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CMP METHOD AND APPARATUS FOR SIMULTANEOUSLY POLISHING PRODUCT AND CONDITIONING THE POLISHING PAD

BACKGROUND OF THE INVENTION

(1) FIELD OF THE INVENTION

This invention relates to an apparatus and method for CMP (Chemical Mechanical Polishing) of a semiconductor substrate and more specifically to an apparatus and method for conditioning the polishing pad in a CMP apparatus in order to control the polish removal rate and prolong the life of the polishing pad.

(2) DESCRIPTION OF RELATED ART

In the fabrication of semiconductor integrated circuits CMP (Chemical Mechanical Polishing) has been developed for providing smooth topographies on surfaces deposited on the semiconductor substrates. Rough topography results when metal conductor lines are formed over a substrate containing device circuitry. The metal conductor lines serve to interconnect discrete devices, and thus form integrated circuits. The metal conductor lines are further insulated from the next interconnection level by thin layers of insulating material and holes formed through the insulating layers provide electrical access between successive conductive interconnection layers. In such wiring processes,

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it is desirable that the insulating layers have a smooth surface topography, since it is difficult to lithographically image and pattern layers applied to rough surfaces. CMP can, also, be used to remove different layers of material from the surface of a semiconductor substrate. For example, following via hole formation in an insulating material layer, a metallization layer is blanket deposited and then CMP is used to produce planar metal studs embedded in the insulating material layer.

Briefly, the CMP processes involve holding and rotating a thin, flat substrate of the semiconductor material against a wetted polishing surface under controlled chemical, pressure and temperature conditions. A chemical slurry containing a polishing agent, such as alumina or silica, is used as the abrasive material. Additionally, the chemical slurry contains selected chemicals which etch various surfaces of the substrate during processing. The combination of mechanical and chemical removal of material during polishing results in superior planarization of the polished surface.

In CMP the wetted polishing surface comprises a porous pad material, such as blown polyurethane, saturated with the polishing slurry. Mounting of the polishing pad to the polishing apparatus is a labor intensive operation and the mounting process, also, interrupts use of the polishing

apparatus. The initial cost of the polishing pad, labor cost for mounting the pad to the polishing apparatus, and reduced throughput of the apparatus due to the polishing apparatus downtime while mounting the polishing pad add to the cost of polished product. Therefore, it is desirable to prolong the useful life of a polishing pad by conditioning the pad periodically during use of the pad. A principal factor in polishing pad degradation is a phenomenon referred to as "glazing", in which, during use, abrasive particles from the polishing slurry and polished byproduct become embedded and packed into the pores of the polishing pad. The result of "glazing" is attenuation of the roughness of the polishing pad and a reduction of polish removal rate and under-polishing of product until a correction is made. A technique used to overcome "glazing" is to periodically condition the polishing pad to rid the pad of embedded abrasive particles and polished byproduct. State-of-the-art conditioning techniques include liquid rinsing, air blowing the polishing pad surface, and grinding of the polishing pad surface to expose a fresh surface. The grinding technique is typically accomplished by using a rotating diamond wheel to remove a portion of the pad surface. During the conditioning processes the polishing apparatus cannot be used to process product substrates. This results in polishing tool downtime and reduces the throughput of product, thereby increasing the cost of product. Also, as the polishing pad degrades due to

"glazing" the uniformity of polish removal rate decreases and polishing process yield is decreased.

Important challenges in CMP, therefore, are to prolong the life of the polishing pad and to prevent degradation of polishing properties, such as removal rate and removal rate uniformity, during use. At the same time it is important to maximize the throughput of CMP machines in order to reduce the cost of product.

U.S. Pat. No. 5,681,215 entitled "Carrier Head Design For a Chemical Mechanical Polishing Apparatus" granted Oct. 28, 1997 to Michael T. Sherwood et al describes a CMP carrier head having a retaining ring in the base assembly. The retaining ring includes a protruding portion which contacts the polishing pad and blocks the substrate from slipping out from under the base assembly. Also, described is a polishing station that includes a separate pad conditioning apparatus having a rotatable arm and an independently rotating conditioner head. The conditioner apparatus maintains the condition of the polishing pad so that it will effectively polish any substrate pressed against it while it is rotating.

