

CLAIMS

1. A method of forming a semiconductor structure, the method comprising:

providing a first substrate with an in-depth weakened layer;

providing a second substrate with an oxide layer at a surface thereof;

attaching the first substrate to the second substrate to form a compound substrate comprising a buried oxide layer, the first substrate comprising the in-depth weakened layer, the second substrate comprising the oxide layer;

stabilizing at least the second substrate with the oxide layer at the surface; and

after stabilizing at least the second substrate, cleaving the compound substrate at the weakened layer to form a semiconductor structure.
2. The method of claim 1, wherein stabilizing at least the second substrate comprises stabilizing at least the second substrate before attaching the first substrate to the second substrate.
3. The method of claim 1, wherein stabilizing at least the second substrate comprises nucleation, precipitation of precipitates, and growth of the precipitates.
4. The method of claim 1, wherein stabilizing at least the second substrate comprises heat treating at least the second substrate at each of a plurality of temperatures within a range from approximately 650°C to approximately 1,200°C.
5. The method of claim 4, wherein each of the plurality of temperatures is maintained for a duration with a range extending from approximately 30 minutes to approximately 10 hours.
6. The method of claim 4, wherein heat treating at least the second substrate comprises exposing at least the second substrate to a nonoxidizing atmosphere.
7. The method of claim 4, wherein heat treating at least the second substrate comprises exposing at least the second substrate to an oxidizing atmosphere.

8. The method of claim 7, wherein exposing at least the second substrate to an oxidizing atmosphere comprises exposing at least the second substrate to an atmosphere comprising water and oxygen.

9. The method of claim 1, further comprising forming the weakened layer by ion implantation in the first substrate.

10. The method of claim 1, further comprising annealing the semiconductor substrate after cleaving the compound substrate at the weakened layer.

11. The method of claim 10, wherein annealing the semiconductor structure comprises exposing the semiconductor structure to a temperature within a range from approximately 1,075°C to approximately 1,250°C.

12. The method of claim 11, wherein annealing the semiconductor structure comprises exposing the semiconductor structure to a temperature within a range from approximately 1,175°C to approximately 1,230°C.

13. The method of claim 10, wherein annealing the semiconductor structure comprises exposing the semiconductor structure to an annealing condition for a period of time within a range from approximately 15 seconds to approximately 120 seconds.

14. The method of claim 13, wherein annealing the semiconductor structure comprises exposing the semiconductor structure to an annealing condition for a period of time within a range from approximately 20 seconds to approximately 90 seconds.

15. The method of claim 10, wherein annealing the semiconductor structure comprises exposing the semiconductor structure to a nonoxidizing atmosphere.

16. The method of claim 15, wherein exposing the semiconductor structure to a nonoxidizing atmosphere comprises exposing the semiconductor structure to an atmosphere comprising at least one gas selected from the group consisting of hydrogen and argon.

17. The method of claim 16, wherein exposing the semiconductor structure to a nonoxidizing atmosphere comprises exposing the semiconductor structure to an atmosphere comprising approximately 50% hydrogen or less.

18. The method of claim 1, further comprising attaching a residue of the first substrate to a third substrate after cleaving the compound substrate at the weakened layer, the third substrate comprising a layer of an oxide.

19. The method of claim 1, wherein the first substrate comprises a semiconductor material.

20. The method of claim 1, wherein the second substrate comprises silicon.