What is claimed is:

1. A method of reorganizing the structure of a solid material, comprising:

exposing the solid material to pulses of energy to progressively melt the solid material, forming a molten material; and

recrystallizing the molten material.

2. The method of claim 1, wherein recrystallizing the molten material comprises progressively crystallizing the molten material from a location of the molten material near an interface with a subjacent layer to the surface of the molten material.

3. The method of claim 1, wherein each energy pulse melts a portion of the solid material, and a duration between delivery of a first energy pulse and delivery of a second energy pulse immediately following the first energy pulse is selected to allow a portion of the solid material melted by the first energy pulse to refreeze.

4. The method of claim 3, wherein progressively recrystallizing the molten material comprises delivering pulses of energy to the molten material, the pulses of energy designed to form a crystalline solid from the molten material by progressing a crystallization front through the molten material in a direction opposite the direction the melt front progressed through the solid material.

5. A method of forming a solar cell, comprising:

forming large crystal domains in an active layer of the solar cell by progressively melting and recrystallizing the active layer using pulses of spatially uniform laser light.

6. The method of claim 5, wherein each pulse of uniformly distributed laser light extends a melt front within the active layer.

7. The method of claim 5, wherein the active layer comprises a p-type doped semiconductor layer, an intrinsic semiconductor layer, and an n-type doped semiconductor layer.

8. A method of forming a memory device, comprising:

forming a first conductive layer on a substrate;

forming a polycrystalline or monocrystalline semiconductor layer on the substrate by a process comprising:

depositing a semiconductor layer on the substrate;

progressively melting the semiconductor layer by exposing the semiconductor layer to pulses of energy, forming a molten semicondutor layer; and

recrystallizing the molten semiconductor layer; and

forming a second conductive layer on the substrate.

9. The method of claim 8, wherein the pulses of energy progress a melt front through the semiconductor material.

10. The method of claim 8, wherein each incident pulse of the plurality of laser pulses is separated from the next pulse by a duration selected to refreeze a portion of the semiconductor material melted by the incident pulse.

11. The method of claim 10, wherein each pulse of the plurality of laser pulses overlaps at least partially with neighboring pulses.

12. A method of forming a photonic device, comprising:

forming an compound semiconductor layer over a ceramic substrate; and

crystallizing the compound semiconductor layer by a process comprising:

directing pulses of energy toward the compound semiconductor layer, progressively melting the compound semiconductor layer to form a molten layer; and

crystallizing the molten layer to form a crystalline compound semiconductor layer.

13. The method of claim 12, wherein directing pulses of energy toward the compound semiconductor layer comprises directing a plurality of laser pulses toward the compound semiconductor layer, each pulse having energy selected to melt a portion of the compound semiconductor layer, and progressing a melt front through the compound semiconductor layer.

14. The method of claim 13, wherein the compound semiconductor layer comprises at least an n-type doped layer, a p-type doped layer, and a multiple quantum-well layer.

15. The method of claim 12, wherein each incident pulse of energy is separated from the next pulse of energy by a duration selected to refreeze a portion of the molten layer smaller than the portion of the compound semiconductor layer melted by the incident pulse.

What is claimed is:

1. A method of treating a substrate, comprising:

identifying a first treatment zone;

forming a molten area of the first treatment zone by exposing a surface of the first treatment zone to a first laser pulse and a second laser pulse, wherein the first laser pulse and the second laser pulse have the same duration and intensity;

recrystallizing the molten area of the first treatment zone while exposing the first treatment zone to a plurality of laser pulses, wherein each pulse of the plurality of laser pulses melts a portion of a recrystallized area;

identifying a second treatment zone adjacent to the first treatment zone; and

repeating the forming a molten area and the recrystallizing the molten area with the second treatment zone.

2. The method of claim 1, wherein a duration between the first laser pulse and the second laser pulse is less than a time necessary for a portion of the molten area to refreeze.

3. The method of claim 1, wherein each pulse of the plurality of laser pulses has the same duration and intensity as the first laser pulse.

4. A method of treating a substrate, comprising:

identifying a first treatment zone;

forming a molten area of the first treatment zone by exposing a surface of the first treatment zone to a first laser pulse;

recrystallizing the molten area of the first treatment zone while exposing the first treatment zone to a plurality of laser pulses, wherein each pulse of the plurality of laser pulses melts a portion of a recrystallized area, wherein each pulse of the plurality of laser pulses has a duration or an intensity that is different from the first laser pulse;

identifying a second treatment zone adjacent to the first treatment zone; and

repeating the forming a molten area and the recrystallizing the molten area with the second treatment zone.

5. The method of claim 4, wherein the second treatment zone and the first treatment zone share a boundary.

6. The method of claim 4, wherein the forming a molten area of each treatment zone further comprises exposing the surface of each treatment zone to a second laser pulse.

7. A method of treating a substrate, comprising:

identifying a treatment zone of the substrate;

delivering a first plurality of laser pulses to the treatment zone, wherein each pulse of the first plurality of laser pulses melts a portion of the treatment zone, and a duration between each pulse of the first plurality of laser pulses is less than a time to freeze the portion of the treatment zone that melted; and

delivering a second plurality of laser pulses to the treatment zone of the substrate, wherein each pulse of the second plurality of laser pulses melts a portion of the treatment zone, and a duration between each pulse of the second plurality of laser pulses is more than a time to freeze the portion of the treatment zone that melted.

8. The method of claim 7, wherein each pulse of the first plurality of laser pulses overlaps with adjacent pulses.

9. The method of claim 7, wherein a duration between each pulse of the first plurality of laser pulses and adjacent pulses of the first plurality of laser pulses is the same, and wherein a duration between each pulse of the second plurality of laser pulses and adjacent pulses of the second plurality of laser pulses is the same.

10. The method of claim 7, wherein an intensity of each pulse of the first plurality of laser pulses and of each pulse of the second plurality of laser pulses is the same.