WHAT IS CLAIMED IS:

1. A wafer processing method for dividing a wafer along a plurality of division lines to obtain a plurality of individual device chips, the division lines being formed on the front side of the wafer, the wafer processing method comprising:

a ring frame preparing step of preparing a ring frame having an inside opening for accommodating the wafer;

a polyolefin sheet providing step of positioning the wafer in the inside opening of the ring frame and providing a polyolefin sheet having no adhesive layer on a back side of the wafer and on a back side of the ring frame, such that the polyolefin sheet is in direct contact with the back side of the wafer and the back side of the ring frame;

a uniting step of heating the polyolefin sheet as applying a pressure to the polyolefin sheet after performing the polyolefin sheet providing step, thereby uniting the wafer and the ring frame through the polyolefin sheet by thermocompression bonding to form a frame unit in a condition where the wafer and the ring frame are exposed;

a dividing step of applying a laser beam to the

wafer along each division line, the laser beam having an absorption wavelength to the wafer, after performing the uniting step, thereby forming a division groove in the wafer along each division line to divide the wafer into the individual device chips; and

a pickup step of blowing air at each device chip through the polyolefin sheet to push up each device chip, thereby picking up each device chip from the polyolefin sheet after performing the dividing step.

2. The wafer processing method according to claim 1, wherein the uniting step includes a step of applying infrared light to the polyolefin sheet, thereby performing the thermocompression bonding.

3. The wafer processing method according to claim 1, wherein the polyolefin sheet is larger in size than the ring frame, and the uniting step includes an additional step of cutting the polyolefin sheet after heating the polyolefin sheet, thereby removing a part of the polyolefin sheet outside an outer circumference of the ring frame.

4. The wafer processing method according to claim 1, wherein the pickup step includes a step of expanding the polyolefin sheet to thereby increase a spacing between any adjacent ones of the device chips.

5. The wafer processing method according to claim 1, wherein the polyolefin sheet is formed of a material selected from the group consisting of polyethylene, polypropylene, and polystyrene.

6. The wafer processing method according to claim 5, wherein the polyolefin sheet is formed of polyethylene, and the polyolefin sheet is heated in the range of 120°C. to 140°C. in the uniting step.

7. The wafer processing method according to claim 5, wherein the polyolefin sheet is formed of polypropylene, and the polyolefin sheet is heated in the range of 160°C. to 180°C. in the uniting step.

8. The wafer processing method according to claim 5, wherein the polyolefin sheet is formed of polystyrene, and the polyolefin sheet is heated in the range of 220°C. to 240°C. in the uniting step.

9. The wafer processing method according to claim 1, wherein the wafer is formed of a material selected from the group consisting of silicon, gallium nitride, gallium arsenide, and glass.

10. The wafer processing method according to claim 1, wherein the polyolefin sheet is a non-adhesive polyolefin sheet.

11. The wafer processing method according to claim

1, wherein the polyolefin sheet is transparent to visible light.

12. The wafer processing method according to claim 1, wherein the polyolefin sheet is translucent to visible light.

13. The wafer processing method according to claim 1, wherein the uniting step includes applying pressure to the polyolefin sheet with a heat roller.

14. The wafer processing method according to claim 1, further comprising placing the wafer and the ring frame on a holding surface of a chuck table that is connected to a vacuum source, and wherein the uniting step includes applying a vacuum to the polyolefin sheet through the holding surface and bringing the polyolefin sheet into close contact with the wafer and the ring frame.

15. The wafer processing method according to claim 1, wherein said polyolefin sheet providing step includes providing the polyolefin sheet having no adhesive layer on the back side of the wafer and on the back side of the ring frame, such that the polyolefin sheet fully covers the wafer and the ring frame.