparent crystal embedded within a wall and a liner of a processing chamber;

depositing, on a distal surface of the transparent crystal that is exposed to an interior of the processing chamber, a transparent thin film;

depositing, on the transparent thin film within the processing chamber, a process film layer;

receiving, by a spectrometer, light reflected from a surface of the transparent thin film and a surface of the process film layer;

detecting, by the spectrometer, a first spectrum within the received light that is representative of the process film layer;

receiving, by a processing device coupled to the spectrometer, a first spectrum;

receiving, by the processing device, a second spectrum when a source of the received light is off;

generating, by the processing device, a reflectometry signal based on a reference spectrum and a difference between the second spectrum and the first spectrum; and

fit, by the processing device, the reflectometry signal to a thin film optical model to determine information comprising one or more optical film property of the process film layer.

19. The method of claim 18, further comprising:

subtracting, by the processing device, the second spectrum from the first spectrum to generate a reflectometry data; and

dividing, by the processing device, the reflectometry data by a reference spectrum to generate a reflectometry signal.

20. The method of claim 18, wherein the transparent thin film comprises chemical properties substantially matching those of the liner.

21. The method of claim 18, further comprising:

transmitting light, from a light source by a light coupling device, through a proximal end of the transparent crystal;

focusing, by the light coupling device into a fiber optic cable, light received reflected back from a combination of the distal surface, a surface of the transparent thin film, and a surface of the process film layer.

22. The method of claim 19, wherein the one or more optical film property comprises thickness, and wherein, during processing substrates within the processing chamber, the method further comprising:

comparing the thickness with a baseline measurement for the process film layer;

determining, using the comparison, a variation in a rate of deposition of the process film layer that is beyond a threshold variation; and

triggering a process within the processing chamber that is to correct the rate of deposition of the process film layer.

23. The method of claim 19, wherein the one or more optical film property comprises thickness, and the method further comprising:

detecting that the thickness of the process film layer on the transparent thin film has reached an accumulation limit; and

in response to the detecting, triggering the processing chamber to initiate a cleaning process in the processing chamber.

24. The method of claim 19, wherein the one or more optical film property comprises thickness, and wherein, after processing a substrate within the processing chamber, the method further comprising:

detecting a moment in time at which the process film layer on the transparent thin film has been removed by a cleaning process within a predetermined threshold thickness; and

in response to the detecting, triggering the processing device to end the cleaning process within the processing chamber.

25. The method of claim 19, wherein the one or more optical film property comprises thickness, and wherein, during processing substrates within the processing chamber, the method further comprising:

detecting a moment in time when the process film layer has reached a threshold level of thickness on the transparent thin film; and

triggering an end of a deposition process that is depositing the process film layer.