

**What is claimed is:**

1. A method for detecting an endpoint of a coating process, the method comprising:
  - measuring a temperature of a plurality of substrates being processed;
  - comparing the measured temperature to a temperature threshold;
  - upon determining that the measured temperature does not satisfy the temperature threshold, adjusting a parameter of the coating process;
  - upon determining that the measured temperature satisfies the temperature threshold, measuring a thickness of a coating deposited on the plurality of substrates;
  - comparing the measured coating thickness to a target coating thickness; and
  - upon determining that the measured coating thickness does not satisfy the target coating thickness, depositing an additional thickness of the coating on the plurality of substrates.
2. The method of claim 1, further comprising:
  - upon determining that the measured coating thickness satisfies the target coating thickness, identifying an endpoint of the coating process.
3. The method of claim 1, wherein the parameter of the coating process includes at least one of one or more axes of rotation of the plurality of substrates, a speed of rotation of the plurality of substrates, and a power provided to one or more electron beam generators.
4. The method of claim 1, further comprising:
  - rotating each substrate of the plurality of substrates along more than one axis during the coating process.
5. The method of claim 1, wherein the thickness of the coating deposited on the plurality of substrates is determined by the coating on a test structure.
6. The method of claim 1, wherein the thickness of the coating deposited on the plurality of substrates is determined by depositing the coating on one or more quartz crystal monitors.

7. The method of claim 1, wherein the temperature of the plurality of substrates is measured by one or more pyrometers.

8. A method of measuring a coating thickness, comprising:  
aligning a test structure disposed on a probe between a first window and a second window;

measuring a first distance between a first laser source through the first window and a first surface of the test structure;

measuring a second distance between a second laser source through the second window and a second surface of the test structure;

extending the probe into a process chamber in which a coating is applied to a plurality of substrates and the test structure;

retracting the probe from the process chamber to align the test structure between the first window and the second window;

measuring a third distance between the first laser source and a surface of the coating deposited on the first surface of the test structure;

measuring a fourth distance between the second laser source and a surface of the coating deposited on the second surface of the test structure;

determining a first difference between the first distance and the third distance;

determining a second difference between the second distance and the fourth distance;

determining a thickness of the coating based on the first difference and the second difference;

comparing the thickness of the coating to a target coating thickness; and

upon determining the thickness of the coating satisfies the target coating thickness, identifying an endpoint of a coating process performed on the plurality of substrates.

9. The method of claim 8, further comprising:

maintaining a temperature of the probe by flowing a cooling fluid through a cooling jacket surrounding the probe.

10. The method of claim 9, further comprising:
  - determining a thickness of the coating deposited on the plurality of substrates via a third laser source substantially parallel to the probe.
11. The method of claim 10, further comprising:
  - determining an first oscillation rate of a quartz crystal monitor prior to the extending the probe into a process chamber; and
  - determining a second oscillation rate of the quartz crystal monitor after the retracting the probe from the process chamber;
  - determining a third difference between the first oscillation rate and the second oscillation rate; and
  - determining a thickness of the coating based on the third difference.
12. The method of claim 8, further comprising:
  - measuring a temperature of the plurality of substrates in the process chamber via one or more pyrometers disposed therein.
13. The method of claim 8, wherein the coating is continuously deposited on the plurality of substrates during the retracting, measuring the third distance and the fourth distance, determining, and comparing operations.
14. A process chamber, comprising:
  - a body defining a process volume therein;
  - a melt pool disposed in the process volume having one or more ingots disposed therein;
  - one or more electron beam generators disposed opposite the melt pool;
  - a plurality of substrates disposed in the process volume between the one or more electron beam generators and the melt pool;
  - a probe assembly, comprising:
    - an enclosure having a first window and a second window opposite the first window, the first window and the second window adjacent to the body;
    - a shaft disposed in the enclosure; and
    - a test structure disposed on the shaft; and

a controller configured to perform the following operations:

- aligning the test structure in the enclosure between the first window and the second window;

- rotating each substrate of the plurality of substrates about more than one axis;

- vaporizing the one or more ingots to generate a vapor plume surrounding the plurality of substrates by controlling a power provided to the one or more electron beam generators;

- extending the test structure into the vapor plume;

- retracting the test structure into the enclosure;

- aligning the test structure between the first window and the second window;

- determining a thickness of a coating deposited on the test structure; and

- upon determining that the thickness of the coating satisfies a target coating thickness, identifying an endpoint of a coating process for the plurality of substrates.

15. The process chamber of claim 14, further comprising:

- an actuator coupled to the shaft, wherein the controller is coupled to the actuator.

16. The process chamber of claim 14, further comprising:

- one or more pyrometers disposed adjacent to the body.

17. The process chamber of claim 16, wherein the probe assembly further comprises:

- a dichroic mirror;

- a microscope objective disposed between the dichroic mirror and the first window; and

- a Raman spectrometer aligned with the dichroic mirror, the Raman spectrometer coupled to the controller.

18. The process chamber of claim 17, further comprising:  
an infrared imaging device for monitoring a behavior of contents of the melt pool.
19. The process chamber of claim 18, wherein the operations of the controller further include:  
determining a composition of the coating using the Raman spectrometer; and  
upon determining the composition fails to satisfy a target composition, adjusting one or more parameters of the coating process.
20. The process chamber of claim 19, wherein the one or more parameters includes at least one of one or more axes of rotation of the plurality of substrates, a speed of rotation of the plurality of substrates, a composition of the one or more ingots, and a power provided to the one or more electron beam generators.