

GRINDING METHOD FOR PLATELIKE WORKPIECE

BACKGROUND OF THE INVENTION

Field of the Invention

The present invention relates to a grinding method of grinding a platelike workpiece such as an optical device wafer, and more particularly to a platelike workpiece grinding method of grinding a platelike workpiece attached to a support member to reduce the thickness of the platelike workpiece to a predetermined thickness.

Description of the Related Art

In recent years, it has been desired to reduce the thickness of an optical device wafer in order to realize an optical device reduced in size and weight. A plurality of division lines are formed on the front side of an optical device wafer to thereby partition a plurality of regions where a plurality of optical devices are respectively formed. The back side of the optical device wafer having the optical devices formed on the front side is ground to be reduced in thickness. In general, a protective tape for protecting the optical devices is attached to the front side of the optical device wafer in grinding the wafer (see Japanese Patent Laid-open No. Hei 5-198542, for example).

The rigidity of the optical device wafer is remarkably decreased with a decrease in thickness of the wafer in the grinding step. Accordingly, with the advance of the grinding step, the optical device wafer is largely warped to cause a high possibility of breaking or cracking in the wafer. Further, when the outer circumferential portion of the optical device wafer is sharpened like a knife edge in the grinding step, there is a possibility of cracking, breaking, or chipping at the outer circumferential portion of the wafer.

To solve the above problems in the grinding step, there has been proposed a method of grinding the optical device wafer as a workpiece in the condition where the wafer is attached to a rigid support member (see Japanese Patent Laid-open No. 2004-207606, for example). According to this method, the optical device wafer is supported to the rigid support member and thereby reinforced, so that the warpage of the optical device wafer in the grinding step can be suppressed to thereby prevent damage to the wafer.

SUMMARY OF THE INVENTION

In the above-mentioned grinding method, the optical device wafer as a workpiece is fixed through a resin, for example, as a fixing agent to the front side of the support member, and the wafer is then ground to obtain a predetermined thickness. After performing the grinding step, the resin is softened to physically peel the support member from the optical

device wafer. However, since the rigidity of the optical device wafer reduced in thickness is greatly low, there is a possibility of damage to the optical device wafer in peeling the support member.

It is therefore an object of the present invention to provide a platelike workpiece grinding method which can suppress damage to the platelike workpiece in peeling the support member from the platelike workpiece reduced in thickness.

In accordance with an aspect of the present invention, there is provided a platelike workpiece grinding method including a platelike workpiece placing step of applying a photocurable resin to at least one of the front side of a support member and the front side of a platelike workpiece, the support member being formed of metal and having a thickness allowing the curvature of the support member by an external force, next making the front side of the platelike workpiece face the front side of the support member with the photocurable resin interposed therebetween, and next pressing the platelike workpiece until the platelike workpiece is sunk in the photocurable resin and the photocurable resin is raised so as to fully cover the outer circumferential surface of the platelike workpiece and reach the back side of the platelike workpiece, thus placing the platelike workpiece on the support member through the photocurable resin; a platelike workpiece fixing step of applying ultraviolet radiation through the platelike workpiece to the photocurable resin to cure the photocurable resin, thereby fixing

the platelike workpiece through the photocurable resin to the support member after performing the platelike workpiece placing step; a thickness reducing step of holding the support member on a holding table and next grinding the back side of the platelike workpiece to reduce the thickness of the platelike workpiece to a predetermined thickness, after performing the platelike workpiece fixing step; and a removing step of softening the photocurable resin by applying heat or water in the condition where a ground surface of the platelike workpiece is held on a table and next peeling the support member and the photocurable resin from the platelike workpiece so as to curve the support member and the photocurable resin, after performing the thickness reducing step.

With this configuration, the platelike workpiece is supported to the support member formed of metal, so that the platelike workpiece can be ground to be reduced in thickness in the condition where flexing of the platelike workpiece is suppressed. Further, the thickness of the support member formed of metal is a thickness allowing the curvature of the support member by an external force, so that the support member can be curved in peeling to thereby improve the peelability of the support member from the platelike workpiece. Accordingly, damage to the platelike workpiece can be suppressed in peeling the support member from the platelike workpiece reduced in thickness.

