

(54) [Title of the Invention] WAFER POLISHING METHOD

[Detailed Description of the Invention]

[Technical Field]

[0001]

The present invention relates to a wafer polishing method, and specifically to a wafer polishing method that can efficiently manufacture a wafer for a semiconductor having a high flatness.

[Background Art]

[0002]

A conventional wafer manufacturing method will be explained by an example of a silicon wafer manufacturing method. First, a silicon single crystal ingot is grown, for example, by the Czochralski method (the CZ method). The obtained silicon single crystal ingot is sliced to produce silicon wafers, and thereafter the silicon wafers are subjected to each of the steps of chamfering, lapping, and etching one after the other. At least a polishing process is subsequently performed to make a main surface of each wafer a mirror surface.

[0003]

In this polishing process of the wafer, for example, a double-side polishing apparatus may be used to polish both surfaces of the silicon wafer.

As the double-side polishing apparatus, a so-called four-way double-side polishing apparatus is normally used which has a planetary gear construction in which a carrier for holding wafers are arranged between a sun gear provided at a center portion and an internal gear provided at an outer circumferential

portion.

[0004]

The four-way double-side polishing apparatus can simultaneously polish both surfaces of the silicon wafers by inserting the silicon wafers into a plurality of carriers, in which wafer-holding holes are formed, to hold the wafers, by rotating an upper turn table and a lower turn table, in which a polishing pad is attached on each of the surfaces facing to the wafers, in a direction relative to one another with pressing the upper turn table and the lower turn table against front and back surfaces of each of the wafers, while supplying a polishing slurry from above the held silicon wafers, and by concurrently rotating and revolving the carrier with the sun gear and the internal gear.

[0005]

However, when the above-described double-side polishing apparatus is used to polish, there are problems such that the productivity is low even though flat wafers can be obtained or on the contrary low flatness wafers are obtained even though the productivity is high.

This is because there is a tradeoff relationship between a polishing rate of the wafer and the flatness. To deal with these problems, quasi-static processing by keeping the polishing rate as low as possible is needed in a finishing stage.

[0006]

In view of this, there has been used a polishing method to flatly and smoothly polish by switching a polishing agent into a polishing agent

having a different grain diameter or a different pH on the identical turn table (See Patent Document 1, for example), or by polishing while lowering a rotation number or decreasing a load when finishing is close at hand (See Patent Document 2, for example).

[0007]

[Patent Document 1] Japanese Unexamined Patent publication (Kokai) No.2006-324417

[Patent Document 2] Japanese Unexamined Patent publication (Kokai) No.H9-38849

[Disclosure of the Invention]

[The Problem to be solved by the Invention]

[0008]

In the method described above, polishing conditions (type of a polishing agent, a polishing load, and a speed against the polishing surface of each turn table to which the polishing pad is attached) are switched during one polishing cycle (one wafer in single wafer processing and a plurality of wafers in batch-wise manner processing).

[0009]

In this method, however, the polishing conditions are not switched with taking account of deterioration of a polishing jig material such as the polishing pad and the carrier. A failure in a wafer shape, such as an outer peripheral sag, thereby occurs. This is because the deterioration to the above-mention material is generated by polishing, and the polishing conditions (for example, a polishing speed) thereby vary even in the case of polishing with the identical apparatus in the same conditions.

Moreover, since timing of switching the

polishing conditions is constant regardless of the deterioration of the polishing jig material such as the polishing pad and the carrier, there arise problems such that the productivity becomes worse by increasing a polishing time with the deterioration of the polishing pad, and that excess or deficiency of polishing stock removal occurs.

The problem of the excess or deficiency of polishing stock removal may easily suppress by measuring the thickness to adjust during polishing or after and before polishing with extracting it. However, since the polishing needs to be stopped halfway and thereby the productivity becomes significantly worse, it is not realistic method.
[0010]

Moreover, when the wafer is polished, the polishing rate varies due to the deterioration of the polishing pad and the like. As shown in FIG. 6, the polishing time required for polishing up to a target thickness of α accordingly greatly varies between the case of a high polishing rate and a low polishing rate. There thus arises a problem that the time required for polishing process is not stable to obtain a constant target thickness in the finish of polishing. When the polishing time is made constant, it is over-polished in case of a high polishing rate, a lot of failures such as scratch are thereby generated, and a yield greatly becomes worse. On the other hand, a polishing deficiency occurs in case of a low polishing rate, the flatness of the wafer thereby becomes worse, and the yield also becomes worse.

