The new polishing pad is mounted on the first platen or the second platen. One or more sacrificial wafers are placed in the one or more wafer carriers. A first batch of one or more sacrificial wafers is contacted with the new polishing pad while supplying a first polishing fluid to the new polishing pad in a first polishing operation. The new polishing pad is contacted with a conditioning substrate. A second batch of one or more sacrificial wafers is contacted with the new polishing pad while supplying a second polishing fluid to the new polishing pad in a second polishing operation.

[0008] Yet another aspect of the present disclosure is directed to a method for polishing product substrates in a double-side polishing apparatus having first and second platens and wafer carriers. New polishing pads are mounted on the first and second platens. Sacrificial wafers are placed in the wafer carriers. The sacrificial wafers are contacted with the new polishing pads while supplying a first polishing fluid to the new polishing pads in a first polishing operation. The new polishing pads are contacted with a conditioning substrate. Sacrificial wafers are contacted with the new polishing pads while supplying a second polishing fluid to the new polishing pads in a second polishing operation. Product wafers are placed in the wafer carriers. The product wafers are contacted with the new polishing pads while supplying a third polishing fluid to the new polishing pads in a third polishing operation.

[0009] Various refinements exist of the features noted in relation to the above-mentioned aspects of the present disclosure. Further features may also be

incorporated in the above-mentioned aspects of the present disclosure as well. These refinements and additional features may exist individually or in any combination. For instance, various features discussed below in relation to any of the illustrated embodiments of the present disclosure may be incorporated into any of the above-described aspects of the present disclosure, alone or in any combination.

BRIEF DESCRIPTION OF THE DRAWINGS

[0010] Figure 1 is a schematic cross-section view of a double-side polishing apparatus;

[0011] Figure 2 is a top view of a polishing apparatus showing a lower polishing pad and wafer carriers;

[0012] Figure 3 is a block diagram of an embodiment of the present disclosure;

[0013] Figure 4 is a schematic diagram showing polishing of sacrificial wafers;

[0014] Figure 5 is a top view of the polishing apparatus showing a lower polishing pad and wafer carriers having sacrificial wafers mounted therein;

[0015] Figure 6 is a top view of a conditioning substrate wheel;

[0016] Figure 7 is a detailed top view of the conditioning substrate wheel showing diamonds embedded therein;

In some embodiments of the present disclosure, the first and second polishing pads 120, 128 are each made of polyurethane impregnated polyester felts. In other embodiments, the pads may be polyurethane such as polyurethane using a foaming control technique.

[0027] To polish the substrates 108, the substrates 108 are positioned in a wafer carrier 146 and the substrates 108 and the carrier 146 are positioned within the polisher 102. As shown in Figure 2, a plurality of substrates 108 may be positioned in the wafer carrier 146 (e.g., two, three, four, or five or more). Alternatively or in addition, a plurality of wafer carriers 146 may be positioned between the platens 118, 126 (e.g., two, three, four, or five or more). In the illustrated embodiment, each wafer carrier 146 includes circumferential teeth 122 that engage inner teeth 137 and outer teeth 133 of the wafer polishing apparatus 102.

[0028] Polishing fluid is channeled from the slurry source 106 (Figure 1) to the polishing apparatus 102. Pressure is applied by the first and/or second heads 110, 114. The polishing heads 110, 114 (and consequently the pads 120, 128) are rotated in opposite directions. The wafer carriers 146 also rotate (e.g., through rotation of inner teeth 137 and outer teeth 133 of the wafer polishing apparatus 102). During the polishing operation, a front surface and a back surface of each substrate 108 are polished by double-side polishing. The polishing fluid is discharged from the fluid distribution tubes 124 and is applied to the first polishing pad 120 and falls onto the second polishing pad 128.

[0029] The substrates 108 are polished in one or more polishing cycles. The polishing cycles may occur for about 300 seconds to about 60 minutes and at a pad pressure of from about 150 g/cm^2 to about 700 g/cm^2 with a slurry flow rate of about 50 ml/min to about 300 ml (or from about 75 ml/min to about 125 ml/min). However, it should be understood that other polish times, pad pressures and slurry flow rates may be used without departing from the scope of the present disclosure.

[0030] In accordance with methods of the present disclosure, when the first and/or second polishing pad 120, 128 is new (e.g., a pad that has not been used polish product substrates), the new polishing pad is conditioned before being used to polish product substrates. In some embodiments, both the upper polishing pad 120 and the lower polishing pad 128 is new. In other embodiments, only one of the pads 120, 128 is new. While the figures and embodiments of the present disclosure may be described with respect to conditioning of both polishing pads 120, 128, the methods are also applicable to conditioning a single new polishing pad (i.e., with the other pad not being new).