U.S. Pat. No. 5,624,299 entitled "Chemical Mechanical Polishing Apparatus With Improved Carrier and Method of Use" granted Apr. 29, 1997 to Norman Shendon shows a CMP carrier

head which facilitates substrate loading, retaining and unloading in a CMP apparatus.

U.S. Pat. No. 5,571,044 entitled "Wafer Holder For Semiconductor Wafer Polishing Machine" granted Nov. 5, 1996 to Hooman Bolandi et al describes a wafer holder for a polishing machine.

U.S. Pat. No. 5,643,061 entitled "Pneumatic Polishing Head For CMP Apparatus" granted Jul. 1, 1997 to Paul David Jackson et al describes a CMP polishing head which includes a retaining ring. The wafer substrate can be pressed against the polishing pad with a force independent of the force applied to the retaining ring. Grooves, included in the underside of the retaining ring, assist in circulating the polishing slurry about a wafer substrate within the retaining ring.

U.S. Pat. No. 5,614,446 entitled "Holding Apparatus, A Metal Deposition System, and a Wafer Processing Method Which Preserve Topographical Marks on a Semiconductor Wafer" granted Mar. 25, 1997 to Seshadri Ramaswami et al describes a wafer retaining ring which prevents metal deposition on a portion of a wafer substrate.

U.S. Pat. No. 5,403,228 entitled "Techniques For Assembling Polishing Pads For Silicon Wafer Polishing"

granted Apr. 4, 1995 to Nicholas R. Pasch describes the mounting of laminated polishing pads to a polishing platen. The mounting method prevents catastrophic delamination of the pads and, also, forms a bowl-like surface which retains slurry better than a planar surface.

The present invention is directed to a novel CMP apparatus and CMP method which prolong the life of polishing pads and increase the throughput of the CMP apparatus.

SUMMARY OF THE INVENTION

It is a general object of the present invention to provide an improved and new apparatus and method for conditioning a polishing pad in a CMP (Chemical Mechanical Polishing) apparatus.

Another object of the present invention is to provide a new and improved apparatus and method for conditioning a polishing pad, wherein the life of the polishing pad is prolonged.

A further object of the present invention is to provide a new and improved apparatus and method for conditioning a polishing pad, wherein polishing pad conditioning is achieved simultaneously with product polishing.

In accordance with the present invention, the above and other objectives are realized by a carrier head for chemical mechanical polishing, comprising: an assembly connectable to a drive shaft to rotate with said drive shaft; a base to hold a substrate against a polishing pad; and a retaining ring surrounding said base to hold said substrate beneath said base, said retaining ring having an abrasive surface thereon for the purpose of conditioning said polishing pad.

In a second embodiment of the present invention, the above and other objectives are realized by a carrier head for chemical mechanical polishing, comprising: an assembly connectable to a drive shaft to rotate with said drive shaft; a base to hold a substrate against a polishing pad; a retaining ring surrounding said base to hold said substrate beneath said base; and a conditioning ring surrounding said retaining ring, said conditioning ring having an abrasive surface thereon for the purpose of abrading said polishing pad.

In a third embodiment of the present invention, the above and other objectives are realized by a carrier head for chemical mechanical polishing, comprising: an assembly connectable to a drive shaft to rotate with said drive shaft; a base to hold a substrate against a polishing pad; a retaining ring surrounding said base to hold said substrate beneath said base; and a conditioning ring surrounding said

retaining ring, said conditioning ring having an inner diameter larger than the outer diameter of said retaining ring to form a gap for slurry flow between said retaining ring and said conditioning ring, said conditioning ring having an abrasive surface thereon, for the purpose of abrading said polishing pad.

