Claims:

1. A method for processing a substrate, comprising:

providing a transparent plate coated with an energy blocking layer, wherein the transparent plate has a transparent sheet disposed at a predetermined distance from a front side of the transparent plate to prevent particle contaminants from being imaged onto the surface of the substrate; and

exposing a surface of the substrate to a plurality of pulses of electromagnetic energy that pass through the transparent plate and the transparent sheet.

2. The method of claim 1, wherein the energy blocking layer is opaque or reflective to a preselected range of wavelengths between about 200 nm and about 2,000 nm.

3. The method of claim 2, wherein the energy blocking layer has predetermined pattern openings that are configured to allow the plurality of pulses of electromagnetic energy to pass through.

4. The method of claim 3, wherein the transparent sheet is supported by a frame mounted onto the front side of the transparent plate and is configured to fully cover the pattern openings.

5. The method of claim 1, further comprising:

providing a second transparent sheet at a predetermined distance from a back side of the transparent plate.

6. The method of claim 1, wherein each pulse of electromagnetic energy has energy above a melt temperature of a layer deposited on the surface of the substrate, or has energy less than that required to melt or nearly melt a portion of a layer deposited on the surface of the substrate.

7. The method of claim 6, wherein each pulse has the same energy of about 100 mJ/cm^2 and about 50 J/cm^2, and is delivered with a duration between about 1 nsec and about 500 nsec.

8. The method of claim 1, wherein the predetermined distance is between about 2 mm and about 20 mm.

9. The method of claim 1, wherein the transparent sheet has a thickness of about 5 μm to about 500 μm.

10. The method of claim 1, wherein the transparent sheet comprises nitrocellulose, cellulose acetate, or fluorocarbon-based polymers.

11. The method of claim 1, wherein the transparent sheet comprises glass, quartz, or fused silica.

12. A system for processing a substrate, comprising:

a source of electromagnetic energy operable to produce pulses of electromagnetic energy;

a homogenizer for adjusting spatial energy distribution of the pulses of the electromagnetic energy;

an aperture member having a transparent sheet disposed at a predetermined distance from a front side of the aperture member, the aperture member is coated with an energy blocking layer having pattern openings to allow the pulses of the electromagnetic energy to pass through; and

an imaging module for receiving and projecting a uniform amount of electromagnetic energy on a desired region of a surface of the substrate.

13. The system of claim 12, wherein the energy blocking layer is opaque or reflective to a preselected range of wavelengths between about 200 nm and about 2,000 nm.

14. The system of claim 12, wherein the transparent sheet is supported by a frame mounted onto the front side of the aperture member, and the predetermined distance is between about 2 mm and about 20 mm.

15. The system of claim 12, further comprising:

a second transparent sheet disposed at a predetermined distance from a back side of the aperture member, wherein the second transparent sheet is supported by a second frame mounted onto the back side of the aperture member.

Claims

The invention claimed is:

1. A system for processing a substrate, comprising:

a source of electromagnetic energy operable to produce pulses of electromagnetic energy; and

a transparent plate coupling to a first transparent sheet disposed parallel to the transparent plate at a distance from a first surface of the transparent plate, the transparent plate is coated with an energy blocking layer having pattern openings to allow the pulses of the electromagnetic energy to pass through, wherein the first transparent sheet is not in physical contact with the energy blocking layer, and wherein the energy blocking layer is opaque or reflective to a preselected range of wavelengths between about 200 nm and about 2,000 nm; and

a second transparent sheet disposed at a distance from a second surface of the transparent plate, wherein the second transparent sheet is supported by a second frame mounted onto the second surface of the transparent plate.

2. The system of claim 1, wherein the first transparent sheet is supported by a frame mounted onto the first surface of the transparent plate, and the distance is between about 2 mm and about 20 mm.

3. The system of claim 1, wherein each pulse of electromagnetic energy has energy less than that required to melt or nearly melt a portion of a layer deposited on the surface of the substrate.

4. The system of claim 1, wherein each pulse has energy of about 100 mJ/cm^2 to about 10 J/cm^2 and each pulse is delivered with a duration between about 1 nsec and about 100 nsec.

5. An aperture member for used in a thermal processing chamber, comprising:

a transparent plate having a first surface and a second surface opposing the first surface;

a first transparent sheet disposed at a distance from the first surface of the transparent plate, wherein the first transparent sheet is supported by a first frame mounted onto the first surface of the transparent plate;

an energy blocking layer disposed on the second surface of the transparent plate, the energy blocking layer having patterned openings allowing for a plurality of pulses of laser radiation having a wavelength of between about 490 nm and about 1100 nm to pass through; and

a second transparent sheet coupled to the second surface of the transparent plate through a frame, wherein the second transparent sheet is disposed parallel to the transparent plate at a distance and covers the patterned openings, and the second transparent sheet is not in physical contact with the energy blocking layer.

6. The aperture member of claim 5, wherein each transparent sheet is selected from the group consisting of nitrocellulose, cellulose acetate, fluorocarbon-based polymers, glass, quartz, and fused silica.

7. The aperture member of claim 5, wherein the distance is between about 2 mm and about 20 mm.

8. The aperture member of claim 5, wherein each pulse of laser radiation has energy of about 100 mJ/cm^2 to about 10 J/cm^2 and each pulse is delivered with a duration between about 1 nsec and about 100 nsec.