[0031] To condition the pad, in a first step S_1 (Figure 3) the new pads are mounted to the respective first platen 118 (Figure 1) and second platen 126. Each new pad 120, 128 may be composed of one or more pad segments. For example, each pad 120, 128 may be composed of two segments each shaped as a “half-moon” which together form the respective pad 120, 128. The pads 120, 128 may be mounted by use of an adhesive that bonds the mounting surfaces of the platen and pad together. An adhesive (e.g., glue) may also be used along the seam that runs between the two pad

[0034] As shown in Figure 6, the conditioning substrate 145 may be part of a conditioning substrate wheel 140 which, in the illustrated embodiment, is shaped as an annulus. The conditioning substrate 145 may be disposed on a wheel segment 155 (Figure 7) that is connected (e.g., bolted) to a wheel frame 159. Diamond wheels may be obtained from Shinhan Diamond (Incheon, Korea).

[0035] The conditioning substrate wheel 140 may have circumferential teeth 153 (Figure 6) that engage inner teeth 137 (Figure 5) and the outer teeth 133 of the wafer polishing apparatus 102. The conditioning substrate wheel 140 and wafer carriers 146 (Figure 5) may have the same diameter with the diameter being the distance between the inner teeth 137 (Figure 5) and outer teeth 133 of the wafer polishing apparatus 102. In some embodiments, for every wafer carrier 146 that is removed from the polishing apparatus 102 before use of the conditioning substrate wheel 140, a conditioning substrate wheel 140 (Figure 8) is positioned on the polishing apparatus 102.

[0036] After contacting the new pads 120, 128 with the conditioning substrate 145, a second batch of sacrificial wafers 150 are placed in the wafer carriers 146 in a fourth step S_4 (Figure 3). The sacrificial wafers 150 are contacted with the new polishing pads while supplying a second polishing fluid to the new polishing pads 120, 128 in a second polishing operation. The first and second batches of sacrificial wafers 150 may include the same sacrificial wafers in both polishing operations. In other embodiments, different sacrificial wafers 150 are used in the first and second batches of wafers during the first and second polishing operations. The second polishing operation

may be at least 30 minutes or at least 60 minutes (e.g., from 30 to 180 minutes or from 60 to 120 minutes).

[0037] In some embodiments, after the second polishing operation, a third batch of sacrificial wafers 150 are placed in the wafer carriers 146 and the third batch of wafers are polished while supplying a third polishing fluid to the new polishing pads 120, 128 in a third polishing operation. The third polishing operation may be at least 30 minutes or at least 60 minutes (e.g., from 30 to 180 minutes or from 60 to 120 minutes).

[0038] The first and second polishing fluids (and optional third polishing fluid) that are supplied to the pads 120, 128 in the respective first and second polishing operations may include the same components and/or supply the same components in the same sequence (e.g., slurry comprising silica particles, followed by contact with KOH, followed by deionized water rinse) or different components and polishing fluid sequences may be used.

[0039] In some embodiments, the polishing pads 120, 128 may be contacted with a cleaning brush such as the annular cleaning brush 165 shown in Figure 9. The cleaning brush 165 includes a plurality of bristles on the upper and lower surfaces of the brush 165. The body of the brush 165 may be made of plastic. As shown in Figure 10, the annular cleaning brush 165 may be the same diameter as the first and second platens 118, 126 (i.e., only one cleaning brush 165 is needed for the brushing operation).

[0040] In some embodiments, the new polishing pads 120, 128 are contacted with the annular cleaning brush 165 in a brushing operation with the brushing operation

CLAIMS:

1. A method for conditioning new polishing pads in a double-side polishing apparatus having first and second platens and wafer carriers, the method comprising:

mounting the new polishing pads on the first and second platens;

placing sacrificial wafers in the wafer carriers;

contacting the sacrificial wafers with the new polishing pads while supplying a first polishing fluid to the new polishing pads in a first polishing operation;

contacting the new polishing pads with a conditioning substrate; and

contacting sacrificial wafers with the new polishing pads while supplying a second polishing fluid to the new polishing pads in a second polishing operation.

2. The method as set forth in claim 1 wherein the conditioning substrate comprises diamonds.

3. The method as set forth in claim 2 wherein the conditioning substrate is part of a conditioning substrate wheel, the conditioning substrate wheel being an annulus.

4. The method as set forth in claim 3 wherein:

each wafer carrier comprises circumferential teeth for rotating the wafer carrier during the first and second polishing operations; and

each conditioning substrate wheel comprises circumferential teeth for rotating the conditioning substrate wheel, the wafer carriers and conditioning substrate wheels having the same diameter.

