

METHODS FOR CONDITIONING POLISHING PADS

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application claims the benefit of U.S. Provisional Patent Application No. 63/583,719, filed 19 September 2023, which is incorporated herein by reference in its entirety.

TECHNICAL FIELD

[0002] The field of the disclosure relates to methods for breaking-in new polishing pads of a double-side polishing apparatus for polishing single crystal silicon wafers.

BACKGROUND

[0003] Single crystal silicon wafers may be polished on a double-side polishing apparatus in which upper and lower polishing pads are pressed against the wafers mounted in the polishing apparatus. During polishing, the polishing pads and wafers (i.e., wafer carriers which secure the wafers) are rotated while supplying an abrasive slurry to the polishing pads. When the polishing pads become worn, new pads are installed on the wafer polishing apparatus. New polishing pads cause poor wafer flatness. New pads may be broken-in before use which improves wafer flatness when the pads are first used for polishing. Conventional methods for breaking-in new pads involve lengthy down-time for breaking-in the pads and result in poor wafer flatness when the pads are first used for polishing product wafers.

[0004] A need exists for new methods for breaking-in new polishing pads and for methods that reduce the break-in period and that improve wafer flatness.

[0005] This section is intended to introduce the reader to various aspects of art that may be related to various aspects of the disclosure, which are described and/or claimed below. This discussion is believed to be helpful in providing the reader with background information to facilitate a better understanding of the various aspects of the present disclosure. Accordingly, it should be understood that these statements are to be read in this light, and not as admissions of prior art.

SUMMARY

[0006] One aspect of the present disclosure is directed to a method for conditioning new polishing pads in a double-side polishing apparatus having first and second platens and wafer carriers. The 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.

[0007] Another aspect of the present disclosure is directed to 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 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 substates 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 surficial 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;

[0017] Figure 8 is a top view of the polishing apparatus showing a lower polishing pad and conditioning substrate wheels;

[0018] Figure 9 is a perspective view of an annular cleaning brush;

[0019] Figure 10 is a top view of the polishing apparatus showing a lower polishing pad before mounting the annular cleaning brush within the polishing apparatus;

[0020] Figure 11 is a graph showing flatness of wafers polished by new polishing pads broken-in by a conventional method; and

[0021] Figure 12 is a graph showing wafer flatness of wafers polished by new polishing pads broken-in by a method of the present disclosure.

[0022] Corresponding reference characters indicate corresponding parts throughout the drawings.

DETAILED DESCRIPTION

[0023] Provisions of the present disclosure relate to methods for conditioning new polishing pads for polishing silicon substrates in a double-side polishing apparatus. Suitable substrates (which may also be referenced herein as semiconductor "wafers" or "structures") include single crystal silicon substrates including substrates obtained by slicing the wafers from ingots formed by the Czochralski process. Each substrate includes a central axis, a front surface and a back surface parallel to the front surface. The front and back surfaces

are generally perpendicular to the central axis. A circumferential edge joins the front and back surfaces and a radius extends from the central axis to the circumferential edge. The structures polished according to methods of the present disclosure may be any diameter suitable for use by those of skill in the art including, for example, 200 mm, 300 mm, greater than 300 mm or even 450 mm diameter wafers.

[0024] An example double-side polishing apparatus 102 (or more simply "polishing apparatus") is shown in Figure 1. The polishing apparatus 102 polishes a plurality of silicon substrates 108. The polishing apparatus 102 is connected to a slurry source 106 which provides a slurry to the polishing apparatus 102 during the polishing process. The polishing apparatus 102 polishes the front surface and the back surface of the structure. In some embodiments, the polish is a "rough" polish that reduces the surface roughness of the wafer to less than about 3.5 Å to even as low as about 2.5 Å or even about 2 Å as measured with an atomic force microscope (AFM) at scan sizes of about 1 μm x about 1 μm to about 100 μm x about 100 μm. Rough polishing typically results in removal of about 1 μm to about 20 μm and, more typically, from about 5 μm to about 15 μm of material from each surface of the wafer.