The above and other objectives are realized by using a first method of simultaneously polishing product and conditioning the polishing pad comprising the steps of: providing said polishing pad affixed to a rotatable polishing platen; providing a rotatable carrier head to hold a substrate against said polishing pad; providing a retaining ring surrounding said rotatable carrier head to hold said substrate beneath said rotatable carrier, said retaining ring having an abrasive surface thereon for the purpose of conditioning said polishing pad; providing a means for holding said rotatable carrier head and said retaining ring in juxtaposition relative to said rotatable polishing platen with an applied pressure between the rotatable carrier head and the rotatable polishing platen; dispensing a polishing slurry onto said rotatable polishing pad; providing a first means to rotate said carrier head and said retaining ring; and providing a second means to rotate said polishing platen.

The above and other objectives are, also, realized by using a second method of simultaneously polishing product and

conditioning the polishing pad comprising the steps of: providing said polishing pad affixed to a rotatable polishing platen; providing a rotatable carrier head to hold a substrate against said polishing pad; providing a retaining ring surrounding said rotatable carrier head to hold said substrate beneath said rotatable carrier head; providing a conditioning ring surrounding said retaining ring, said conditioning ring having an abrasive surface thereon for the purpose of abrading said polishing pad; providing a means for holding said rotatable carrier head and said conditioning ring in juxtaposition relative to said rotatable polishing platen with an applied pressure between the rotatable carrier head and the rotatable polishing platen; dispensing a polishing slurry onto the rotatable polishing pad; providing a first means to rotate the carrier head and said retaining ring; and providing a second means to rotate the polishing platen.

The above and other objectives are, also, realized by using a third method of simultaneously polishing product and conditioning the polishing pad comprising the steps of: providing said polishing pad affixed to a rotatable polishing platen; providing a rotatable carrier head to hold a substrate against said polishing pad; providing a retaining ring surrounding said substrate beneath said rotatable carrier head; providing a conditioning ring surrounding said retaining ring, said conditioning ring having an inner

diameter larger than the outer diameter of said retaining ring to form a gap for slurry flow between said retaining ring and said conditioning ring, said conditioning ring having an abrasive surface thereon for the purpose of abrading said polishing pad; providing a means for holding said rotatable carrier head and said conditioning ring in juxtaposition relative to said rotatable polishing platen with an applied pressure between the rotatable carrier head and the rotatable polishing platen; dispensing a polishing slurry onto said rotatable polishing pad; providing a first means to rotate said carrier head and said retaining ring; and providing a second means to rotate said polishing platen.

BRIEF DESCRIPTION OF THE DRAWINGS

The object and other advantages of this invention are best described in the preferred embodiments with reference to the attached drawings that include:

Fig. 1A, which in cross-sectional representation illustrates a CMP carrier head for one embodiment of the present invention.

Fig. 1B, which is a bottom view of the carrier head illustrated in Fig. 1A.

Fig. 2A, which in cross-sectional representation illustrates a CMP carrier head for a second embodiment of the present invention.

Fig. 2B, which is a bottom view of the carrier head illustrated in Fig. 2A.

Fig. 3A, which in cross-sectional representation illustrates a CMP carrier head for a third embodiment of the present invention.

Fig. 3B, which is a bottom view of the carrier head illustrated in Fig. 3A.

Fig. 4, which in cross-sectional representation illustrates a CMP apparatus which uses one embodiment of the CMP carrier head of the present invention

Fig. 5, which in cross-section representation illustrates a CMP apparatus which uses a second embodiment of the CMP carrier head of the present invention.

Fig. 6, which in cross-sectional representation illustrates a CMP apparatus which uses a third embodiment of the CMP carrier head of the present invention.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

The new and improved CMP apparatus and method of using CMP for conditioning a polishing pad, wherein polishing pad conditioning is achieved simultaneously with product polishing, will now be described in detail.

Referring to Fig. 1A, which in cross-sectional representation illustrates a CMP carrier head, a base plate 10 is connected to a drive shaft 11, which is rotatable as indicated by arrow 12. The base plate 10 holds semiconductor substrate 13 against a polishing pad (not shown). Retaining ring 14 holds the substrate 13 beneath the base plate 10 and has an abrasive surface 15 thereon. Typically semiconductor substrate 13 has a diameter between about 150 and 300 mm. However, substrates with diameter larger than 300 mm may, also, be polished. The retaining ring 14 has a width between about 1/4 and 1 inch. This provides an abrasive surface 15 having a width between about 1/4 and 1 inch. It has been found that providing abrasive surface 15 having a width between about 1/4 and 1 inch is effective in conditioning a polishing pad while simultaneously polishing semiconductor substrate 13. The abrasive surface 15 on the retaining ring 14 may be polyurethane impregnated with diamond particles. Alternately, the abrasive surface may comprise a knurled metal alloy surface. Fig. 1B, which is a bottom view of the carrier head illustrated in Fig. 1A, shows semiconductor

substrate 13, and the retaining ring having abrasive surface 15.

