WHAT IS CLAIMED IS:

1. A wafer processing method for processing a back side of a wafer having a plurality of devices on a front side thereof, the plurality of devices being separated from each other by a plurality of crossing division lines formed on the front side of the wafer, a plurality of bumps being provided on a front side of each of the plurality of devices, the wafer processing method comprising:

a thermoplastic polymer sheet preparing step of preparing a thermoplastic polymer sheet that has an upper surface and a lower surface;

a wafer providing step of placing the lower surface of the thermoplastic polymer sheet on an upper surface of a substrate for supporting the wafer, and then placing the wafer on the upper surface of the thermoplastic polymer sheet in a condition where the back side of the wafer is exposed upward;

a thermocompression bonding step of setting the wafer placed through the thermoplastic polymer sheet on the substrate in an enclosed environment after performing the wafer providing step, next evacuating the enclosed environment, and next applying a uniform pressure by a pressure applying plate to the whole back side of the

wafer while heating the thermoplastic polymer sheet to the extent that that thermoplastic polymer sheet softens, thereby embedding the plurality of bumps in the softened thermoplastic polymer sheet and uniting the wafer through the thermoplastic polymer sheet to the substrate by thermocompression bonding,

a back processing step of processing the back side of the wafer after performing the thermocompression bonding step; and

a separating step of separating the wafer from the thermoplastic polymer sheet after performing the back processing step, wherein the separating step includes cooling the thermoplastic polymer sheet to reduce adhesion between the wafer and the thermoplastic polymer sheet.

2. The wafer processing method according to claim 1, wherein the back processing step comprises a grinding step of grinding the back side of the wafer.

3. The wafer processing method according to claim 1, wherein the thermoplastic polymer sheet is formed of a material selected from the group consisting of polyolefin and polyester.

4. The wafer processing method according to claim 3, wherein the thermoplastic polymer sheet comprises a

polyolefin sheet formed of a material selected from the group consisting of polyethylene, polypropylene, and polystyrene.

5. The wafer processing method according to claim 4, wherein the polyolefin sheet is formed of polyethylene, and the polyolefin sheet is heated to a temperature in the range of 120°C. to 140°C. in the thermocompression bonding step.

6. The wafer processing method according to claim 4, wherein the polyolefin sheet is formed of polypropylene, and the polyolefin sheet is heated to a temperature in the range of 160°C. to 180°C. in the thermocompression bonding step.

7. The wafer processing method according to claim 4, wherein the polyolefin sheet is formed of polystyrene, and the polyolefin sheet is heated to a temperature in the range of 220°C. to 240°C. in the thermocompression bonding step.

8. The wafer processing method according to claim 3, wherein the thermoplastic polymer sheet comprises a polyester sheet formed of a material selected from the group consisting of polyethylene terephthalate and polyethylene naphthalate.

9. The wafer processing method according to claim 8, wherein the polyester sheet is formed of polyethylene terephthalate, and the polyester sheet is heated to a temperature in the range of 250°C. to 270°C. in the thermocompression bonding step.

10. The wafer processing method according to claim 8, wherein the polyester sheet is formed of polyethylene naphthalate, and the polyester sheet is heated to a temperature in the range of 160°C. to 180°C. in the thermocompression bonding step.

11. The wafer processing method according to claim 1, wherein a pressure is applied to the wafer such that a raised portion surrounding an outer circumference of the wafer is formed along an outer circumference of the thermoplastic polymer sheet in the thermocompression bonding step.

12. The wafer processing method according to claim 1, wherein during the thermocompression bonding step, air previously present near each of the bumps is completely sucked off, and accordingly, the wafer is tightly bonded through the thermoplastic polymer sheet to the substrate.

13. A wafer processing method for processing a back side of a wafer having a plurality of devices on a front side thereof, the plurality of devices being separated

from each other by a plurality of crossing division lines formed on the front side of the wafer, a plurality of bumps being provided on a front side of each of the plurality of devices, the wafer processing method comprising:

a wafer providing step of placing a thermoplastic polymer sheet on an upper surface of a substrate for supporting the wafer, and placing the wafer on an upper surface of the thermoplastic polymer sheet in a condition where the back side of the wafer is exposed upward, wherein the substrate is formed of a resin;

a thermocompression bonding step of setting the wafer placed through the thermoplastic polymer sheet on the substrate in an enclosed environment after performing the wafer providing step, next evacuating the enclosed environment, and next applying a uniform pressure by a pressure applying plate to the whole back side of the wafer while heating the thermoplastic polymer sheet to the extent that that thermoplastic polymer sheet softens thereby embedding the plurality of bumps in the softened thermoplastic polymer sheet and uniting the wafer through the polymer sheet to the substrate by thermocompression bonding to simultaneously bond: (i) the upper surface of the thermoplastic polymer sheet to the front side of the

wafer, and (ii) a lower surface of the thermoplastic polymer sheet to the upper surface of the substrate;

a back processing step of processing the back side of the wafer after performing the thermocompression bonding step; and

a separating step of separating the wafer from the thermoplastic polymer sheet after performing the back processing step, wherein the separating step includes heating the thermoplastic polymer sheet to reduce adhesion between the wafer and the thermoplastic polymer sheet, and further wherein the separating step includes separating the substrate and the thermoplastic polymer sheet together from the wafer by bending the substrate,

wherein the wafer is bonded to the substrate via the thermoplastic polymer sheet by performing the thermocompression bonding step, without the use of a liquid resin, an adhesive, or a wax.

14. The wafer processing method according to claim 13, wherein the back processing step comprises a grinding step of grinding the back side of the wafer.

15. The wafer processing method according to claim 13, wherein the thermoplastic polymer sheet is formed of a material selected from the group consisting of polyolefin and polyester.

16. The wafer processing method according to claim 15, wherein the thermoplastic polymer sheet comprises a polyolefin sheet formed of a material selected from the group consisting of polyethylene, polypropylene, and polystyrene.

17. The wafer processing method according to claim 16, wherein the polyolefin sheet is formed of polyethylene, and the polyolefin sheet is heated to a temperature in the range of 120°C. to 140°C. in the thermocompression bonding step.

18. The wafer processing method according to claim 16, wherein the polyolefin sheet is formed of polypropylene, and the polyolefin sheet is heated to a temperature in the range of 160°C. to 180°C. in the thermocompression bonding step.

19. The wafer processing method according to claim 16, wherein the polyolefin sheet is formed of polystyrene, and the polyolefin sheet is heated to a temperature in the range of 220°C. to 240°C. in the thermocompression bonding step.

20. The wafer processing method according to claim 15, wherein the thermoplastic polymer sheet comprises a polyester sheet formed of a material selected from the

group consisting of polyethylene terephthalate and polyethylene naphthalate.

21. The wafer processing method according to claim 20, wherein the polyester sheet is formed of polyethylene terephthalate, and the polyester sheet is heated to a temperature in the range of 250°C. to 270°C. in the thermocompression bonding step.

22. The wafer processing method according to claim 20, wherein the polyester sheet is formed of polyethylene naphthalate, and the polyester sheet is heated to a temperature in the range of 160°C. to 180°C. in the thermocompression bonding step.

23. The wafer processing method according to claim 20, wherein a pressure is applied to the wafer such that a raised portion surrounding an outer circumference of the wafer is formed along an outer circumference of the thermoplastic polymer sheet in the thermocompression bonding step.

24. The wafer processing method according to claim 13, wherein during the thermocompression bonding step, air previously present near each of the bumps is completely sucked off, and accordingly, the wafer is tightly bonded through the thermoplastic polymer sheet to the substrate.