[0025] The polishing apparatus 102 includes a first polishing head (or "upper" polishing head) 110 attached to a first shaft 112 and a second polishing head (or "lower" polishing head) 114 attached to a second shaft 116. The first shaft 112 rotates the first polishing head 110 and the second shaft 116 rotates the second polishing

head 114. The first polishing head 110 includes a first platen (or "upper" platen) 118 and a first polishing pad (or "upper" polishing pad) 120 attached to the first platen 118. Similarly, the second polishing head 114 includes a second platen (or "lower" platen) 126 and a second polishing pad (or "lower" polishing pad) 128 attached to the second platen 126. One or more fluid distribution tubes 124 apply polishing fluid to the first polishing pad 120 and the second polishing pad 128.

[0026] The polishing apparatus 102 is a double-side polisher that rough or finish polishes the substrates 108. The polish may be achieved by, for example, chemical-mechanical planarization (CMP). CMP typically involves contacting the substrate 108 with an abrasive slurry supplied by the slurry source 106 and polishing the wafer by the first and second polishing pads 120, 128. Through a combination of chemical and mechanical action the surface of the substrate 108 is smoothed. Typically the polish is performed until a chemical and thermal steady state is achieved and until the substrates 108 have achieved their targeted shape and flatness. The polish may be performed on a double-side polisher commercially available from Peter Wolters (e.g., AC2000 polisher; Rendsburg, Germany), Fujikoshi (Tokyo, Japan), or Speedfam (Kanagawa, Japan). Stock removal pads for silicon polishing are available from Psiloquest (Orlando, Florida) and Dow Chemical Company (Midland, Michigan) and silica based slurries may be purchased from Dow Chemical Company, Cabot (Boston, Massachusetts), Nalco (Naperville, Illinois), Bayer MaterialScience (Leverkusen, Germany), DA NanoMaterials (Tempe, Arizona) and Fujimi (Kiyoso, Japan).

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 on 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/cm² to about 700 g/cm² 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 S₁ (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

segments of each pad. Once mounted, the pads 120, 128 may be pressed together to help adhere the pads 120, 128 to the platens 118, 126 (e.g., from 30 minutes to two hours).

[0032] Referring now to Figure 4-5, after mounting the pads 120, 128, a first batch of sacrificial wafers 150 (e.g., wafers which are not intended as product wafers) are placed in the wafer carriers 146 in a second step S_2 (Figure 3) in a first polishing operation. The sacrificial wafers 150 are contacted with the new polishing pad(s) 120, 128 (i.e., the first and second pads 120, 128 are rotated while rotating the wafer carriers 146) while a first polishing fluid is supplied to the new polishing pads 120, 128. The first polishing fluid may be supplied in various steps in which the polishing slurry comprises different components. In some embodiments, in at least one step of adding polishing slurry, the polishing slurry comprises silica particles. In some embodiments, an oxide such as potassium hydroxide (KOH) is added after the polishing slurry is used (e.g., KOH plus deionized water). The last step of adding the polishing fluid may involve rinsing with deionized water. The first polishing operation may be at least 10 minutes or at least 25 minutes (e.g., from 10 to 90 minutes or from 20 to 60 minutes).

[0033] In a third step S_3 , the new polishing pads 120, 128 are conditioned by contacting the new polishing pads with a conditioning substrate 145 (Figure 6). The conditioning substrate 145 may comprise diamonds 149 (Figure 7). The diamonds may be electroplated on the substrate 145.

[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 S₄ (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 bush 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 bush 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

being prior to the second polishing operation of step S₄. In addition to this brushing operation (which may be referred to herein as a "second" brushing operation), in a first brushing operation, the new polishing pads 120, 128 are contacted with the annular cleaning brush 165 prior to the first polishing operation of step S₁ (e.g., with the same brush 165 being used in both steps). Commercial cleaning brushes may be obtained from Lapmaster Wolters (Mt. Prospect, Illinois). The length of the first and second brushing operation may each be at least 1 minute or at least 5 minutes (e.g., from 1 to 30 minutes or from 5 to 20 minutes).

