METHODS AND APPARATUS FOR
POLISHING AN EDGE AND/OR NOTCH OF A
SUBSTRATE

Inventors: Gary C. Ettinger, Cupertino, CA (US); Paul D. Butterfield, San Jose, CA (US); Antoine P. Manens, Sunnyvale, CA (US); Sen-Hou Ko, Sunnyvale, CA (US)

Correspondence Address:
DUGAN & DUGAN, PC
245 Saw Mill River Road, Suite 309
Hawthorne, NY 10532 (US)

Assignee: Applied Materials, Inc., Santa Clara, CA (US)

Applic. No.: 12/258,242

Filed: Oct. 24, 2008

Publication Classification

Int. Cl. B24B 21/00 (2006.01)

U.S. Cl. 451/303

ABSTRACT

Apparatus and methods are provided to polish a substrate. In some aspects, the invention includes a polishing head adapted to apply a polishing tape against at least one of a substrate edge and a notch in the substrate edge. The polishing head includes a polisher coupled to the polishing head, wherein the polisher has a hollow portion and is adapted to conform to a shape of at least one of the substrate edge and the notch. Numerous other aspects are provided.
S802 Secure Substrate on Support
S804 Press Polishing Tape Against the Substrate with a Hollow Polishing Pad
S806 Advance Polishing Tape
S808 Rotate Polishing Head About the Substrate
S810 Monitor the Substrate Polishing

FIG. 8
METHODS AND APPARATUS FOR POLISHING AN EDGE AND/OR NOTCH OF A SUBSTRATE

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] The present application is related to the following commonly-assigned, co-pending U.S. patent applications, each of which is hereby incorporated herein by reference in its entirety for all purposes:


FIELD OF THE INVENTION

[0006] The present invention relates generally to substrate processing, and more particularly to methods and apparatus for cleaning an edge of a substrate, and/or a notch in an edge of the substrate.

BACKGROUND OF THE INVENTION

[0007] During processing of substrates for electronic device manufacturing, a film and/or flakes (“contaminants”) may be deposited on the surface of the substrate. However, the presence of the contaminants on portions of the substrate, including an edge and/or a notch in the edge of the substrate, may be undesirable as it may negatively affect device fabrication on the substrate. Conventional systems, which contact a substrate edge and/or notch with an abrasive film or tape to clean the substrate edge and/or notch, may not be able to contact all parts of the substrate edge and/or notch and therefore may not be able to thoroughly clean the substrate edge and/or notch to remove the contaminants. The inability to sufficiently clean the substrate may affect electronic device manufacturing throughput. Accordingly improved methods and apparatus for cleaning an edge and notch of a substrate are desired.

SUMMARY OF THE INVENTION

[0008] In some aspects of the invention, an apparatus for polishing a substrate is provided. The apparatus includes a polishing head adapted to apply a polishing tape against at least one of a substrate edge and a notch in the substrate edge. The polishing head includes a polishing pad coupled to the polishing head, wherein the polishing pad has a hollow portion and is adapted to conform to a shape of at least one of the substrate edge and the notch.

[0009] In other aspects of the invention, a system for polishing a substrate is provided. The system includes a substrate support adapted to rotate a substrate; a polishing head adapted to apply a polishing tape against at least one of a substrate edge and a notch in the substrate edge. The polishing head includes a polishing pad coupled to the polishing head, wherein the polishing pad has a hollow portion and is adapted to conform to a shape of at least one of the substrate edge and the notch. The system also includes a controller adapted to operate the rotation of the substrate and the polishing head.

[0010] In yet other aspects of the invention, a method for polishing a substrate is provided. The method includes (1) securing a substrate on a support; (2) pressing a polishing tape against at least one of a substrate edge and a notch with a hollow polishing pad; (3) advancing the polishing tape as the polishing tape is pressed against the notch; and (4) monitoring the polishing process.

[0011] Other features and aspects of the present invention will become more fully apparent from the following detailed description, the appended claim and the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0012] FIG. 1 is a schematic illustration of a cross-section of a portion of a substrate.

[0013] FIG. 2 is a schematic plan view of an embodiment of a system for polishing parts of a substrate, including major surfaces, edge, bevel, and notch in accordance with the present invention.

[0014] FIG. 3 is a schematic perspective view of an embodiment of a polishing apparatus for in accordance with the present invention.

[0015] FIG. 4 is a schematic illustration of part of a substrate, including a substrate notch.