5. The method as set forth in claim 4 comprising;

removing the wafer carriers from the polishing apparatus after the first polishing operation; and

positioning one conditioning substrate wheel on the polishing apparatus for every wafer carrier removed from the polishing apparatus.

6. The method as set forth in any one of claims 1 to 5 comprising contacting the new polishing pads with an annular cleaning brush in a brushing operation, the brushing operation being prior to the second polishing operation.

7. The method as set forth in claim 6 wherein the brushing operation is a second brushing operation, the method comprising contacting the new polishing pads with an annular cleaning brush in a first brushing operation, the first brushing operation being prior to the first polishing operation.

8. The method as set forth in claim 7 wherein the same polishing brush is used in the first brushing operation and the second brushing operation.

9. The method as set forth in any one of claims 1 to 8 wherein the same sacrificial wafers are used in the first polishing operation and the second polishing operation.

10. The method as set forth in any one of claims 1 to 8 wherein different sacrificial wafers are used in the first polishing operation and the second polishing operation, the sacrificial wafers contacted with the new

polishing pads in the first polishing operation being a first batch of sacrificial wafers, the method comprising placing a second batch of sacrificial wafers in the wafer carriers prior to the second polishing operation.

11. The method as set forth in any one of claims 1 to 10 wherein the first and second polishing fluids have the same composition.

12. The method as set forth in any one of claims 1 to 11 wherein the polishing pads are made of polyurethane impregnated polyester felts.

13. The method as set forth in any one of claims 1 to 11 wherein the polishing pads are made of polyurethane.

14. A method for conditioning a new polishing pad in a double-side polishing apparatus having first and second platens and one or more wafer carriers, the method comprising:

mounting the new polishing pad on the first platen or the second platen;

placing one or more sacrificial wafers in the one or more wafer carriers;

contacting a first batch of one or more sacrificial wafers with the new polishing pad while supplying a first polishing fluid to the new polishing pad in a first polishing operation;

contacting the new polishing pad with a conditioning substrate; and

contacting a second batch of one or more sacrificial wafers with the new polishing pad while

supplying a second polishing fluid to the new polishing pad in a second polishing operation.

15. The method as set forth in claim 14 wherein the conditioning substrate comprises diamonds.

16. The method as set forth in claim 15 wherein the conditioning substrate is part of a conditioning substrate wheel, the conditioning substrate wheel being an annulus.

17. The method as set forth in any one of claims 14 to 16 comprising contacting the new polishing pad with an annular cleaning brush in a brushing operation, the brushing operation being prior to the second polishing operation.

18. The method as set forth in claim 17 wherein the brushing operation is a second brushing operation, the method comprising contacting the new polishing pad with an annular cleaning brush in a first brushing operation, the first brushing operation being prior to the first polishing operation.

19. The method as set forth in claim 18 wherein the same polishing brush is used in the first brushing operation and the second brushing operation.

20. The method as set forth in any one of claims 14 to 19 wherein the first and second polishing fluids have the same composition.

21. The method as set forth in any one of claims 14 to 20 wherein the polishing pads are made of polyurethane impregnated polyester felts.

22. The method as set forth in any one of claims 14 to 20 wherein the polishing pads are made of polyurethane.

23. A method for polishing product substrates in a double-side polishing apparatus having first and second platens and wafer carriers, the method comprising:

mounting new polishing pads on the first and second platens;

placing sacrificial wafers in the wafer carriers;

contacting the sacrificial wafers with the new polishing pads while supplying a first polishing fluid to the new polishing pads in a first polishing operation;

contacting the new polishing pads with a conditioning substrate;

contacting sacrificial wafers with the new polishing pads while supplying a second polishing fluid to the new polishing pads in a second polishing operation;

placing product wafers in the wafer carriers; and

contacting the product wafers with the new polishing pads while supplying a third polishing fluid to the new polishing pads in a third polishing operation.

24. The method as set forth in claim 23 wherein the conditioning substrate comprises diamonds.

25. The method as set forth in claim 23 or claim 24 comprising contacting the new polishing pads with an annular cleaning brush in a brushing operation, the brushing operation being prior to the second polishing operation.

26. The method as set forth in claim 25 wherein the brushing operation is a second brushing operation, the method comprising contacting the new polishing pads with an annular cleaning brush in a first brushing operation, the first brushing operation being prior to the first polishing operation.

27. The method as set forth in any one of claims 23 to 26 wherein the polishing pads are made of polyurethane impregnated polyester felts.

28. The method as set forth in any one of claims 23 to 26 wherein the polishing pads are made of polyurethane.