[0011]

FIG. 7 shows the case where the thickness of the wafer in the finish of polishing can be made a constant target thickness α by measuring the thickness of the wafer during polishing.

In this way, the thickness in the finish can be made a target thickness by the measurement of the thickness of the wafer, but each polishing time greatly differs between the case of a high polishing rate and a low polishing rate. The time required for polishing processing is not therefore stable, also the quality of the wafer is not stable, and these become a bottleneck.

[0012]

The present invention was accomplished in view of the above-explained problems, and its object is to provide a wafer polishing method that can manufacture a wafer having a high flatness and a high smoothness at high productivity and high yield.

[Means to solve the Problems]

[0013]

To achieve this object, the present invention provides a wafer polishing method including simultaneously polishing both surfaces of a wafer by pressing and rubbing the wafer, while holding the wafer with: a lower turn table having a flat polishing-upper-surface rotationally driven; an upper turn table having a flat polishing-lower-surface rotationally driven, the upper turn table being arranged with facing to the lower turn table; and a carrier having a wafer-holding hole for holding the wafer, wherein the polishing is performed while

measuring a thickness of the wafer through a plurality of windows provided between a rotation center and an edge of the upper turn table or the lower turn table, and switching a polishing slurry with a polishing slurry having a different polishing rate during the polishing of the wafer.

[0014]

In this manner, when the polishing is performed while measuring the thickness of the wafer at the time of simultaneously polishing both surfaces, the thickness of the wafer can be evaluated in real time. Timing of the switching with the slurry having a different polishing rate and the end of a polishing state can be therefore seen without stopping the polishing, and the time required for polishing processing can be reduced.

Moreover, for example, the wafer is first polished with a polishing slurry having a high polishing rate, and the polishing slurry is switched with a polishing slurry having a low polishing rate halfway. The polishing is thereby performed in a condition of a high rate and rough processing, and thereafter a high precision polishing is performed at a low rate. The time required for polishing the wafer can be thereby reduced, and the productivity can be increased without decreasing the flatness and smoothness of the wafer.

Consequently, the wafer can be polished at high productivity and high yield, and the wafer having a high flatness and a high smoothness can be manufactured.

[0015]

Moreover, the plurality of windows are preferably provided at the upper turn table.

When the thickness of the wafer is measured during polishing through the plurality of windows provided at the upper turn table, a leak of the polishing slurry through the windows does not occur and the polishing slurry does not enter the inside of the openings. A measure against the leak is not therefore necessary. Consequently, the maintenance of the turn tables becomes easy, and a risk of a measuring problem of the thickness of the wafer can be suppressed.

[0016]

Moreover, the wafer is preferably polished in a batch-wise manner.

Since the wafer polishing method according to the present invention enables the wafer having a high flatness to be obtained at high productivity, and the productivity can be more improved by polishing in a batch-wise manner. In the present invention, since the polishing is performed while measuring the thickness of the wafer through the plurality of windows, even in the case of simultaneously polishing a plurality of wafers in a batch-wise manner, the thicknesses of all wafers can be precisely measured.

[0017]

Moreover, a method of measuring the thickness of the wafer is preferably an optical reflection interferometry by a wavelength-variable-infrared laser.

In this manner, when a reflection spectrum on the surface of the wafer (a situation of interference

of light reflected from a front surface and a back surface of the wafer) is evaluated by the wavelength-variable-infrared laser, the thickness of the wafer can be measured with high precision during polishing. [0018]

Moreover, timing of the switching of the polishing slurry is preferably determined on the basis of at least one of an elapsed time from a start of the polishing, a polishing rate, polishing stock removal, and a lifetime of a polishing pad.