Preferably, the surface roughness of the front side of the support member is larger

than the surface roughness of the front side of the platelike workpiece, so that the photocurable resin is peeled together with the support member in the removing step. With this configuration, the surface roughness of the front side of the support member is larger than the surface roughness of the front side of the platelike workpiece. Accordingly, the bonding strength between the support member and the photocurable resin can be set larger than that between the platelike workpiece and the photocurable resin. As a result, the support member with the photocurable resin can be easily peeled from the platelike workpiece.

According to the present invention, it is possible to provide a platelike workpiece grinding method which can suppress damage to the platelike workpiece in peeling the support member from the platelike workpiece reduced in thickness.

The above and other objects, features and advantages of the present invention and the manner of realizing them will become more apparent, and the invention itself will best be understood from a study of the following description and appended claims with reference to the attached drawings showing some preferred embodiments of the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

FIGS. 1A and 1B are perspective views showing a manner of applying a photocurable resin to a support substrate in a placing step constituting a grinding method for an optical

device wafer according to a preferred embodiment of the present invention;

FIGS. 2A and 2B are sectional views showing a manner of pressing the optical device wafer in the placing step;

FIG. 3 is a sectional view showing a manner of applying ultraviolet light to the photocurable resin in a fixing step constituting the grinding method;

FIGS. 4A and 4B are sectional views showing a manner of grinding the optical device wafer in a thickness reducing step constituting the grinding method;

FIGS. 5A and 5B are sectional views showing a manner of peeling the support substrate and the photocurable resin from the optical device wafer in a removing step constituting the grinding method; and

FIG. 6 is a flowchart showing the grinding method for the optical device wafer according to this preferred embodiment.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

A preferred embodiment of the present invention will now be described with reference to the attached drawings. A grinding method for an optical device wafer (platelike workpiece) according to a preferred embodiment of the present invention includes a placing step (platelike workpiece placing step) of placing the optical device wafer on a support

substrate (support member), a fixing step (platelike workpiece fixing step) of fixing the optical device wafer to the support substrate, a thickness reducing step of grinding the optical device wafer to reduce the thickness thereof, and a removing step of peeling the support substrate from the optical device wafer.

In the placing step, a photocurable resin is first applied to a metal substrate as the support substrate and the optical device wafer is next pressed through the photocurable resin on the metal substrate, thereby placing the optical device wafer on the support substrate. In the fixing step, ultraviolet light (ultraviolet radiation) is applied to the photocurable resin to cure the photocurable resin, thereby fixing the optical device wafer through the photocurable resin to the support substrate. In the thickness reducing step, the back side of the optical device wafer is ground to reduce the thickness of the optical device wafer. In the removing step, the photocurable resin is softened and the support substrate is next curved to be peeled together with the photocurable resin from the optical device wafer.

The support substrate formed of metal used in this preferred embodiment has high supportability in the thickness reducing step and high peelability in the removing step. Accordingly, by performing the optical device wafer grinding method according to this preferred embodiment, the optical device wafer can be ground to be reduced in thickness and the support substrate can be easily peeled off. The optical device wafer grinding method

according to this preferred embodiment will now be described in detail.

The placing step will be described with reference to FIGS. 1A to 2B. FIGS. 1A and 1B are perspective views showing a manner of applying the photocurable resin in the placing step, and FIGS. 2A and 2B are sectional views showing a manner of pressing the optical device wafer in the placing step.

As shown in FIG. 1A, a photocurable resin R is applied to the front side S1 of a support substrate S by using a resin applying apparatus 1. The resin applying apparatus 1 has a nozzle 11 for downwardly discharging a liquid resin. More specifically, the photocurable resin R as a fixing agent for fixing an optical device wafer W to the support substrate S is discharged from the nozzle 11 of the resin applying apparatus 1. After applying the photocurable resin R to the support substrate S, the optical device wafer W is positioned directly above the support substrate S as shown in FIG. 1B. Thereafter, the optical device wafer W is stacked on the support substrate S in its central area where the photocurable resin R has been applied in such a manner that the photocurable resin R is sandwiched between the optical device wafer W and the support substrate S.

