CLAIMS

1. A wafer polishing method of polishing a wafer with a polishing device, wherein

the polishing device comprises:

a polishing head comprising:

a head main body part,

a first ring-shaped member located below the head main body part, and having an opening,

a plate-shaped member closing the opening on an upper surface side of the first ring-shaped member,

a membrane closing the opening on a lower surface side of the first ring-shaped member, and

a second ring-shaped member located below the membrane, and holding a wafer to be polished; and

a polishing pad with which a lower surface of the wafer to be polished and a lower surface of the second ring-shaped member come in contact at the time of polishing,

a space part formed by closing the opening of the first ring-shaped member by the plate-shaped member and the membrane has a central region and an outer peripheral region partitioned from the central region,

the wafer polishing method comprises:

acquiring in-plane thickness distribution information regarding the wafer to be polished or a wafer subjected to the same processing treatment as that for the wafer to be polished,

determining a difference in pressure between a pressure Pc to be applied to a central part of the wafer to be polished by introducing a gas into the central region and a pressure Pe to be applied to an outer peripheral part of the wafer to be polished by introducing a gas into the outer peripheral region based on the in-plane thickness distribution information,

determining any one pressure of Pc and Pe, and determining the other pressure based on the determined pressure and the difference in pressure,

determining a pressure Pg to be applied from the head main body part downward by pressing the head main body part, based on a set value Pr of a contact pressure to be applied to the lower surface of the second ring-shaped member due to

contact with the polishing pad at the time of polishing, and

with the determined Pg, Pc, and Pe applied thereto, bringing the lower surface of the wafer to be polished into contact with the polishing pad to conduct polishing.

2. The wafer polishing method according to claim 1,

which comprises determining the Pg based on a ratio Pr/Pt of the Pr and a reference value Pt of the contact pressure to be applied to the lower surface of the second ring-shaped member, and a ratio Pe/Pc of the Pe and the Pc.

3. The wafer polishing method according to claim 2,

which further comprises determining the Pg by calculating Pg from a mathematical relation of the ratio Pr/Pt, the ratio Pe/Pc, and the Pg.

4. The wafer polishing method according to claim 3,

wherein the mathematical relation is the following equation A:

(Equation A)

$$Pr/Pt=-R-X(Pe/Pc)+Y(Pg/Pc)+Z((Pe/Pc)-a)((Pg/Pc)-b)$$

in the equation A, R, X, Y, Z, a, and b are each independently a positive number.

5 The wafer polishing method according to any of claims 2 to 4,

wherein the ratio Pr/Pt falls within a range of 0.8 to 1.2.

6. A method of manufacturing a wafer, comprising polishing a surface of a wafer to be polished by the polishing method according to any of claims 1 to 5 to form a polished surface.

7. The method of manufacturing a wafer according to claim 6,

wherein the wafer is a semiconductor wafer.

8. The method of manufacturing a wafer according to claim 7,

wherein the semiconductor wafer is a silicon wafer.

9. A wafer polishing device,

which comprises:

a polishing part; and

a polishing condition determining part,

the polishing part comprising

a polishing head having:

a head main body part,

a first ring-shaped member located below the head main body part, and having an opening,

a plate-shaped member closing the opening on an upper surface side of the first ring-shaped member,

a membrane closing the opening on a lower surface side of the first ring-shaped member, and

a second ring-shaped member located below the membrane, and holding a wafer to be polished; and

a polishing pad with which a lower surface of the wafer to be polished and a lower surface of the second ring-shaped member come in contact at the time of polishing,

a space part formed by closing the opening of the first ring-shaped member by the plate-shaped member and the membrane has a central region and an outer peripheral region partitioned from the central region,

the polishing condition determining part,

determining a difference in pressure between a pressure Pc to be applied to a central part of the wafer to be polished by introducing a gas into the central region and a pressure Pe to be applied to an outer peripheral part of the wafer to be polished by introducing a gas into the outer peripheral region based on in-plane thickness distribution information acquire for a wafer to be polished or a wafer subjected to the same processing treatment as that for the wafer to be polished,

determining any one pressure of Pc and Pe, and determining the other pressure based on the determined pressure and the difference in pressure,

determining a pressure Pg to be applied from the head main body part downward by pressing the head main body part, based on a set value Pr of a contact pressure to be applied to the lower surface of the second ring-shaped member due to contact with the polishing pad at the time of polishing, and

with the determined Pg, Pc, and Pe applied thereto, bringing the lower surface of the wafer to be polished into contact with the polishing pad to conduct polishing.

10. The wafer polishing device according to claim 9,

wherein the polishing condition determining part determines the Pg based on a ratio Pr/Pt of the Pr and a reference value Pt of the contact pressure to be applied to the lower surface of the second ring-shaped member, and a ratio Pe/Pc of the Pe and the Pc~~Pe~~.

11. The wafer polishing device according to claim 10,

wherein the polishing condition determining part determines the Pg by calculating Pg from a mathematical relation of the ratio Pr/Pt, the ratio Pe/Pc, and the Pg.

12. The wafer polishing device according to claim 11,

wherein the mathematical relation is the following equation A:

(Equation A)

$$Pr/Pt=-R-X(Pe/Pc)+Y(Pg/Pc)+Z((Pe/Pc)-a)((Pg/Pc)-b)$$

in the equation A, R, X, Y, Z, a, and b are each independently a positive number.

13. The wafer polishing device according to any of claims 10 to 12,

wherein the ratio Pr/Pt falls within a range of 0.8 to 1.2.

14. The wafer polishing device according to any of claims 9 to 13,

wherein the wafer is a semiconductor wafer.

15. The wafer polishing device according to claim 14,

wherein the semiconductor wafer is a silicon wafer.