In this manner, when the switching of the polishing slurry is determined on the basis of the elapsed time from the start of the polishing, the polishing rate, the polishing stock removal, and the lifetime of a polishing pad, an appropriate response can be made according to circumstances against a polishing state of the wafer, which varies depending on the deterioration of the polishing jig material such as the polishing pad and the carrier. The target shape of the wafer, particularly improvement in the outer peripheral sag, stabilization of the flatness, and the target amount of the polishing stock removal can be therefore readily achieved. [0019]

Moreover, at least one of a polishing load, a rotation speed of the upper turn table, and a rotation speed of the lower turn table is preferably changed during the polishing of the wafer on the basis of measured data of the thickness of the wafer.

In this manner, when at least one of a polishing load, a rotation speed of the upper turn table, and a rotation speed of the lower turn table

is changed, in addition to the switching with the slurry having a different polishing rate during the polishing of the wafer, a minute and appropriate response can be made during the polishing of the wafer against changes in the polishing conditions due to deterioration of a mechanism used for polishing. The wafer having a greatly high flatness of the polished surface can be therefore stably obtained.

[Effects]

[0020]

As explained above, the wafer polishing method according to the present invention enables the improvement in the deterioration of the shape of the wafer, such as the outer peripheral sag, due to small changes of the polishing conditions during polishing, the changes which are accompanied by the deterioration of the polishing jig material such as the polishing pad and the carrier, and the stabilization of the flatness of each wafer can be obtained.

In addition to these, since the polishing is performed while measuring the thickness of the wafer, the timing of the switching of the polishing agent can be changed on the basis of the deterioration of the polishing jig material such as the polishing pad and the carrier, and the target amount of the polishing stock removal can be obtained in relatively short time. The productivity can be therefore improved, the variation of the thickness can be made very small, and the yield can be greatly improved.

[Best Mode for Carrying out the Invention]

[0021]

Hereinafter, the present invention will be explained in detail. However, the present invention is not restricted thereto.

The double-side polishing apparatus according to the present invention used for the wafer polishing method will be explained with reference to the drawings, but the present invention is not of course restricted thereto.

[0022]

As shown in FIG. 5, the double-side polishing apparatus 10 according to the present invention includes the lower turn table 12 having the flat polishing-upper-surface rotationally driven; the upper turn table 11 having the flat polishing-lower-surface rotationally driven, the upper turn table being arranged with facing to the lower turn table 12; and the carrier 13 having the wafer-holding hole for holding the wafer, in order to hold the wafer W, and also includes the wafer-thickness-measuring mechanism 16 for measuring the thickness of the wafer W during polishing.

The plurality of windows 14 for measuring the thickness of the wafer during polishing and a polishing-slurry-supply mechanism 15 are provided at a side of the upper turn table 11.

[0023]

The wafer-thickness-measuring mechanism 16 has at least an optical unit 16a for radiating laser to the wafer, a photo detector 16b for detecting the laser reflected from the wafer, a laser source unit 16c, and a calculation/control unit 16d for calculating the thickness of the wafer from the

detected laser.

As will hereinafter be described in detail, in the case of changing at least one of a polishing load, a rotation speed of the upper turn table 11, a rotation speed of the lower turn table 12 during polishing, the upper turn table 11 and the lower turn table 12 can be controlled by installing a polishing control unit 17. The at least one of a polishing load, a rotation speed of the upper turn table 11, a rotation speed of the lower turn table 12 can be thereby changed.

[0024]

Hereinafter, the wafer polishing method according to the present invention by using the above-described double-side polishing apparatus will be explained in detail. However, the present invention is not restricted thereto.

[0025]

First, the wafer to be polished is set to the carrier.

The wafer is held with the polishing-lower-surface of the upper turn table, polishing-upper-surface of the lower turn table, and the carrier, and the polishing is started while supplying the polishing slurry and rotating the upper turn table and the lower turn table in a horizontal plane.

[0026]

In this case, the polishing is performed while measuring the thickness of the wafer through the plurality of openings provided at the upper turn table or the lower turn table.