The optical device wafer W as a workpiece (platelike workpiece) has a structure such that a gallium nitride compound semiconductor layer is formed on the front side of a substantially disk-shaped sapphire substrate. A plurality of crossing division lines (not

shown) are formed on the front side W1 (not shown in FIGS. 1A and 1B; see FIGS. 2A and 2B, for example) of the optical device wafer W, thereby partitioning a plurality of regions where a plurality of optical devices (not shown) are respectively formed.

The support substrate S is provided by a substantially disk-shaped aluminum sheet having a thickness allowing curvature by an external force. The support substrate S has an area larger than the area of the optical device wafer W so that it can support the whole of the optical device wafer W. The front side S1 of the support substrate S has a surface roughness larger than that of the front side W1 of the optical device wafer W. Accordingly, the contact area between the support substrate S and the photocurable resin R is larger than that between the optical device wafer W and the photocurable resin R, so that the photocurable resin R comes into contact with the support substrate S more tightly than with the optical device wafer W. The surface roughness can be increased by sand blasting or coarse grinding, for example.

The photocurable resin R is provided by a solventless photocurable resin to be cured by applying ultraviolet light. As shown in FIG. 1A, the photocurable resin R is applied to the support substrate S in such a manner as to be dropped from the nozzle 11 of the resin applying apparatus 1 to the central area of the front side S1 of the support substrate S. While the solventless photocurable resin R is used in this preferred embodiment, any other fixing agents capable of fixing the optical device wafer W to the support substrate S may be used. For

example, a thermosetting resin may be used.

After stacking the optical device wafer W through the photocurable resin R on the support substrate S, a pressure is applied to the optical device wafer W by using a pressing apparatus 2 as shown in FIGS. 2A and 2B, thereby pressing the optical device wafer W through the photocurable resin R on the support substrate S. The pressing apparatus 2 includes a chuck table 21 having a suction holding surface formed of a porous ceramic material. The back side S2 of the support substrate S is held under suction on the suction holding surface of the chuck table 21, thereby holding the support substrate S on the chuck table 21. The pressing apparatus 2 further includes a pressing portion 22 for pressing the back side W2 of the optical device wafer W. The pressing portion 22 is provided above the chuck table 21 so as to be vertically movable.

As shown in FIG. 2A, the pressing portion 22 is brought into contact with the back side W2 of the optical device wafer W and a downward force is applied to the pressing portion 22 to thereby downwardly press the optical device wafer W. When the optical device wafer W is pressed downwardly, the spacing between the optical device wafer W and the support substrate S is reduced and the photocurable resin R is radially spread as shown by arrows A in FIG. 2A.

When the downward force applied to the pressing portion 22 is further increased, the

optical device wafer W is sunk in the photocurable resin R as shown in FIG. 2B. In this condition where the optical device wafer W is sunk in the photocurable resin R, the photocurable resin R is raised so as to fully cover the outer circumferential surface of the optical device wafer W and reach the back side W2 of the optical device wafer W as shown in FIG. 2B. In the next step to be described later, the photocurable resin R is cured in the condition where the photocurable resin R fully covers the outer circumferential surface of the optical device wafer W so as to reach the back side W2 of the optical device wafer W, thereby firmly fixing the optical device wafer W to the support substrate S.

The fixing step will now be described with reference to FIG. 3. FIG. 3 is a sectional view showing a manner of applying ultraviolet light UV to the photocurable resin R in the fixing step. The support substrate S on which the optical device wafer W has been placed through the photocurable resin R in the placing step mentioned above is now transported to an ultraviolet light applying apparatus 3 for applying ultraviolet light UV to the photocurable resin R. The ultraviolet light applying apparatus 3 includes a stage 31 for placing the support substrate S thereon and an ultraviolet light source 32 positioned above the stage 31.