[0016] FIG. 5 is a schematic illustration of an example embodiment of a polishing pad in accordance with the present invention.

[0017] FIG. 6 is a block diagram of an example embodiment of a system for polishing parts of a substrate in accordance with the present invention.

[0018] FIG. 7 is a schematic perspective view of another example embodiment of a polishing pad in accordance with the present invention.

[0019] FIG. 8 is a flow chart describing an exemplary method for polishing a substrate in accordance with the present invention.

DETAILED DESCRIPTION

[0020] Substrates used in semiconductor processing often have films and/or surface defects which it is helpful to remove prior to subsequent processing steps. These films and defects may occur on the edge of a substrate, including notches formed thereon.

[0021] In some embodiments, the present invention provides apparatus and methods that effectively adapt to various shapes and profiles of different substrate edges and notches, ensuring good contact of a polishing or abrasive film or tape with all sections of a substrate edge and/or notch region. In one or more embodiments, a hollow polisher is provided. The polisher may be adapted to press a moving polishing tape against the substrate edge and/or notch. The hollow portion or the polisher may be selectively filled or inflated with a fluid, which may allow the polisher to substantially conform to a desired shape, such as the shape of the edge and/or notch of
the substrate, such that the polishing tape may contact and polish substantially all portions of the edge and/or notch of the substrate.

[0022] Turning to FIG. 1, a substrate 100 may include two major surfaces 102, 102' and an edge 104. Each major surface 102, 102' of the substrate 100 may include a device region 106, 106' and an exclusion region 108, 108'. (Typically however, only one of the two major surfaces 102, 102' will include a device region and an exclusion region.) The exclusion regions 108, 108' may serve as buffers between the device regions 106, 106' and the edge 104. The edge 104 of the substrate 100 may include an outer edge 110 and bevels 112, 114. The bevels 112, 114 may be located between the outer edge 110 and the exclusion regions 108, 108' of the two major surfaces 102, 102'. A notch 116 may be located in the outer edge 110 of the substrate 100. In some embodiments, the present invention may be adapted for use with a system adapted to clean and/or polish the outer edge 110 and at least one bevel 112, 114 of the substrate 100 without affecting the device regions 106, 106'. In some embodiments, all or part of the exclusion regions 108, 108' may be cleaned or polished as well.

[0023] FIG. 2 is a schematic plan view of an embodiment of a system 200 for polishing parts of the substrate 100, including the major surfaces 102, 102', the edge 104, and the notch 116. The system 200 includes three polishing apparatuses 202, each including a polishing head 204. However, any number and type of apparatus 202:heads 204 may be used in any practicable combination. In addition, in such multi-head embodiments, each head 204 may use a differently configured or type of a polishing tape (e.g., different grits, materials, tensions, pressures, etc.) to contact and polish the substrate edge 104 and/or notch 116. Any number of heads 204 may be used concurrently, individually, and/or in any sequence. The heads 204 may be disposed in different positions and/or in different orientations (e.g., aligned with the substrate edge 104 and/or notch 116, normal to the substrate edge 104 and/or notch 116, angled relative to the substrate edge 104 and/or notch 116, etc.) to allow polishing tape, pushed by a polisher in some embodiments (FIG. 3), to polish different portions of the substrate edge 104 and/or notch 116.

[0024] In some embodiments, one or more of the heads 204 may be adapted to be oscillated or moved (e.g., pivoted or angularly translated about a tangential axis of the substrate 102 and/or circumferentially relative to the substrate 102) around or along the substrate edge 104 and/or notch 116 so as to polish different portions of the substrate edge 104 and/or notch 116. In some embodiments, one or more of the heads 204 may be adapted to continuously or intermittently oscillate between the various positions. Alternatively, one or more of the heads 204 may be fixed and/or only adjusted while the substrate 102 is not being rotated. In yet other embodiments, the substrate 102 may be held fixed while one or more of the heads 204 oscillate (as described above) as well as rotate circumferentially around the substrate 102. This movement may be under the direction of a programmed or user operated controller 206, described below. Different heads 204 may be used for different substrates 102 or different types of substrates 102.