Now referring to Figs. 2A and 2B, a second embodiment of the present invention is illustrated. In Fig. 2A, which in cross-sectional representation illustrates a CMP carrier head, a base plate 10 is connected to a drive shaft 11, which is rotatable as indicated by arrow 12. The base plate 10 holds semiconductor substrate 13 against a polishing pad (not shown). Retaining ring 20 surrounds the semiconductor substrate 13 and serves to hold the semiconductor substrate 13 in place. Surrounding retaining ring 20 is conditioning ring 21, which has an abrasive surface 22 thereon. Typically semiconductor substrate 13 has a diameter between about 150 and 300 mm. However, substrates with diameter larger than 300 mm may, also, be polished. The conditioning ring 21, which surrounds the retaining ring 20, has a width between about 1/4 and 1 inch. The abrasive surface 22 thereon, also, has a width between about 1/4 and 1 inch. It has been found that providing abrasive surface 22 having a width between about 1/4 and 1 inch is effective in conditioning a polishing pad while simultaneously polishing semiconductor substrate 13. The abrasive surface 22 on the conditioning ring 21 may be polyurethane impregnated with diamond particles. Alternately, the abrasive surface may comprise a knurled metal alloy surface. Fig. 2B, which is a bottom view of the carrier head illustrated in Fig. 2A, shows semiconductor

substrate 13, retaining ring 20, and the conditioning ring having abrasive surface 22.

Now referring to Figs. 3A and 3B, a third embodiment of the present invention is illustrated. In Fig. 3A, which in cross-sectional representation illustrates a CMP carrier head, a base plate 10 is connected to a drive shaft 11, which is rotatable as indicated by arrow 12. The base plate 10 holds semiconductor substrate 13 against a polishing pad (not shown). Retaining ring 30 surrounds the semiconductor substrate 13 and serves to hold the semiconductor substrate 13 in place. Surrounding retaining ring 30 is conditioning ring 31, which has an abrasive surface 32 thereon. Typically semiconductor substrate 13 has a diameter between about 150 and 300 mm. However, substrates with diameter larger than 300 mm may, also, be polished. The conditioning ring 31 has an inner diameter larger than the outer diameter of the retaining ring 30 in order to form a gap 33 for slurry flow between retaining ring 30 and conditioning ring 31. The gap 33 between retaining ring 30 and conditioning ring 31 has a width between about 1/16 and 3/16 inch. The conditioning ring 31, which surrounds the retaining ring 30, has a width between about 1/4 and 1 inch. The abrasive surface 32 thereon, also, has a width between about 1/4 and 1 inch. It has been found that providing abrasive surface 32 having a width between about 1/4 and 1 inch is effective in conditioning a polishing pad while simultaneously polishing

semiconductor substrate 13. The abrasive surface 32 on the conditioning ring 31 may be polyurethane impregnated with diamond particles. Alternately, the abrasive surface may comprise a knurled metal alloy surface. Fig. 3B, which is a bottom view of the carrier head illustrated in Fig. 3A, shows semiconductor substrate 13, retaining ring 30, the conditioning ring having abrasive surface 32, and the gap 33 between retaining ring 30 and conditioning ring 31.