[0041] Once the polishing pads have been conditioned, the conditioned new pads may be used to polish product wafers (i.e., wafers intended for sale and/or for electronic device manufacturing). The product wafers are placed in the wafer carriers 146 that are positioned in the polishing apparatus 102. The product wafers are contacted with the conditioned new polishing pads while supplying a third polishing fluid to the new polishing pads in a third polishing operation. The third polishing fluid may be the same or different than the first and second polishing fluids used to condition the new polishing pads. The third polishing fluid may contain abrasive particles such as silica particles. The conditioned new pads may be used to polish product wafers in additional cycles until the conditioned new pads become worn.

[0042] Compared to conventional methods for preparing new polishing pads for polishing product substrates, the methods of the present disclosure have several advantages. By conditioning the new polishing pads,

the "dry run" process in which the pads are pressed together and run under a dry condition (e.g., no slurry, caustic or deionized water) of conventional methods may be eliminated. Conditioning allows the total break-in time to be reduced by at least 60 minutes, at least 90 minutes or at least 120 minutes compared to conventional methods. The new method reduces flatness (SFQR) "out of control" ("OOC") rate which increases throughput by increasing the number of in-spec silicon wafers.

EXAMPLES

[0043] The processes of the present disclosure are further illustrated by the following Examples. These Examples should not be viewed in a limiting sense.

Example 1: Improvement in Wafer Flatness by Conditioning New Polishing Pads

[0044] A first series of wafers (300 mm) were polished after a conventional break-in process. The break-in process included:

- attaching a new lower pad (two section half-moon) to the lower platen by adhesive;
- attaching a new upper pad (two section half-moon) to the upper platen by adhesive;
- pressing the upper pad and lower pad together;
- sealing the two sections of the upper pad together by glue and sealing the two sections of the lower pad together by glue;
- flushing the new pads with deionized water;

- cleaning the new pads with an annular cleaning brush;
- dry pad process (pads pressed together and rotated without fluid);
- polishing a first batch of sacrificial wafers while applying a first polishing slurry in a first polishing operation; and
- polishing a second batch of sacrificial wafers while applying a second polishing slurry in a second polishing operation.

[0045] A second series of wafers (300 mm) were polished after a break-in process of the present disclosure. The break-in process included:

- attaching a new lower pad (two section half-moon) to the lower platen by adhesive;
- attaching a new upper pad (two section half-moon) to the upper platen by adhesive;
- pressing the upper pad and lower pad together;
- sealing the two sections of the upper pad together by glue and sealing the two sections of the lower pad together by glue;
- flushing the new pads with deionized water;
- cleaning the new pads with an annular cleaning brush in a first brushing operation;

- polishing a first batch of sacrificial wafers while applying a first polishing slurry in a first polishing operation;
- conditioning the pads with a diamond substrate;
- cleaning the new pads with the annular cleaning brush in a second brushing operation;
- polishing a second batch of sacrificial wafers while applying a second polishing slurry in a second polishing operation; and
- polishing a third batch of sacrificial wafers while applying a third polishing slurry in a third polishing operation.

[0046] Figure 11 shows the average wafer flatness for the conventional break-in method and Figure 12 shows the average flatness of the new break-in method described above. As shown in Figures 11-12, the new break-in process increases wafer flatness relative to the conventional process. The new process also reduced the break-in time by 120 minutes and reduced tool idle time for pad reconditioning (240 minutes).

[0047] As used herein, the terms "about," "substantially," "essentially" and "approximately" when used in conjunction with ranges of dimensions, concentrations, temperatures or other physical or chemical properties or characteristics is meant to cover variations that may exist in the upper and/or lower limits of the ranges of the properties or characteristics, including, for

example, variations resulting from rounding, measurement methodology or other statistical variation.

[0048] When introducing elements of the present disclosure or the embodiment(s) thereof, the articles "a," "an," "the," and "said" are intended to mean that there are one or more of the elements. The terms "comprising," "including," "containing," and "having" are intended to be inclusive and mean that there may be additional elements other than the listed elements. The use of terms indicating a particular orientation (e.g., "top," "bottom," "side," etc.) is for convenience of description and does not require any particular orientation of the item described.

[0049] As various changes could be made in the above constructions and methods without departing from the scope of the disclosure, it is intended that all matter contained in the above description and shown in the accompanying drawing[s] shall be interpreted as illustrative and not in a limiting sense.

WHAT IS CLAIMED IS:

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 substates 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.