The thickness of the wafer can be thereby seen

during the polishing without stopping the polishing and in particular the thickness of the wafer during the polishing can be seen at any time. Whether the thickness reaches to a target thickness of the wafer can be thereby judged while performing the polishing. That is, whether the thickness reaches to a target thickness of the wafer can be judged without stopping the polishing, and the time required for the polishing can be consequently reduced.

In addition to these, since the wafer can be polished into a target thickness without predetermining the polishing time, the excess or deficiency of the polishing does not occur, and the deterioration of the flatness can be suppressed. That is, this can also manage the deterioration of the polishing pad and the like.

[0027]

In the wafer polishing method according to the present invention, the polishing slurry is switched with a polishing slurry having a different polishing rate with a certain timing.

For example, the wafer is roughly polished at a high rate with the polishing slurry having a high polishing rate at the beginning of the polishing (a condition of a high polishing rate). Thereafter, it is changed, for example, when the thickness of the wafer becomes a target thickness γ . In this change, the polishing slurry is switched with a polishing slurry having a low polishing rate during the polishing to precisely polish the wafer at a low rate (a condition of a low polishing rate).

The polishing method as described above enables

a total time required for polishing the wafer to be reduced. The polishing in a finishing stage is performed after changing with the polishing slurry having a high polishing precision, and the flatness of the polished wafer is not thereby sacrificed. The wafer having a high flatness and a high smoothness can be therefore obtained at high productivity.

[0028]

In this case of the present invention, the thickness of the wafer is measured through the plurality of openings. Therefore, even when a plurality of wafers are simultaneously polished in a batch-wise manner, the thicknesses of all wafers can be measured, the thicknesses can be measured with high precision, and the polishing can be thereby performed with high precision.

[0029]

Here, the thickness of the wafer can be measured through the plurality of openings provided at the upper turn table.

When the thickness of the wafer is measured through the plurality of openings provided at the upper turn table, the openings can be arranged above the wafer, the leak of the polishing slurry can be thereby suppressed. The measure against the leak is not therefore necessary, and the maintenance of the turn tables consequently becomes easy. Also, the thickness of the wafer can be of course measured through the plurality of openings provided at the lower turn table.

[0030]

The method of measuring the thickness of the

wafer can be an optical reflection interferometry by a wavelength-variable-infrared laser.

The thickness of the wafer can be measured with high precision by the above-described optical reflection interferometry, in which wavelength dispersion of the reflection (a reflection spectrum : a situation of interference of light reflected from a front surface and a back surface of the wafer) is reconfigured from reflection strength of highly wavelength-swept "wavelength-variable-infrared laser" on the surface of the wafer, and a frequency analysis is carried out.

[0031]

In the present invention, the timing of the switching of the polishing slurry can be determined on the basis of at least one of the elapsed time from the start of the polishing, the polishing rate, the polishing stock removal, and the lifetime of a polishing pad.

The polishing conditions, such as the polishing rate of the wafer, vary due to the deterioration of the polishing jig material such as the polishing pad and the carrier.

However, in the present invention, the polishing is performed while accurately measuring the thickness of the wafer through the plurality of openings one by one. Therefore, an appropriate response can be made according to circumstances against small changes in the polishing conditions of the wafer by using the lifetime of the polishing pad, the elapsed time from the start of the polishing, the polishing rate, the polishing stock removal for

determining the timing of the switching of the polishing slurry. The shape of the polished wafer can be thereby stably made flat with high precision, and particularly the outer peripheral sag can be improved. In addition to this, the thickness of the wafer can be readily made a target thickness.

[0032]

Moreover, at least one of the polishing load, the rotation speed of the upper turn table, and the rotation speed of the lower turn table can be changed during the polishing of the wafer on the basis of measured data of the thickness of the wafer.

As described above, when at least one of the polishing load, the rotation speed of the upper turn table, and the rotation speed of the lower turn table is changed during polishing, in addition to the switching with the slurry having a different polishing rate during the polishing, the polishing rate and the like can be minutely and freely changed during the polishing. An appropriate response can be therefore made against the changes in the polishing conditions during the polishing of the wafer. The wafer having a very high flatness on the surface after polishing can be consequently obtained.