[0025] As described above, the system 200 may further include the controller 206, (e.g., a programmed computer, a programmed processor, a microcontroller, a gate array, a logic circuit, an embedded real time processor, etc.), which may control the driver(s) used to rotate the substrate 102 and/or the actuator(s) used to push a polisher (FIG. 3) against the substrate edge 104 and/or notch 116. Note that the controller 206 may be coupled (e.g., electrically, mechanically, pneumatically, hydraulically, etc.) to each of a plurality of actuators. Likewise, the controller 206 may be adapted to receive feedback signals from one or more drivers and/or actuators, that indicate the amount of energy being exerted to rotate the substrate 102 (e.g., rotate a vacuum chuck holding the substrate 102) and/or actuate the actuator(s) to push the polisher against the substrate edge 104 and/or notch 116. As described further below, these feedback signals may be employed to determine when a particular layer of film has been removed from the substrate edge 104 and/or notch 116 and/or whether a sufficient amount of substrate polishing has occurred.

[0026] As mentioned above, substrate polishing may be performed using one or more polishing apparatuses 202. In one or more embodiments, a plurality of polishing apparatuses 202 may be employed, in which each polishing apparatus 202 may have similar or different characteristics and/or mechanisms. In the latter case, particular polishing apparatuses 202 may be employed for specific operations. For example, one or more polishing apparatuses 202 may be adapted to perform relatively rough polishing and/or adjustments while another one or more polishing apparatus 202 may be adapted to perform relatively fine polishing and/or adjustments. Polishing apparatuses 202 may be used in sequence so that, for example, a rough polishing procedure may be performed initially and a fine polishing procedure may be employed subsequently as needed or according to a polishing recipe. The plurality of polishing apparatuses 202 may be located in a single chamber or module, as shown herein, or alternatively, one or more polishing apparatuses 202 may be located in separate chambers or modules. Where multiple chambers are employed, a robot or another type of transfer mechanism may be employed to move substrates between the chambers so that polishing apparatuses 202 in the separate chambers may be used in series or otherwise.

[0027] Substrate [edge/notch] polishing may be performed using one or more polishing apparatuses 202. In one or more embodiments, a plurality of polishing apparatuses 202 may be employed, in which each polishing apparatus 202 may have similar or different characteristics and/or mechanisms. In the latter case, particular polishing apparatuses 202 may be employed for specific operations. For example, one or more of a plurality of polishing apparatuses 202 may be adapted to perform relatively rough polishing and/or adjustments while another one or more of the plurality of polishing apparatus 202 may be adapted to perform relatively fine polishing and/or adjustments. Polishing apparatuses 202 may be used in sequence so that, for example, a rough polishing procedure may be performed initially and a fine polishing procedure may be employed subsequently to make adjustments to a relatively rough polish as needed or according to a polishing recipe. The plurality of polishing apparatuses 202 may be located in a single chamber or module, as shown herein, or alternatively, one or more polishing apparatuses 202 may be located in separate chambers or modules. Where multiple chambers are employed, a robot or another type of transfer mechanism may be employed to move substrates between the chambers so that polishing apparatuses 202 in the separate chambers may be used in series or otherwise.
FIG. 3 is a schematic perspective view of an embodiment of a polishing apparatus 300 for polishing a substrate edge 104 and/or notch 116. The polishing apparatus 300 may include a substrate driver 302 (e.g., a servomotor, gear, belt, chain, etc.), which may be mounted on a pedestal 304. A support 306 (e.g., a vacuum chuck) may be coupled (e.g., rigidly) to a shaft (not shown) of the substrate driver 302. The support 306 may support the substrate 100, for example. The substrate driver 302 may rotate the substrate 100, via the support 306, about a center 308 of the substrate 100 or another suitable axis. The substrate driver 302 may be connected to a substrate driver control unit, such as the controller 206 (FIG. 2), for example, which may control the angular displacement, angular velocity, and angular acceleration of the substrate 100. The polishing apparatus 300 may further include a polishing arm 310 aligned in the horizontal plane approximately tangential to the substrate edge 104 and supported by a frame 312. The frame 312 may be coupled at one end to a polishing head driver 309. In other embodiments, the polishing arm 310 may be aligned differently, for example, vertically or at an angle with respect to the horizontal plane. The polishing arm 310 may include a polishing head section 314 ('head'). The polishing head 314 may include a polisher 316. The polisher 316 may be selectively shaped to correspond to the shape of the substrate edge 104 and/or notch 116, described further below. The polisher 316 may be relatively or substantially planar in shape, as shown herein, or the polisher 316 may be wheel or roller-shaped, for example. Any other suitable shape may be used. Polishing tape 318, may wrap around the polishing head 314, and guide rollers 320, 322 and over the polisher 316, and be tensioned between supply and take-up spools 324, 326. The supply and take-up spools 324, 326 may be driven by supply and take-up spool drivers 328, 330 (e.g., servomotors), respectively. The supply and take-up spool drivers 328, 330, may be moved continuously or indexed to precisely control the amount of the polishing tape 318 that is advanced over the polishing head 314 from, for example, the supply and take-up spools 324, 326, in order to polish the substrate edge 104 and/or notch 116. The substrate 100 may rotate in the xy plane. While the polishing tape 318 is shown to advance in a longitudinal direction in the plus or minus x-direction, in other embodiments, the polishing tape 318 may advance in a longitudinal direction the plus or minus y-direction.