In the fixing step shown in FIG. 3, the support substrate S is placed on the stage 31 and the ultraviolet light UV is next applied from the ultraviolet light source 32 to the back side W2 of the optical device wafer W. The optical device wafer W is formed from a sapphire

substrate that can transmit the ultraviolet light UV having a predetermined wavelength. Therefore, the ultraviolet light UV applied to the back side W2 of the optical device wafer W is transmitted through the optical device wafer W to reach the photocurable resin R. The photocurable resin R thus irradiated with the ultraviolet light UV through the optical device wafer W is cured by a chemical reaction with the ultraviolet light UV, so that the optical device wafer W is fixed to the support substrate S. The photocurable resin R thus cured can be ground together with the optical device wafer W in the thickness reducing step to be performed later.

The thickness reducing step will now be described with reference to FIGS. 4A and 4B. FIGS. 4A and 4B are sectional views showing a manner of grinding the optical device wafer W in the thickness reducing step. The back side W2 of the optical device wafer W fixed to the support substrate S in the fixing step is ground by using a grinding apparatus 4 shown in FIGS. 4A and 4B. The grinding apparatus 4 includes a chuck table (holding table) 41 having a suction holding surface formed of a porous ceramic material. A rotating mechanism (not shown) for rotating the chuck table 41 is located below the chuck table 41, so that the chuck table 41 is rotatable about a rotation axis C1. The support substrate S is held under suction on the chuck table 41 in such a manner that the back side S2 of the support substrate S is in contact with the suction holding surface of the chuck table 41.

The grinding apparatus 4 further includes a grinding wheel 42 for grinding the back side W2 of the optical device wafer W. The grinding wheel 42 is provided above the chuck table 41 so as to be vertically movable. A rotating mechanism (not shown) for rotating the grinding wheel 42 is located above the grinding wheel 42, so that the grinding wheel 42 is rotatable about a rotation axis C2. A plurality of abrasive members 43 are mounted on the lower surface of the grinding wheel 42 along the outer circumference thereof. As shown in FIG. 4A, the chuck table 41 and the grinding wheel 42 are relatively rotated in the condition where the abrasive members 43 are kept in contact with the back side W2 of the optical device wafer W, thereby grinding the back side W2 of the optical device wafer W. At the same time, the photocurable resin R raised along the outer circumferential surface of the optical device wafer W is also ground. The grinding wheel 42 is rotated at a speed higher than that of the chuck table 41.

A height gauge (not shown) for measuring the thickness of the optical device wafer W is provided in the vicinity of the chuck table 41. Accordingly, the back side W2 of the optical device wafer W is ground as measuring the thickness of the optical device wafer W, thereby reducing the thickness of the optical device wafer W to a predetermined thickness as shown in FIG. 4B. The outer circumferential portion of the optical device wafer W is reinforced by the photocurable resin R, thereby preventing cracking, breaking, or chipping due

to the formation of a knife edge. In the condition where the thickness of the optical device wafer W has been reduced to a predetermined thickness, a ground surface W3 obtained by this grinding appears to the optical device wafer W as shown in FIG. 4B.

The removing step will now be described with reference to FIGS. 5A and 5B. FIGS. 5A and 5B are sectional views showing a manner of peeling the support substrate S and the photocurable resin R from the optical device wafer W in the removing step. In this removing step, a peeling apparatus 5 shown in FIGS. 5A and 5B is used to peel the support substrate S and the photocurable resin R from the optical device wafer W reduced in thickness by the thickness reducing step mentioned above. The peeling apparatus 5 includes a chuck table 51 having a suction holding surface formed of a porous ceramic material. The ground surface W3 of the optical device wafer W obtained by the thickness reducing step mentioned above is held under suction on the suction holding surface of the chuck table 51. The chuck table 51 is provided with a heater (not shown) for softening the photocurable resin R.

In the removing step, the ground surface W3 of the optical device wafer W is held under suction on the chuck table 51 and then the heater is operated to heat the photocurable resin R, thereby softening the photocurable resin R. This softening of the photocurable resin R may be performed by adding water to the photocurable resin R. That is, when water is added to the photocurable resin R, the photocurable resin R is swelled to be softened.