The carrier heads described in Figs. 1A and 1B, Figs. 2A and 2B, and Figs. 3A and 3B are used in a CMP apparatus to simultaneously polish product and condition the polishing pad. For example, Fig. 4, in cross-sectional representation, illustrates the use of the carrier head shown in Figs. 1A and 1B in a CMP apparatus. Polishing pad 40 is affixed to a rotatable polishing platen 41. A means is provided to rotate the polishing platen 41 and polishing pad 40, as shown by arrow 42. The rotatable carrier head 43 holds semiconductor substrate 44 against polishing pad 40. A retaining ring 45 holds semiconductor substrate 44 in place and has thereon an abrasive surface 46. The retaining ring 45 has a width between about 1/4 and 1 inch. The abrasive surface 46 comprises polyurethane impregnated with diamond particles. Alternately, the abrasive surface 46 may be a knurled metal alloy surface. A polishing slurry comprising silica or alumina and polishing chemicals and H_2O at a pH between about pH = 4.5 and pH = 11.5 is dispensed from reservoir 47 through

conduit 48 onto polishing pad 40. Polishing platen 41 and polishing pad 40 are rotated at a speed between about 15 and 80 rpm. Carrier head 43 is rotated, as indicated by arrow 49, at a speed between about 18 and 60 rpm. The applied pressure, as indicated by arrow 50, between the rotatable carrier head 43 and the rotatable polishing platen 41 is between about 200 and 500 psi.

Fig. 5, in cross-sectional representation, illustrates the use of the carrier head shown in Figs. 2A and 2B in a CMP apparatus. Polishing pad 40 is affixed to a rotatable polishing platen 41. A means is provided to rotate the polishing platen 41 and polishing pad 40, as shown by arrow 42. The rotatable carrier head 43 holds semiconductor substrate 44 against polishing pad 40. A retaining ring 55 holds semiconductor substrate 44 in place. A conditioning ring 56, which surrounds retaining ring 55, has an abrasive surface 57, thereon. The conditioning ring 56 has a width between about 1/4 and 1 inch. The abrasive surface 57 comprises polyurethane impregnated with diamond particles. Alternately, the abrasive surface 57 may be a knurled metal alloy surface. A polishing slurry comprising silica or alumina and polishing chemicals and H_2O at a pH between about pH = 4.5 and pH = 11.5 is dispensed from reservoir 47 through conduit 48 onto polishing pad 40. Polishing platen 41 and polishing pad 40 are rotated at a speed between about 15 and 80 rpm. Carrier head 43 is rotated, as indicated by arrow

49, at a speed between about 18 and 60 rpm. The applied pressure, as indicated by arrow 50, between the rotatable carrier head 43 and the rotatable polishing platen 41 is between about 200 and 500 psi.

Fig. 6, in cross-sectional representation, illustrates the use of the carrier head shown in Figs. 3A and 3B in a CMP apparatus. Polishing pad 40 is affixed to a rotatable polishing platen 41. A means is provided to rotate the polishing platen 41 and polishing pad 40, as shown by arrow 42. The rotatable carrier head 43 holds semiconductor substrate 44 against polishing pad 40. A retaining ring 55 holds semiconductor substrate 44 in place. The conditioning ring 66, which surrounds retaining ring 55, has an inner diameter larger than the outer diameter of the retaining ring 55, thus forming a gap 68 for slurry flow between the retaining ring 55 and the conditioning ring 66. The gap 68 has a width between about 1/16 and 3/16 inch. The conditioning ring 66 has an abrasive surface 67, thereon. The conditioning ring 66 has a width between about 1/4 and 1 inch. The abrasive surface 67 comprises polyurethane impregnated with diamond particles. Alternately, the abrasive surface 67 may be a knurled metal alloy surface. A polishing slurry comprising silica or alumina and polishing chemicals and H_2O at a pH between about pH = 4.5 and pH = 11.5 is dispensed from reservoir 47 through conduit 48 onto polishing pad 40. Polishing platen 41 and polishing pad 40

are rotated at a speed between about 15 and 80 rpm. Carrier head 43 is rotated, as indicated by arrow 49, at a speed between about 18 and 60 rpm. The applied pressure, as indicated by arrow 50, between the rotatable carrier head 43 and the rotatable polishing platen 41 is between about 200 and 500 psi.

While the invention has been particularly shown and described with reference to the preferred embodiments thereof, it will be understood by those skilled in the art that various changes in form and details may be made without departing from the spirit and scope of the invention.