In one or more embodiments, the polishing tape 318 may be made from many different materials, such as aluminum oxide, silicon oxide, silicon carbide, etc. Other materials may also be used. In some embodiments, abrasives used may range, for example, from about 0.1 micron up to about 10 microns in size or, for example, 0.5 microns to 3 microns in size, although other sizes may be used. Different widths of polishing tape 318 ranging from about 0.55 inch to about 1.5 inches may be used, although other polishing tape widths may be used. In one or more embodiments, the polishing tape 318 may be about 0.002 to about 0.02 inches thick and withstand about 1 to 5 lbs. in tension. Other polishing tapes having different thicknesses and tensile strengths may be used. The supply and take-up spools 324, 326 may have a diameter of approximately 3 inches and be capable of holding about 30,000 inches of polishing tape 318, or may have a diameter of approximately 1 inch and be capable of holding about 500 inches of polishing tape 318. Other spool dimensions may be used. The supply and take-up spools 324, 326 may be constructed from materials such as nylon, polyurethane, polyvinyl difluoride (PVDF), etc. Other materials may also be used.

With reference to FIG. 4, a part of the substrate 100 containing the notch 116 is schematically illustrated, not to scale. The notch 116 may include one or more notch sides 400. The notch 116 may also include a first notch corner or node 402 and a second notch corner or node 404. Each notch corner 402, 404 may be positioned at the intersection of the notch side 400 and the outer perimeter of the substrate 100. The notch 116 may further include a notch center 406, positioned at the intersection of the one or more notch sides 400. The notch center 406 may be used to align the substrate 100 during processing. As is apparent from the figure, the notch 116 may exhibit large changes in curvature as it is traced from the first notch corner 402 to the second notch corner 404, via the notch sides 400 and notch center 406. For reasons, it is advantageous to maintain consistent contact between the polishing tape 318 and all regions of the notch 116 indicated above during polishing.

Turning to FIGS. 5A and 5B, a schematic perspective view of an example embodiment of a polisher 500 (FIG. 5A) and a cross section of the polisher 500 (FIG. 5B) are provided in accordance with the present invention. The polisher 500 may include a hollow portion 502 therein, shown in FIG. 5B. The hollow portion 502 may be selectively filled with a fluid, such as pressure controlled air, N₂, and deionized water, for example. Other suitable fluids may be used. The polisher 500 may also include one or more fluid ports 504 adapted to couple the hollow portion 502 to a fluid supply 506 (FIG. 6). A valve 508 (FIG. 6) may be coupled to the fluid port 504, and the valve 508 may be adapted to selectively control the flow of fluid from the fluid supply 506 to the hollow portion 502 of the polisher 500. The polisher 500 may be selectively filled to conform itself (and the polishing tape 318) to the substrate edge 104 and/or notch 116. For example, the polisher 500 may be filled such that it remains pliable as the polisher 500 presses the polishing tape 318 against the substrate edge 104 and/or notch 116. The polisher 500, and hence the polishing tape 318, may then conform to the shape of the substrate edge 104 and/or notch 116 under the applied pressure. In this manner, the polishing tape 318 may form a tight contact with the substrate edge 104 and/or notch 116 and provide effective polishing. In some embodiments, the polisher 500 may include a notch portion 510 (not shown to scale) that may more easily conform to the shape of the notch 116.

