Claims

1. A system comprising: a dual interferometer sub-system configured to measure flatness across a substrate; and a controller communicatively coupled to the dual interferometer sub-system and a mass sensor, the controller including one or more processors, wherein the one or more processors are configured to execute a set of program instructions stored in memory, the set of program instructions configured to cause the one or more processors to: determine a thickness distribution of at least one of the substrate or a film deposited on the substrate as a function of position across the substrate based on one or more flatness measurements from the dual interferometer sub-system and one or more mass measurements; and provide one or more control instructions based on the determined thickness distribution of at least one of the substrate or the film to adjust one or more process tools.

2. The system of claim 1, wherein the one or more processors are further configured to: receive one or more flatness measurements of the substrate as a function of position across the substrate from the dual interferometer sub-system; receive one or more mass measurements of the substrate; determine an average thickness of the substrate based on the one or more mass measurements; and determine the thickness distribution of the substrate as a function of position across the substrate based on the one or more flatness measurements and the average thickness of the substrate.

3. The system of claim 1, wherein the one or more processors are configured to: receive the one or more mass measurements of the substrate from a user via a user interface.

4. The system of claim 1, wherein the one or more processors are configured to: receive the one or more mass measurements of the substrate from the memory.

5. The system of claim 1, wherein the dual interferometer sub-system comprises: a dual wavelength dual Fizeau interferometer (DWDFI) sub-system.

6. The system of claim 1, wherein the mass sensor comprises: a high precision weighing sensor.

7. The system of claim 1, wherein the substrate comprises: a semiconductor wafer.

8. The system of claim 1, wherein the one or more processors are further configured to: determine a thickness distribution of the film as a function of position across the substrate based on two or more flatness measurements of the substrate and two or more mass measurements of the substrate.

9. The system of claim 8, wherein the one or more processors are further configured to: receive a first flatness measurement and a first mass measurement of a substrate prior to deposition of a film on the substrate; determine an average thickness of the substrate based on the first mass measurement prior to deposition of the film on the substrate; receive a second flatness measurement and a second mass measurement of a substrate following deposition of the film on the substrate; determine an average thickness of the substrate based on the second mass measurement following deposition of the film on the substrate;

and determine the thickness of the film as a function of position across the substrate based on the first flatness measurement and the first average thickness prior to deposition of the film and the second flatness measurement and the second average thickness of the substrate following deposition of the film on the substrate.

10. The system of claim 9, wherein the one or more processors are further configured to: receive a first flatness measurement and a first mass measurement of a substrate prior to deposition of a film on the substrate and following deposition of one or more pre-layers on the substrate; receive a second flatness measurement and a second mass measurement of the substrate following deposition of the film onto the pre-layers of the substrate; and determine the thickness of the film as a function of position across the substrate based on the density of the film, the first flatness measurement, the first mass of the substrate, the second flatness measurement and the second mass of the substrate.

11. A system comprising: a dual interferometer sub-system configured to measure flatness across a substrate; a mass sensor configured to measure the mass of the substrate; and a controller communicatively coupled to the dual interferometer sub-system and the mass sensor, the controller including one or more processors, wherein the one or more processors are configured to execute a set of program instructions stored in memory, the set of program instructions configured to cause the one or more processors to: determine a thickness distribution of at least one of the substrate or a film deposited on the substrate as a function of position across the substrate based on one or more flatness measurements from the dual interferometer sub-system and one or more mass measurements from the mass sensor; and provide one or more control instructions based on the determined thickness distribution of at least one of the substrate or the film to adjust one or more process tools.

12. The system of claim 11, wherein the one or more processors are further configured to: receive one or more flatness measurements of the substrate as a function of position across the substrate from the dual interferometer sub-system; receive one or more mass measurements of the substrate from the mass sensor; determine an average thickness of the substrate based on the one or more mass measurements; and determine the thickness distribution of the substrate as a function of position across the substrate base on the one or more flatness measurements and the average thickness of the substrate.

13. The system of claim 11, wherein the dual interferometer sub-system comprises: a dual wavelength dual Fizeau interferometer (DWDFI) sub-system.

14. The system of claim 11, wherein the mass sensor comprises: a high precision weighing sensor.

15. The system of claim 11, wherein the substrate comprises: a semiconductor wafer.

16. The system of claim 11, wherein the one or more processors are further configured to: determine a thickness distribution of the film as a function of position across the substrate based on two or more flatness measurements of the substrate and two or more mass measurements of the substrate.

17. The system of claim 16, wherein the one or more processors are further configured to:

receive a first flatness measurement and a first mass measurement of a substrate prior to deposition of a film on the substrate; determine an average thickness of the substrate based on the first mass measurement prior to deposition of the film on the substrate; receive a second flatness measurement and a second mass measurement of a substrate following deposition of the film on the substrate; determine an average thickness of the substrate based on the second mass measurement following deposition of the film on the substrate; and determine the thickness of the film as a function of position across the substrate based on the first flatness measurement and the first average thickness prior to deposition of the film and the second flatness measurement and the second average thickness of the substrate following deposition of the film on the substrate.

18. The system of claim 16, wherein the one or more processors are further configured to: receive a first flatness measurement and a first mass measurement of a substrate prior to deposition of a film on the substrate and following deposition of one or more pre-layers on the substrate; receive a second flatness measurement and a second mass measurement of the substrate following deposition of the film onto the pre-layers of the substrate; and determine the thickness of the film as a function of position across the substrate based on the density of the film, the first flatness measurement, the first mass of the substrate, the second flatness measurement and the second mass of the substrate.