Thereafter, as shown in FIG. 5A, one end portion S3 of the support substrate S is pulled up obliquely to thereby curve the support substrate S. As a result, the support substrate S is peeled from one end portion W4 of the optical device wafer W.

The surface roughness of the front side S1 of the support substrate S is larger than that of the front side W1 of the optical device wafer W. Accordingly, the bonding strength of the photocurable resin R to the support substrate S is larger than that of the photocurable resin R to the optical device wafer W. As a result, the photocurable resin R bonded to the support substrate S is peeled from the optical device wafer W. In other words, the support substrate S is peeled together with the photocurable resin R from the optical device wafer W.

The thickness of the support substrate S is set so as to allow the curvature of the support substrate S. Accordingly, the support substrate S can be curved by obliquely pulling up the one end portion S3, so that the support substrate S can be gradually peeled as starting from the one end portion S3. After peeling the one end portion S3 of the support substrate S, the one end portion S3 is further pulled up obliquely to be further curved as shown in FIG. 5B. As a result, the peeling of the support substrate S with the photocurable resin R from the optical device wafer W proceeds. Finally, the support substrate S with the photocurable resin R is completely peeled from the optical device wafer W.

FIG. 6 is a flowchart showing the optical device wafer grinding method according to

this preferred embodiment. As shown in FIG. 6, in the placing step (step ST1), the photocurable resin R is applied to the front side S1 of the support substrate S and the optical device wafer W is next stacked through the photocurable resin R on the support substrate S in the condition where the back side W2 is oriented upward. Thereafter, the optical device wafer W is pressed down so as to be sunk in the photocurable resin R. That is, by pressing down the optical device wafer W, the photocurable resin R is raised so as to fully cover the outer circumferential surface of the optical device wafer W and reach the back side W2 of the optical device wafer W.

In the fixing step (step ST2), the ultraviolet light UV is applied to cure the photocurable resin R, thereby fixing the optical device wafer W through the photocurable resin R to the support substrate S. In the case of using any other fixing agents, any suitable curing processes (fixing processes) may be applied according to the fixing agents. For example, in the case of using a thermosetting resin, heat is applied to cure the thermosetting resin, thereby fixing the optical device wafer W through the thermosetting resin to the support substrate S.

In the thickness reducing step (step ST3), the back side W2 of the optical device wafer W is ground to reduce the thickness of the optical device wafer W to a predetermined thickness. In this preferred embodiment, the support substrate S is provided by a rigid metal substrate, so that a reduction in rigidity of the optical device wafer W due to grinding can be

compensated by the support substrate S. Accordingly, it is possible to suppress damage to the optical device wafer W in grinding the wafer W.

In the removing step (step ST4), the photocurable resin R is softened and the support substrate S with the photocurable resin R is peeled from the optical device wafer W reduced in thickness. In this preferred embodiment, the metal support substrate S has a thickness allowing the curvature of the support substrate S. Accordingly, the peelability of the support substrate S can be improved by curving the support substrate S in the removing step, thereby suppressing damage to the optical device wafer W in peeling the support substrate S. Further, the surface roughness of the front side S1 of the support substrate S is larger than that of the front side W1 of the optical device wafer W. Accordingly, the support substrate S can be peeled together with the photocurable resin R from the optical device wafer W.

As described above, the metal support substrate S used in this preferred embodiment has high supportability in the thickness reducing step and high peelability in the removing step. Accordingly, the optical device wafer can be ground to be reduced in thickness and the support substrate can be easily peeled off.

The effects of the grinding method according to this preferred embodiment will now be verified on the basis of Example and Comparison described below. The present invention is not limited to Example.

(Example)

The above-mentioned steps of the grinding method according to this preferred embodiment were followed to reduce the thickness of a sapphire substrate constituting an optical device wafer to 60 μm and then peel a support substrate. A disk-shaped sapphire substrate having a diameter of four inches and a thickness of 0.7 mm was used as the optical device wafer, and a disk-shaped aluminum sheet having a diameter of eight inches and a thickness of 0.3 mm was used as the support substrate. The thickness of this aluminum sheet is a thickness allowing the curvature of the aluminum sheet by an external force. TEMPLOC manufactured by Denki Kagaku Kogyo K.K. was used as a photocurable resin.