CLAIMS

1. A carrier head for chemical mechanical polishing, comprising:

an assembly connectable to a drive shaft to rotate with said drive shaft;

a base to hold a substrate against a polishing pad; and

a retaining ring surrounding said base to hold said substrate beneath said base, said retaining ring having an abrasive surface thereon for the purpose of conditioning said polishing pad.

2. The carrier head of claim 1, wherein said retaining ring has a width between about 1/4 and 1 inch.

3. The carrier head of claim 1, wherein said abrasive surface on said retaining ring comprises polyurethane impregnated with diamond particles.

4. The carrier head of claim 1, wherein said abrasive surface on said retaining ring comprises a knurled metal alloy surface.

5. The carrier head of claim 1, wherein said abrasive surface on said retaining ring has a width between about 1/4 and 1 inch.

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6. A carrier head for chemical mechanical polishing, comprising:

an assembly connectable to a drive shaft to rotate with said drive shaft;

a base to hold a substrate against a polishing pad;

a retaining ring surrounding said base to hold said substrate beneath said base; and

a conditioning ring surrounding said retaining ring, said conditioning ring having an abrasive surface thereon for the purpose of abrading said polishing pad.

7. The carrier head of claim 6, wherein said conditioning ring has a width between about 1/4 and 1 inch.

8. The carrier head of claim 6, wherein said abrasive surface on said conditioning ring comprises polyurethane impregnated with diamond particles.

9. The carrier head of claim 6, wherein said abrasive surface on said conditioning ring comprises a knurled metal alloy surface.

10. The carrier head of claim 6, wherein said abrasive surface on said conditioning ring has a width between about 1/4 and 1 inch.

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11. A carrier head for chemical mechanical polishing, comprising:

an assembly connectable to a drive shaft to rotate with said drive shaft;

a base to hold a substrate against a polishing pad;

a retaining ring surrounding said base to hold said substrate beneath said base; and

a conditioning ring surrounding said retaining ring, said conditioning ring having an inner diameter larger than the outer diameter of said retaining ring to form a gap for slurry flow between said retaining ring and said conditioning ring, said conditioning ring having an abrasive surface thereon for the purpose of abrading said polishing pad.

12. The carrier head of claim 11, wherein said conditioning ring has a width between about 1/4 and 1 inch.

13. The carrier head of claim 11, wherein said gap has a width between about 1/16 and 3/16 inch.

14. The carrier head of claim 11, wherein said abrasive surface on said conditioning ring comprises polyurethane impregnated with diamond particles.

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15. The carrier head of claim 11, wherein said abrasive surface on said conditioning ring comprises a knurled metal alloy surface.

16. The carrier head of claim 11, wherein said abrasive surface on said conditioning ring has a width between about 1/4 and 1 inch.

17. A CMP method for simultaneously polishing product and conditioning the polishing pad comprising the steps of:

providing said polishing pad affixed to a rotatable polishing platen;

providing a rotatable carrier head to hold a substrate against said polishing pad;

providing a retaining ring surrounding said rotatable carrier head to hold said substrate beneath said rotatable carrier, said retaining ring having an abrasive surface thereon for the purpose of conditioning said polishing pad;

providing a means for holding said rotatable carrier head and said retaining ring in juxtaposition relative to said rotatable polishing platen with an applied pressure between the rotatable carrier head and the rotatable polishing platen;

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dispensing a polishing slurry onto said rotatable polishing pad;

providing a first means to rotate said carrier head and said retaining ring; and

providing a second means to rotate said polishing platen.

18. The method of claim 17, wherein said retaining ring has a width between about 1/4 and 1 inch.

19. The method of claim 17, wherein said abrasive surface on said retaining ring comprises polyurethane impregnated with diamond particles.

20. The method of claim 17, wherein said abrasive surface on said retaining ring comprises a knurled metal alloy surface.

21. The method of claim 17, wherein said abrasive surface on said retaining ring has a width between about 1/4 and 1 inch.

22. The method of claim 17, wherein said polishing slurry comprises silica or alumina and polishing chemicals and H_2O at a pH between about pH = 4.5 and pH = 11.5.

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23. The method of claim 17, wherein said rotatable polishing platen is rotated at a speed between about 15 and 80 rpm.

