CLAIMS

What is claimed is:

1. A semiconductor structure, comprising:

a carrier wafer;

a semiconductor wafer coupled on top of the carrier wafer;

a first dielectric layer on top of the semiconductor wafer;

a second dielectric layer directly bonded on top of the first dielectric layer; and

one or more back end of line (BEOL) wiring passing from a top surface of the semiconductor wafer through the first and second dielectric layers, wherein the first and second dielectric layers comprise a diamond film.

2. The semiconductor structure of claim 1, wherein the first and second dielectric layers comprise oxide.

3. The semiconductor structure of claim 1, wherein the first and second dielectric layers have a thermal conductivity equal to or higher than that of Silicon oxide.

4. The semiconductor structure of claim 1, wherein a width of the semiconductor wafer is thinned to 50μm to 100μm.

5. The semiconductor structure of claim 1, wherein the carrier wafer comprises glass.

6. The semiconductor structure of claim 1, wherein the bond between the first dielectric layer and the second dielectric layer is an oxynitride bond.

7. The semiconductor structure of claim 1, wherein the bond between the first dielectric layer and the second dielectric layer is a nitride bond.

8. A method of fabricating a semiconductor structure, comprising:

providing a first carrier wafer;

forming a scissionable layer that is able to absorb infrared (IR) radiation, below the first carrier wafer;

forming a first hard-dielectric layer below the scissionable layer;

forming a second hard-dielectric layer on a top surface of a semiconductor wafer;

directly bonding the first dielectric layer with the second dielectric layer;

forming connectors on a bottom portion of the semiconductor wafer to provide an electric connection to the semiconductor wafer;

connecting a second carrier wafer to the connectors on the bottom portion of the semiconductor wafer;

separating the first carrier wafer from the semiconductor wafer by degrading the scissionable layer with an infrared (IR) radiation, by passing the IR through the first carrier wafer; and

providing a back end of line (BEOL) wiring passing from a top surface of the semiconductor wafer through the first and second dielectric layers.

9. The method of claim 8, wherein the scissionable layer comprises aluminum (Al).

10. The method of claim 8, wherein the scissionable layer is a Light-To-Heat-Conversion Release Coating (LTHC) layer.

11. The method of claim 8, wherein the first and second dielectric layers comprise oxide.

12. The method of claim 8, further comprising, after the direct bonding of the first dielectric layer with the second dielectric layer, performing a thermal anneal to create a stronger bond between the first dielectric layer and the second dielectric layer.

13. The method of claim 8, further comprising, after the direct bonding of the first dielectric layer with the second dielectric layer, thinning the semiconductor wafer.

14. The method of claim 13, wherein the thinning of the semiconductor wafer is to a thickness of 50 um to 100um.

15. The method of claim 8, further comprising, coating at least one of a top surface or a bottom surface of the carrier wafer with an anti-reflective layer.

16. The method of claim 15, wherein the anti-reflective layer comprises nitride.

17. The method of claim 8, wherein the second carrier wafer is connected below the semiconductor wafer with an adhesive.

18. The method of claim 8, further comprising, upon separating the first carrier wafer from the semiconductor wafer, removing a residual of the scissionable layer by way of a chemical etching of the scissionable layer.

19. The method of claim 8, wherein the semiconductor wafer includes a scissionable layer below the second hard-dielectric layer.