CLAIMS

I/We claim:

1. A method for controlling temperature of a substrate within a chamber processing system, the method comprising:

depositing a material over a surface of the substrate, and

while depositing at least a portion of the material, controlling a temperature of the substrate to be within a target range.

2. The method of claim 1 further comprising:

prior to depositing the material, heating the substrate with a heating device to a temperature within the target range,

wherein controlling the temperature of the substrate to be within the target range includes maintaining the temperature of the substrate to be within the target range by moving fluid over the substrate to remove thermal energy therefrom.

3. The method of claim 2 wherein moving fluid over the substrate includes moving fluid at least partially through a channel of the substrate, wherein heat is transferred from the substrate to the fluid.

4. The method of claim 2 wherein moving fluid over the substrate includes moving fluid at least partially through a plate in direct contact with the substrate, wherein heat is transferred from the substrate to the plate.

5. The method of claim 1 wherein the target range is (a) from approximately -30°C to approximately 300°C and (b) based in part on the material being deposited.

6. The method of claim 1 wherein depositing the material includes depositing a thin film, via the deposition device, using ion assisted beam deposition.

7. The method of claim 6 wherein the thin film has a thickness less than or equal to approximately 40 nanometers.

8. The method of claim 6 wherein the thin film has a thickness from about 100 Angstroms to about 25 microns.

9. The method of claim 1 wherein the target range is based on the material being deposited, and wherein the material comprises yttrium oxide (Y_2O_3), yttrium fluoride (YF_3), and/or yttrium oxyfluoride (YOF).

10. A semiconductor processing system, comprising:

a chamber having a substrate with a generally flat surface, wherein the substrate includes a temperature;

a deposition device configured to deposit a material on the generally flat surface of the substrate; and

a mechanism in thermal contact with the substrate, wherein the mechanism is configured to actively control the temperature of the substrate while the material is being deposited.

11. The system of claim 10 wherein the mechanism includes a channel in thermal contact with the substrate, and wherein the channel has fluid therein to remove thermal energy from the substrate.

12. The system of claim 11, further comprising:

a controller electrically coupled to the mechanism and configured to control flow of the fluid through the channel;

a first thermal measuring element for measuring temperature associated with the substrate and operatively coupled to the controller;

a second thermal measuring element for measuring the temperature associated with the deposition device and operatively coupled to the controller; and

a third thermal measuring element for measuring the temperature associated with the chamber and operatively coupled to the controller,

wherein the controller is configured to control the temperature of the substrate within a range of temperatures based on the second or third temperatures.

13. The system of claim 12 wherein the range of temperatures varies from approximately -30°C to approximately 300°C.

14. The system of claim 12 wherein the range of temperatures varies from approximately 120°C to approximately 180°C.

15. The system of claim 10 wherein the deposition device includes an ion beam deposition device.

16. A method of manufacturing a thin film, the method comprising:

providing a chamber, a substrate in the chamber, and a deposition device for depositing a material on the substrate;

measuring a first temperature associated with the deposition of material on the substrate;

actively causing the substrate to have or maintain a second temperature within a target range, wherein the target range is based in part on at least one of the first temperature or the material.

17. The method of claim 16 wherein actively causing the substrate to have or maintain the second temperature includes actively causing the substrate to have or maintain the second temperature while depositing at least a portion of the material on the substrate.

18. The method of claim 17 wherein the material has a first thermal stress at the first temperature and a second thermal stress at the second temperature, wherein the second thermal stress is less than the first thermal stress.

19. The method of claim 16 wherein actively cooling includes removing heat from the substrate via a cooling fluid, and wherein at least a portion of the heat is introduced to the substrate via the deposition of the material.

20. The method of claim 19 wherein actively cooling further includes, prior to removing heat from the substrate, actively heating the substrate to approximately the second temperature.

21. The method of claim 20, further comprising, after the deposition has finished, limiting the rate at which the substrate cools.