24. The method of claim 17, wherein said rotatable carrier head is rotated at a speed between about 18 and 60 rpm.

25. The method of claim 17 wherein said applied pressure between the rotatable carrier head and the rotatable polishing platen is between about 200 and 500 psi.

26. A CMP method for simultaneously polishing product and conditioning the polishing pad comprising the steps of:

providing said polishing pad affixed to a rotatable polishing platen;

providing a rotatable carrier head to hold a substrate against said polishing pad;

providing a retaining ring surrounding said rotatable carrier head to hold said substrate beneath said rotatable carrier head;

providing a conditioning ring surrounding said retaining ring, said conditioning ring having an

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abrasive surface thereon for the purpose of abrading said polishing pad;

providing a means for holding said rotatable carrier head and said conditioning ring in juxtaposition relative to said rotatable polishing platen with an applied pressure between the rotatable carrier head and the rotatable polishing platen;

dispensing a polishing slurry onto said rotatable polishing pad;

providing a first means to rotate said carrier head and said retaining ring; and

providing a second means to rotate said polishing platen.

27. The method of claim 26, wherein said conditioning ring has a width between about 1/4 and 1 inch.

28. The method of claim 26, wherein said abrasive surface on said conditioning ring comprises polyurethane impregnated with diamond particles.

29. The method of claim 26, wherein said abrasive surface on said conditioning ring comprises a knurled metal alloy surface.

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30. The method of claim 26, wherein said abrasive surface on said conditioning ring has a width between about 1/4 and 1 inch.

31. The method of claim 26, wherein said polishing slurry comprises silica or alumina and polishing chemicals and H_2O at a pH between about pH = 4.5 and pH = 11.5.

32. The method of claim 26, wherein said rotatable polishing platen is rotated at a speed between about 15 and 80 rpm.

33. The method of claim 26, wherein said rotatable carrier head is rotated at a speed between about 18 and 60 rpm.

34. The method of claim 26 wherein said applied pressure between the rotatable carrier head and the rotatable polishing platen is between about 200 and 500 psi.

35. A CMP method for simultaneously polishing product and conditioning the polishing pad comprising the steps of:

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providing said polishing pad affixed to a rotatable polishing platen;

providing a rotatable carrier head to hold a substrate against said polishing pad;

providing a retaining ring surrounding said rotatable carrier head to hold said substrate beneath said rotatable carrier head;

providing a conditioning ring surrounding said retaining ring, said conditioning ring having an inner diameter larger than the outer diameter of said retaining ring to form a gap for slurry flow between said retaining ring and said conditioning ring, said conditioning ring having an abrasive surface thereon for the purpose of abrading said polishing pad;

providing a means for holding said rotatable carrier head and said conditioning ring in juxtaposition relative to said rotatable polishing platen with an applied pressure between the rotatable carrier head and the rotatable polishing platen;

dispensing a polishing slurry onto said rotatable polishing pad;

providing a first means to rotate said carrier head and said retaining ring; and

providing a second means to rotate said polishing platen.

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36. The method of claim 35, wherein said conditioning ring has a width between about 1/4 and 1 inch.

37. The method of claim 35, wherein said abrasive surface on said conditioning ring comprises polyurethane impregnated with diamond particles.

38. The method of claim 35, wherein said abrasive surface on said conditioning ring comprises a knurled metal alloy surface.

39. The method of claim 35. wherein said abrasive surface on said conditioning ring has a width between about 1/4 and 1 inch.

40. The method of claim 35, wherein said gap has a width between about 1/16 and 3/16 inch.

41. The method of claim 35, wherein said polishing slurry comprises silica or alumina and polishing chemicals and H_2O at a pH between about pH = 4.5 and pH = 11.5.

42. The method of claim 35, wherein said rotatable polishing platen is rotated at a speed between about 15 and 80 rpm.

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43. The method of claim 35, wherein said rotatable carrier head is rotated at a speed between about 18 and 60 rpm.

44. The method of claim 35 wherein said applied pressure between the rotatable carrier head and the rotatable polishing platen is between about 200 and 500 psi.

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