After grinding the sapphire substrate, it was checked whether or not the photocurable resin was separated at the outer circumference of the sapphire substrate, whether or not the sapphire substrate was broken, and whether or not the sapphire substrate was cracked. Further, in the removing step, it was checked whether or not the aluminum sheet could be peeled without damage to the sapphire substrate. The check results are shown in Table 1. The trial for this check was made five times. In Table 1, each circle mark indicates that the separation of the photocurable resin, the break of the sapphire substrate, the cracking of the sapphire substrate, and the damage to the sapphire substrate in peeling the aluminum sheet never occurred in all the trials, whereas each cross mark indicates that these problems occurred in at

least one of the trials. (Comparison)

As Comparison, various support substrates different from the support substrate used in Example were used to check whether or not the photocurable resin was separated at the outer circumference of the sapphire substrate, whether or not the sapphire substrate was broken, whether or not the sapphire substrate was cracked, and whether or not each support substrate could be peeled without damage to the sapphire substrate. In Comparison 1, a silicon substrate having a thickness of 0.7 mm was used. In Comparison 2, a glass substrate having a thickness of 1.0 mm was used. In Comparison 3, a PET (polyethylene terephthalate) sheet having a thickness of 0.3 mm was used. The other conditions were similar to those adopted in Example. The check results in Comparisons 1, 2, and 3 are shown in Table 1. As in Example, the trial for this check was made five times and the criterion of evaluation was similar to that adopted in Example.

Table 1

	Separation of photocurable resin	Breaking	Cracking	Peeling of support substrate
Example (aluminum sheet)	o	o	o	o
Comparison 1 (silicon substrate)	o	o	o	×

Comparison 2 (glass substrate)	o	o	o	×
Comparison 3 (PET sheet)	o	×	×	o

As apparent from Table 1, breaking and cracking occur in the thickness reducing step in the case of using the PET sheet having low rigidity. In contrast, breaking and cracking do not occur in the thickness reducing step in the case of using the aluminum sheet, the silicon substrate, or the glass substrate each having high rigidity. The reason for the occurrence of breaking and cracking in the case of using the PET sheet having low rigidity is considered to be due to the fact that the PET sheet may be flexed by a load in grinding the sapphire substrate to cause the occurrence of warpage of the sapphire substrate being ground. To the contrary, in the case of using the aluminum sheet, the silicon substrate, or the glass substrate, each support substrate having high rigidity is resistant to flexing by the load in grinding the sapphire substrate, so that these rigid support substrates can suitably support the sapphire substrate.

As further apparent from Table 1, in the case of using the PET sheet or the aluminum sheet, the support substrate can be properly peeled in the removing step. In contrast, in the case of using the silicon substrate or the glass substrate, the support substrate cannot be properly peeled in the removing step. This is considered to be due to the fact that the PET sheet or the aluminum sheet as the support substrate can be curved and therefore the support

substrate can be gradually peeled as being curved from its end portion by applying a proper force to a bonded portion between the sapphire substrate and the photocurable resin. To the contrary, the silicon substrate or the glass substrate as the support substrate cannot be curved, so that an excessive force is prone to be applied to the sapphire substrate, causing a high possibility of damage to the sapphire substrate.

In the grinding method according to this preferred embodiment, the optical device wafer (platelike workpiece) W is supported to the support substrate (support member) formed of metal, so that the optical device wafer W can be ground to be reduced in thickness in the condition where flexing of the optical device wafer W is suppressed. Further, the thickness of the support substrate S formed of metal is a thickness allowing the curvature of the support substrate S by an external force, so that the support substrate S can be curved in peeling to thereby improve the peelability of the support substrate S from the optical device wafer W. Accordingly, damage to the optical device wafer W can be suppressed in peeling the support substrate S from the optical device wafer W reduced in thickness.