In some embodiments, a fluid monitor or sensor 512 may be coupled to the valve 508. The fluid sensor 512 may sense pressure applied by the polisher 500 caused by the force of the pressure of the fluid in the hollow portion 502 of the polisher 500. The fluid sensor 512 may be coupled to the controller 206, for example, such that the controller 206 may receive feedback from the fluid sensor 512 indicative of the amount of pressure exerted by the fluid in the hollow portion 502. The controller 206 may then change or adjust the flow of fluid into/out of the polisher 500 during the polishing process to adjust the pressure applied by the polisher 500 based on a desired polishing effect. This selectively adjustable pressure may be useful because as the polishing head 314 pivots about
the substrate edge 104 and/or notch 116, the amount of film on the substrate edge 104 and/or notch 116 may change, due, for example, to different locations and different film profiles. As such, it may be desirable to adjust the amount of pressure applied during the polishing process.

[0033] Additionally, filling the polisher pad 500 may have the advantage of allowing precise control of the pressure applied to the film deposited on the substrate edge 104 and/or notch 116. The pressure measurement may also be helpful in tracking the film removed from the substrate edge 104 and/or notch 116. For example, if the applied pressure is set to a particular amount, as the film is removed from the substrate edge 104 and/or notch 116, the applied pressure may increase to maintain the pre-set level. The change in pressure may be indicative that a pre-set amount of film has been removed from the substrate edge 104 and/or notch 116.

[0034] In alternate embodiments, a wheel-shaped polisher 700 (FIG. 7) may be used. Any suitably shaped polisher may be used. The wheel-shaped polisher 700 may be coupled to the polishing head 314 with a low friction bearing (not shown), for example. The low friction bearing may allow the polisher 700 to rotate more easily than if a low friction bearing had not been used. The relative ease of rotation of the polisher 700 may provide less friction to polishing tape 318 when the polishing tape 318 is advancing during polishing processes. The decreased friction may provide for a more consistent tension in the polishing tape 318. In embodiments with higher or increased friction, more torque may be needed to advance the polishing tape 318, which in turn may place a greater tension on the polishing tape 318. The greater tension on the polishing tape 318 may, for example, deform and/or stretch the polishing tape 318, which may negatively affect the polishing performance of the polishing tape 318.

[0035] Turning to FIG. 8 a flow chart depicting an exemplary method 800 for polishing the substrate 100 is provided. In step S802, the substrate 100 may be positioned and secured on the support. In some embodiments, the substrate 100 may be rotated until the notch 116 is in alignment with the polishing head 314, e.g., in alignment with the polisher 500. In step S804, the polisher 500 may be moved in the direction of the substrate 100 by an actuator, until a portion of the polisher 500 is in contact with the substrate edge 104 and/or notch 116 via the polishing tape 318, and presses the polishing tape 318 against the substrate edge 104 and/or notch 116. In step S806, the polishing tape 318 may advance via the supply and take-up spool drivers 328, 330. In step S808, a polishing-head driver or the controller 206 may rotate or pivot the polishing head 314 about the substrate edge 104 and/or notch 116 in a plane approximately perpendicular to major surfaces 102, 102' of the substrate 100, in order to effectively clean and polish parts of the substrate edge 104 and/or notch 116 adjacent to major surfaces 102, 102' of the substrate 100. The speed, direction, tension, pressing force, etc., of the polishing tape 318 may be adjustable, as may be the rotational displacement, speed, and/or acceleration of the polishing head 314 about the substrate 100. For instance, the polishing tape 318 may be advanced at one speed for a certain length, and then another speed for another length. In addition, the polishing tape 318 may be translated or oscillated, or both, with constant or variable tensions and pressing forces.

[0036] Further with respect to the method 800 for cleaning and polishing the substrate edge 104 and/or notch 116, the substrate polishing process may be monitored in step S810. For example, the pressure with which the polishing tape 318 is pressed into contact with, and against, the substrate edge 104 and/or notch 116 may be determined by the force or pressure applied by the fluid in the inflatable polisher 500, the pressure applied by the actuator, and/or the resilience of the polisher 500 and the polishing tape 318. In some embodiments, the fluid sensor 512 may send a signal to the controller 206 indicative of the amount of pressure applied by the fluid in the inflatable polisher 500. As the polishing tape 318 is advanced over the substrate edge 104 and/or notch 116, films and imperfections on the substrate edge 104 and/or notch 116 may be removed and eliminated by abrasion. The force or pressure applied by the polisher 500 due to the pressure of the fluid in the polisher 500, may be adjusted by controller 206, as needed. As described above, the adjustments to the pressure may account for changes in the amount of film removed from the substrate, and the portion of the substrate 100 being polished (i.e. notch, top bevel, bottom bevel, outer edge), for example. Any other suitable parameters may result in changes to the applied pressure. For example, as a layer of film is removed from the substrate edge 104 and/or notch 116, the pressure applied by the polisher 500 may decrease, and therefore, to maintain a pre-set applied pressure, the polisher 500 may be further inflated such that the polisher 500 applies the pre-set pressure to the substrate edge 104 and/or notch 116. In another example the amount and/or type of film deposited in the notch 116 may be different than the amount/type of film deposited on the substrate edge 104. Additionally, the geometries of the substrate edge 104 and notch 116 may be different. As such, the amount of pressure applied by the polisher 500 to polish the notch 116 may be different than the amount of pressure applied by the polisher 500 to polish the substrate edge 104.