[0033]

In the present invention, the wafer can be polished in a batch-wise manner.

The wafer polishing method according to the present invention enables a flat wafer to be manufactured at high productivity. The productivity can be more improved by polishing in a batch-wise manner.

[0034]

Here, the case of changing the timing of the switching of the polishing slurry on the basis of the lifetime of the polishing pad will be explained in detail with reference to the drawings, but the present invention is not of course restricted thereto.

As mentioned above, the timing of the switching can be also changed on the basis of the elapsed time from the start of the polishing, the polishing rate, the polishing stock removal, and can be of course changed by combining these.

[0035]

FIG. 1 will be first explained. FIG. 1 is a view showing an example of the relationship between the elapsed time from the start of polishing the wafer and the thickness of the wafer in case of determining the timing of the switching on the basis of a target thickness, in the wafer polishing method according to the present invention.

As described above, since the polishing is performed while measuring the thickness at any time, the slurry can be surely changed at a predetermined target thickness, and the wafer having the thickness with no variation can be finally obtained.

[0036]

In this case, when high rate polishing in a first stage is performed at a high rate, it reaches predetermined polishing stock removal (a target thickness γ) for a short time, but since the polish is performed at a high rate, the shape of the wafer is apt to deteriorate. Therefore, the shape fundamentally needs to be adjusted by performing low

rate polishing in a second stage for a long time. On the other hand, when the polishing rate of the high rate polishing in a first stage is decreased due to the deterioration of the polishing pad, it takes a long time to reach a predetermined thickness, but the wafer shape fundamentally becomes good. The wafer shape can be finished for a short time by the low rate polishing in a second stage. However, in the case of switching the slurry only on the basis of the target thickness or the polishing stock removal as described above, the deteriorated shape in the first stage cannot be completely repaired by the second stage in some cases, the first and second polishing may be performed for an excessively long time, and thus further improvement is required.

[0037]

In view of this, for example as shown in FIG. 2, a ratio of the target thickness α for the finishing to the target thickness γ for a first polishing slurry can be automatically changed according to the deterioration of the polishing pad. It is to be noted that the target thickness α is the same as that in FIG. 1.

This deterioration of the polishing pad is determined by the polishing rate calculated from the thickness data obtained by the measurement of the thickness during the polishing. In addition, the relationship between the polishing rate and a total polishing time is accumulated by using the same type of polishing pad in advance, and a correspondence table of an average polishing rate and the total polishing time, and switching conditions of the

polishing slurry having a high rate and the polishing slurry having a low rate can be preliminarily made.

[0038]

In this case, the polishing of the wafer is first started, and the polishing rate and the total polishing time are monitored at any time by measuring the thickness of the wafer during the polishing.

Then, the target thickness γ can be automatically changed appropriately with reference to the known correspondence table and condition table.

[0039]

For example, since the polishing rate is high in an early stage of the lifetime when the polishing pad is started to use, it is polished at a higher rate by using the polishing slurry having a high polishing rate. The target thickness γ is accordingly set to be as thin as possible, and for example, it is set at γ_1 . When it is stabilized after a certain time passes, the polishing stock removal by the polishing slurry having a high polishing rate is increased, and it is set at γ_2 , for example. When the lifetime is close to the end due to process of the deterioration of the polishing pad and the polishing rate starts to decrease, the target thickness for the polishing slurry having a high polishing rate is set, for example, at γ_3 so as to increase the polishing stock removal for the polishing slurry having a high polishing rate.