Further, in the grinding method according to this preferred embodiment, the surface roughness of the front side S1 of the support substrate S is larger than the surface roughness of the front side W1 of the optical device wafer W. Accordingly, the bonding strength between the support substrate S and the photocurable resin R can be set larger than that between the

optical device wafer W and the photocurable resin R. As a result, the support substrate S with the photocurable resin R can be easily peeled from the optical device wafer W.

The present invention is not limited to the preferred embodiment mentioned above, but various modifications may be made. For example, while the photocurable resin is applied to the support substrate (support member) in this preferred embodiment, the photocurable resin may be applied to the optical device wafer (platelike workpiece). In this case, the photocurable resin applied to the front side of the optical device wafer is indirectly applied to the front side of the support substrate.

Further, while the ground surface of the optical device wafer is directly held on the chuck table under suction to heat the photocurable resin in the removing step in the above preferred embodiment, a protective tape may be attached to the ground surface of the optical device wafer and the protective tape may be held on the chuck table. In this case, it is desirable that the protective tape is not altered in quality by heating. Further, while the support substrate with the photocurable resin is peeled from the optical device wafer by using the peeling apparatus in the above preferred embodiment, the peeling operation may be manually performed by an operator.

Further, while an optical device wafer formed from a sapphire substrate is used as the workpiece (platelike workpiece) to be ground in the above preferred embodiment, the

workpiece is not limited to such an optical device wafer. For example, a semiconductor wafer formed of silicon, gallium arsenide (GaAs) substrate, silicon carbide (SiC) substrate, and compound semiconductor substrate may be used as the workpiece.

Further, while an aluminum sheet is used as the support substrate in the above preferred embodiment, the support substrate is not limited to an aluminum sheet, but any other substrates capable of exhibiting high supportability in the thickness reducing step and high peelability in the removing step may be used as the support substrate. For example, a stainless steel sheet and a copper sheet each having high rigidity and a proper thickness may be used as the support substrate. Further, the shape of the support substrate is not limited to a circular shape, but arbitrary shapes may be adopted.

The other configurations of the grinding method according to the above preferred embodiment may be suitably modified without departing from the scope of the present invention.

The present invention is useful in grinding a platelike workpiece such as an optical device wafer to reduce the thickness of the workpiece to a predetermined thickness.

The present invention is not limited to the details of the above described preferred embodiments. The scope of the invention is defined by the appended claims and all changes and modifications as fall within the equivalence of the scope of the claims are therefore to be

embraced by the invention.

WHAT IS CLAIMED IS:

1. A platelike workpiece grinding method comprising:

a platelike workpiece placing step of applying a photocurable resin to at least one of the front side of a support member and the front side of a platelike workpiece, said support member being formed of metal and having a thickness allowing the curvature of said support member by an external force, next making the front side of said platelike workpiece face the front side of said support member with said photocurable resin interposed therebetween, and next pressing said platelike workpiece until said platelike workpiece is sunk in said photocurable resin and said photocurable resin is raised so as to fully cover the outer circumferential surface of said platelike workpiece and reach the back side of said platelike workpiece, thus placing said platelike workpiece on said support member through said photocurable resin;

a platelike workpiece fixing step of applying ultraviolet radiation through said platelike workpiece to said photocurable resin to cure said photocurable resin, thereby fixing said platelike workpiece through said photocurable resin to said support member after performing said platelike workpiece placing step;

a thickness reducing step of holding said support member on a holding table and next grinding the back side of said platelike workpiece to reduce the thickness of said platelike

workpiece to a predetermined thickness, after performing said platelike workpiece fixing step;
and

a removing step of softening said photocurable resin by applying heat or water in the condition where a ground surface of said platelike workpiece is held on a table and next peeling said support member and said photocurable resin from said platelike workpiece so as to curve said support member and said photocurable resin, after performing said thickness reducing step.

2. The platelike workpiece grinding method according to claim 1, wherein the surface roughness of the front side of said support member is larger than the surface roughness of the front side of said platelike workpiece, so that said photocurable resin is peeled together with said support member in said removing step.