CLAIMS

The invention claimed is:

1. A method of processing a unit comprising crystalline material, comprising:

forming a damage region within the crystalline material, a portion of the unit being above the damage region; and

utilizing a chuck to bend the unit and thereby induce cleavage along the damage region to form a structure from the portion of the unit above the damage region.

2. The method of claim 1 wherein the chuck is an electrostatic chuck.

3. The method of claim 2 wherein the electrostatic chuck is a Johnsen-Rahbek type chuck.

4. The method of claim 2 wherein the electrostatic chuck has a convex outer topography along a surface that engages the unit.

5. The method of claim 2 wherein the electrostatic chuck has a concave outer topography along a surface that engages the unit.

6. The method of claim 1 wherein the crystalline material comprises semiconductor material.

7. The method of claim 1 wherein the crystalline material comprises monocrystalline silicon.

8. The method of claim 7 wherein the damage region is induced with hydrogen and/or helium.

9. The method of claim 1 wherein the crystalline material comprises semiconductor material, and wherein the unit comprises a dielectric material over the semiconductor material; and further comprising:

bonding the dielectric material of the unit to a handle component after forming the damage region; and

wherein the structure is supported by the handle component after the cleavage.

10. The method of claim 9 wherein the crystalline semiconductor material is monocrystalline silicon and wherein the dielectric material comprises silicon dioxide.

11. The method of claim 10 wherein the handle component comprises a monocrystalline silicon wafer.

12. The method of claim 9 further comprising expanding the damage region with a thermal anneal after bonding the dielectric material of the unit to the handle component.

13. A method of forming a semiconductor-on-insulator construction, comprising:

forming a unit comprising dielectric material over monocrystalline semiconductor material;

forming a damage region within the monocrystalline semiconductor material, a portion of the monocrystalline semiconductor material being between the damage region and the dielectric material;

attaching the unit to a handle component through the dielectric material to form an assembly comprising the handle component and the unit; and

utilizing an electrostatic chuck to contort the assembly and thereby induce cleavage along the damage region and form the semiconductor-on-insulator construction; the semiconductor-on-insulator construction comprising the dielectric material as the insulator, and comprising at least some of said portion of the semiconductor material as the semiconductor.

14. The method of claim 13 wherein the electrostatic chuck has a curved outer topography along a surface that engages the assembly.

15. The method of claim 13 wherein the forming the damage region comprises implanting hydrogen into the monocrystalline semiconductor material.

16. The method of claim 15 wherein the hydrogen is implanted at a dose of from about $2x10^{16}$ particles/cm^2 to about $5x10^{16}$ particles/cm^2.

17. The method of claim 16 further comprising expanding the damage region with a thermal anneal after attaching the unit to the handle component and prior to inducing the cleavage.

18. The method of claim 15 wherein the hydrogen is implanted at a dose of at least about $1x10^{17}$ particles/cm^2.

19. The method of claim 18 wherein the unit is not exposed to a temperature in excess of 300°C during an interval between the hydrogen implant and the cleavage.

20. A method of forming a semiconductor-on-insulator construction, comprising:

forming a unit comprising dielectric material over monocrystalline semiconductor material;

forming a damage region within the monocrystalline semiconductor material, a portion of the monocrystalline semiconductor material being between the damage region and the dielectric material;

attaching the unit to a handle component through the dielectric material to form an assembly comprising the handle component and the unit; and

contorting the assembly along a curved outer surface of a chuck to thereby induce cleavage along the damage region and form the semiconductor-on-insulator construction; the semiconductor-on-insulator construction comprising the dielectric material as the insulator, and comprising at least some of said portion of the semiconductor material as the semiconductor.

21. The method of claim 20 wherein the contorting comprises engaging the assembly along the curved outer surface while the assembly is in a first orientation relative to the curved outer surface, and then flipping the assembly and engaging the assembly along the curved outer surface while the assembly in a second orientation relative to the curved outer surface, with the second orientation being opposite to the first orientation.

22. The method of claim 20 wherein the chuck is an electrostatic chuck.

23. The method of claim 20 wherein the outer surface is comprised by a convex outer topography of the chuck.

24. The method of claim 20 wherein the outer surface is comprised by a concave outer topography of the chuck.

Claims

Claim 1: A method of forming a semiconductor-on-insulator construction, comprising:

forming a unit comprising dielectric material over monocrystalline semiconductor material;

forming a damage region within the monocrystalline semiconductor material, a portion of the monocrystalline semiconductor material being between the damage region and the dielectric material;

attaching the unit to a handle component through the dielectric material to form an assembly comprising the handle component and the unit;

utilizing a chuck to contort the assembly and thereby induce cleavage along the damage region and form the semiconductor-on-insulator construction; the semiconductor-on-insulator construction comprising the dielectric material as the insulator, and comprising at least some of said portion of the semiconductor material as the semiconductor;

wherein the forming the damage region comprises implanting hydrogen into the monocrystalline semiconductor material; and

wherein the hydrogen is implanted at a dose of from about $2x10^{16}$ particles/cm^2 to about $5x10^{16}$ particles/cm^2, or is implanted at a dose of at least about $1x10^{17}$ particles/cm^2.

Claim 2: The method of claim 1 wherein the hydrogen is implanted at the dose of from about $2x10^{16}$ particles/cm^2 to about $5x10^{16}$ particles/cm^2.

Claim 3: The method of claim 2 further comprising expanding the damage region with a thermal anneal after attaching the unit to the handle component and prior to inducing the cleavage.

Claim 4: The method of claim 1 wherein the hydrogen is implanted at the dose of at least about $1x10^{17}$ particles/cm^2.

Claim 5: The method of claim 4 wherein the unit is not exposed to a temperature in excess of 300°C during an interval between the hydrogen implant and the cleavage.

Claim 6: The method of claim 1 wherein the chuck has a curved outer surface utilized to induce the cleavage along the damage region; and wherein the contorting comprises engaging the assembly along the curved outer surface while the assembly is in a first orientation relative to the curved outer surface, and then flipping the assembly and engaging the assembly along the curved outer surface while the assembly in a second orientation relative to the curved outer surface, with the second orientation being opposite to the first orientation.

Claim 7: The method of claim 1 wherein the chuck is an electrostatic chuck.