[0040]

The above-described wafer polishing method enables the changes in the polishing conditions at a polishing area by the same polishing slurry to be

flexibly managed, the changes which are caused by the deterioration of the polishing pad. The change in processing time of the wafer can be therefore suppressed, and throughput can be consequently improved. In the early stage of the lifetime of the polishing pad, the polishing stock removal under a condition of a high polishing rate is made as small as possible, and the deterioration of the flatness by the high rate polishing can be thereby prevented. In an end stage of the lifetime of the polishing pad, the polishing stock removal under a condition of the decrease in the polishing rate in comparison with the early stage of the lifetime of the polishing pad can be increased by the relation of a tradeoff. The polishing time under a condition of a low polishing rate can be reduced, and it can be consequently suppressed that a total polishing time becomes long. Furthermore, the flatness and the smoothness of the wafer can be made high, and such a wafer can be stably obtained.

[Examples]

[0041]

Hereinafter, the present invention will be explained in more detail based on Examples and Comparative Examples, but the present invention is not restricted thereto.

(Example 1)

A wafer was polished according to the wafer polishing method as shown in FIG. 2.

As the wafer to be polished, there were prepared 720 silicon single wafers having a diameter of 300 mm and p⁻-type obtained by slicing, with a

wire saw, an ingot grown by the CZ method. This p⁻-type wafer means a p-type wafer having a high resistivity. The wafers were subjected to chamfering, rapping, and etching in a normal condition.

With the double-side polishing apparatus as shown in FIG. 5, 240 wafers of the prepared silicon single wafers were double-side polished in a batch-wise manner (15 wafers in one batch). As the polishing pad, MH-S15A of Nitta haas was used. As the polishing slurry before the switching, Fujimi FGL11022 (for the high rate polishing) was used, and as the polishing slurry after the switching, Fujimi FGL2100 (for the low rate polishing) was used. It is to be noted that an attempt to keep the thicknesses of all polished wafers constant was made.

[0042]

In this case, the thicknesses of the wafers were measured through the plurality of openings during the polishing to calculate the polishing rate of the wafer at any time, and the relationship between an average rate and the total polishing time every number of the polishing was saved, and past values were referred and compared to switch the polishing slurry when the thickness of the wafer became a predetermined thickness.

[0043]

When the lifetime of the polishing pad was T, the timing of the switching of the polishing agent was classified as an early stage of the polishing pad: $T/5$, a middle stage: $2T/5$ to $4T/5$, an end stage: $4T/5$ to $5T/5$.

The polishing was performed while a ratio of

the polishing stock removal for the polishing slurry before the switching and the polishing slurry after the switching was changed so as to be 2.75:1, 6.5:1, and 14:1 according to the classification of the lifetime of the polishing pad.

[0044]

According to this method, 240 wafers were polished with the identical apparatus, and the flatness of each of the polished surfaces was evaluated by AFS (a capacitance flatness-measuring apparatus made of ADE co.,).

[0045]

(Comparative Example 1)

In FIG. 6, 240 wafers of 720 prepared wafers were polished in the same condition as Example except that the polishing time was made constant without the switching the polishing slurry during polishing and an occurrence of deficiency of the polishing or the over-polishing was not avoided, and the same evaluation was carried out.

[0046]

(Comparative Example 2)

As shown in FIG. 7, the other 240 wafers were polished in the same condition as Example except that the polishing was performed while measuring the thickness of the wafer to achieve a constant target thickness α for the wafer after the polishing and that the polishing slurry was not changed during the polishing, and the same evaluation was carried out.

[0047]

As a result, as shown in FIG. 3(a), it was revealed that the variation of each of the wafers was

small and the polishing was performed with high precision in the wafer polishing method of Example. On the other hand, as shown in FIG. 3(b), each of the polished wafers had the variation of the flatness due to the lifetime of the polishing pad and thereby the polishing was not stably performed in the wafer polishing method of Comparative Example 2. The variation in the wafer polishing method of Comparative Example 1, although this is not shown, was larger than that of Comparative Example 2.

[0048]

As shown in FIG. 4(a), a surface shape of the wafer polished by the wafer polishing method of Example was uniform in a plane, and the outer peripheral sag was removed.

On the other hand, as shown in FIG. 4(b), it was revealed that a surface shape of the wafer polished by the wafer polishing method of Comparative Example 2 had distribution in a plane, and it was not uniformly polished.