[0037] The foregoing description discloses only exemplary embodiments of the invention. Modifications of the above disclosed apparatus and methods which fall within the scope of the invention will be readily apparent to those of ordinary skill in the art.

[0038] Accordingly, while the present invention has been disclosed in connection with exemplary embodiments thereof, it should be understood that other embodiments may fall within the spirit and scope of the invention, as defined by the following claim.

The invention claimed is:

1. An apparatus for polishing a substrate comprising:
   a polishing head adapted to apply a polishing tape against at least one of a substrate edge and a notch in the substrate edge, including:
   a polisher coupled to the polishing head, wherein the polisher has a hollow portion and is adapted to conform to a shape of at least one of the substrate edge and the notch.
2. The apparatus of claim 1 wherein the polisher is selectively inflatable.
3. The apparatus of claim 1 wherein the hollow portion is adapted to retain a fluid.
4. The apparatus of claim 3 wherein the polisher further comprises a port adapted to receive the fluid.
5. The apparatus of claim 4 wherein the fluid is compressed air.
6. The apparatus of claim 1 wherein the polishing head is adapted to pivot about at least one of the substrate edge and the notch.
7. The apparatus of claim 1 wherein the polishing tape is adapted to advance over the polisher during application of the polishing tape to at least one of the substrate edge and the notch.

8. The apparatus of claim 1 wherein the polisher includes a notch portion.

9. A system for polishing a substrate comprising:

a substrate support adapted to rotate a substrate;

a polishing head adapted to apply a polishing tape against at least one of a substrate edge and a notch in the substrate edge, including:

a polisher coupled to the polishing head, wherein the polisher has a hollow portion and is adapted to conform to a shape of at least one of the substrate edge and the notch; and

a controller adapted to operate the rotation of the substrate and the polishing head.

10. The system of claim 9 wherein the controller is adapted to incrementally advance the polishing tape to the polishing head.

11. The system of claim 9 wherein the hollow portion is adapted to retain a fluid.

12. The system of claim 11 wherein the polisher further comprises a port adapted to receive the fluid.

13. The system of claim 12 further comprising a sensor adapted to sense a pressure applied by the fluid.

14. The system of claim 13 wherein the sensor is coupled to the controller, and the controller is adapted to receive a signal from the sensor indicative of the applied pressure.

15. The system of claim 11 wherein the controller is adapted to adjust a pressure applied to at least one of the substrate edge and notch by the fluid.

16. The system of claim 15 further comprising a valve, wherein the valve is coupled to the polisher, and wherein the controller is adapted to manipulate the valve to adjust the applied pressure.

17. The system of claim 15 wherein the controller is adapted to increase the applied pressure by increasing the fluid retained in the hollow portion.

18. The system of claim 9 wherein the polisher includes a notch portion.

19. The system of claim 9 wherein the polishing head is adapted to pivot about at least one of the substrate edge and the notch.

20. A method for polishing a substrate comprising:

securing a substrate on a support;

pressing a polishing tape against at least one of a substrate edge and a notch with a hollow polisher;

advancing the polishing tape as the polishing tape is pressed against the notch; and

monitoring the polishing process.

21. The method of claim 20 further comprising:

inflating the hollow polisher.

22. The method of claim 21 wherein monitoring the polishing process further comprises:

receiving a signal indicative of the pressure applied by the inflated polisher.

23. The method of claim 22 further comprising:

adjusting the pressure based on the received signal.

24. The method of claim 23 wherein adjusting the pressure further comprises one of:

inflating the hollow polisher and deflating the hollow polisher.

25. The method of claim 24 wherein inflating the hollow polishing pad further comprises:

flowing a fluid into the hollow polisher.

* * * * *