[0049]

Here, in Table 1, there is shown a ratio of manufacturing capability to the lifetime of the polishing pad in Example and Comparative Examples when the lifetime of the polishing pad in the wafer polishing method of Comparative Example 2 is 100.

[0050]

(Table 1)

MANUFACTURING CAPABILITY (%)	LIFETIME OF POLISHING PAD		
	EARLY STAGE	MIDDLE STAGE	END STAGE
COMPARATIVE EXAMPLE 1	93	97	89
COMPARATIVE EXAMPLE 2	95	100	84
EXAMPLE 1	103	101	100

[0051]

As shown in Table 1, the wafer polishing method of Example has higher manufacturing capability regardless of the lifetime of the polishing pad in comparison with the case of the middle stage of the lifetime of the polishing pad of Comparative Example 2, and the productivity is increased by 10% in comparison with Comparative Example 2.

On the other hand, it is revealed that both of the manufacturing capability of Comparative Example 1 and 2 are influenced by the lifetime of the polishing pad and are unstable.

[0052]

It is to be noted that the present invention is not restricted to the foregoing embodiment. The embodiment is just an exemplification, and any examples that have substantially the same feature and demonstrate the same functions and effects as those in the technical concept described in claims of the present invention are included in the technical scope of the present invention.

[Brief Explanation of the Drawings]

[0053]

[FIG. 1] FIG. 1 is a view showing an example of a relationship between an elapsed time from the start of polishing the wafer and the thickness of the wafer

in case of switching on the basis of a target thickness, in the wafer polishing method according to the present invention.

[FIG. 2] FIG. 2 is a view showing an another example of a relationship between an elapsed time from the start of polishing the wafer and the thickness of the wafer, in the wafer polishing method according to the present invention.

[FIG. 3] FIG. 3 is a view of comparing the flatness of the wafers polished by the wafer polishing method of Example of the present invention and Comparative Example 2.

[FIG. 4] FIG. 4 is a view showing by a contour line a surface shape of the wafer in Example of the present invention and Comparative Example 2.

[FIG. 5] FIG. 5 is schematic view showing an example of the double-side polishing apparatus which is used in the wafer polishing method of the present invention.

[FIG. 6] FIG. 6 is a view showing an example of a relationship between an elapsed time from the start of polishing the wafer and the thickness of the wafer, in a conventional wafer polishing method.

[FIG. 7] FIG. 7 is a view showing an another example of a relationship between an elapsed time from the start of polishing the wafer and the thickness of the wafer, in a conventional wafer polishing method.

[Explanations of Letters and Numerals]

[0054]

10 ... double-side polishing apparatus

11 ... upper turn table

12 ... lower turn table

13 ... carrier

14 ... window

15 ... polishing-slurry-supply mechanism

16 ... wafer-thickness-measuring mechanism

16a ... optical unit

16b ... photo detector

16c ... laser source unit

16d ... calculation/control unit

17 ... polishing control unit

W ... wafer

(57) [CLAIMS]

[Claim 1]

A wafer polishing method including simultaneously polishing both surfaces of a wafer by pressing and rubbing the wafer, while holding the wafer with: a lower turn table having a flat polishing-upper-surface rotationally driven; an upper turn table having a flat polishing-lower-surface rotationally driven, the upper turn table being arranged with facing to the lower turn table; and a carrier having a wafer-holding hole for holding the wafer, wherein

the polishing is performed while measuring a thickness of the wafer with an optical reflection interferometry by a wavelength-variable-infrared laser through a plurality of openings provided between a rotation center and an edge of the upper turn table,

switching a polishing slurry with a polishing slurry having a different polishing rate during the polishing of the wafer, and

timing of the switching of the polishing slurry is determined on the basis of a lifetime of a polishing pad.

[Claim 2]

The wafer polishing method according to claim 1, wherein the wafer is polished in a batch-wise manner.

[Claim 3]

The wafer polishing method according to claim 1 or claim 2, wherein at least one of a polishing load, a rotation speed of the upper turn table, and a

rotation speed of the lower turn table is changed during the polishing of the wafer on the basis of measured data of the thickness of the wafer.