

CLAIMS

1. An abrasive tool comprising:
a CMP pad conditioner including:
 - a substrate having a first major surface, a second major surface opposite the first major surface, and a side surface extending between the first major surface and the second major;
 - a first layer of abrasive grains attached to the first major surface;
 - a second layer of abrasive grains attached to the second major surface;
 - and
 - a first sealing member extending in a peripheral direction along a portion of the side surface of the substrate.
2. The abrasive tool of claim 1, wherein the first sealing member comprises a deformable member.
3. The abrasive tool of any of claims 1 and 2, wherein the first sealing member is disposed within a recess along a portion of the side surface.
4. The abrasive tool of claim 1, wherein the substrate comprises an engagement structure.
5. The abrasive tool of claim 1, wherein the substrate comprises an engagement structure and a plate removably coupled to the CMP pad conditioner.
6. An abrasive tool for use as a CMP pad conditioner comprising:
a plate; and
an abrasive article comprising:
 - a substrate having a first major surface and a second major surface opposite the first major surface;
 - a first layer of abrasive grains attached to the first major surface;
 - a second layer of abrasive grains attached to the second major surface;
 - and
 - an engagement structure configured to engage a portion of the plate and removably couple the abrasive article and the plate.
7. The abrasive tool of claim 6, wherein the plate comprises a same material the substrate of the abrasive article.

8. The abrasive tool of any of claims 6 and 7, wherein the plate comprises a coupling surface for complementary engagement with the engagement structure of the abrasive article.
9. The abrasive tool of any of claims 6 and 7, wherein the abrasive article is contained within a recess of the plate.
10. The abrasive tool of any of claims 6 and 7, wherein the second layer of abrasive grains are spaced away from a bottom surface defining the recess within the plate.
11. The abrasive tool of any of claims 6 and 7, wherein the engagement structure comprises one of a fastener, an interference fit connection, a clamp, a latch, or a combination thereof.
12. The abrasive tool of any of claims 6 and 7, wherein the abrasive article and plate are removably coupled via a biased engagement structure.
13. The abrasive tool of claim 6, wherein the abrasive article comprises a first protective layer overlying the first layer of abrasive grains.
14. An abrasive tool for use as a CMP pad conditioner comprising:
a plate; and
an abrasive article comprising:
 a substrate having a first major surface and a second major surface opposite the first major surface;
 a first layer of abrasive grains attached to the first major surface;
 a second layer of abrasive grains attached to the second major surface;
 and
wherein the plate and abrasive article are removably coupled via a coupling mechanism.
15. The abrasive tool of claim 14, wherein the coupling mechanism includes an engagement structure attached to the abrasive article, the engagement structure includes a structure selected from the group of structures consisting of latches, fasteners, clamps, interference fit connections, and a combination thereof.
16. The abrasive tool of claim 14, wherein the coupling mechanism includes a magnet.
17. The abrasive tool of claim 16, wherein the magnet is contained within the plate.

18. The abrasive tool of claim 17, wherein the magnet is contained within the abrasive article.
19. The abrasive tool of claim 18, wherein the magnet is contained within the substrate.
20. A method of forming an abrasive article comprising:
placing a first bonding layer material on a first major surface of a substrate, wherein the substrate comprises an engagement structure configured to removably couple the substrate to a plate;
placing a first layer of abrasive grains within the first bonding layer material;
placing a second bonding layer material on a second major surface of the substrate, wherein the second major surface is opposite the first major surface;
placing a second layer of abrasive grains within the second bonding layer material; and
forming a CMP pad conditioner comprising a first abrasive surface defined by the first layer of abrasive grains on the first major surface and a second abrasive surface defined by the second layer of abrasive grains on the second major surface.
21. The method of claim 20, wherein forming comprises heating the substrate.
22. The method of claim 21, wherein during heating, the substrate is suspended and the first layer of abrasive grains and second layer of abrasive grains are spaced apart from contacting surfaces.
23. The method of claim 21, wherein during heating, the substrate changes positions relative to a starting position and a stopping position.
24. A method of dressing a CMP pad comprising:
coupling an abrasive article to a dressing machine, the abrasive article comprising a substrate having a first major surface and a second major surface opposite the first major surface, wherein the abrasive article comprises a first abrasive surface at the first major surface of the substrate, and a second abrasive surface at the second major surface of the substrate, and wherein the abrasive article is mounted on the dressing machine to expose the first abrasive surface;
contacting the first abrasive surface to a surface of a first CMP pad and moving the first CMP pad relative to the first abrasive surface to condition the first CMP pad;
inverting the abrasive article to expose the second abrasive surface; and
contacting the second abrasive surface to a surface of a second CMP pad and moving the second CMP pad relative to the second abrasive surface to condition the second CMP pad.

25. The method of claim 24, wherein the first CMP pad and the second CMP pad are different CMP pads.

26. The method of any of claims 24 and 25, wherein moving the first CMP pad comprises rotating the CMP pad relative to the first abrasive surface.

27. The method of any of claims 24 and 25, wherein coupling the abrasive article to a dressing machine comprises removably coupling the abrasive article to a plate, wherein the plate is directly coupled to the dressing machine.

28. The method of any of claims 24 and 25, wherein inverting the abrasive article comprises:
removing the abrasive article from the plate;
inverting the abrasive article; and
coupling the abrasive article to the plate, wherein the second abrasive surface is exposed to conduct a conditioning operation.

29. An abrasive tool comprising:
a CMP pad conditioner including:

- a substrate having a first major surface, a second major surface opposite the first major surface, and a side surface extending between the first major surface and the second major;
- a first layer of abrasive grains attached to the first major surface;
- a second layer of abrasive grains attached to the second major surface;
- and

a groove extending peripherally around a side surface of the substrate.

30. The abrasive tool of claim 29, wherein the groove defines a convex shape extending radially inward.

31. The abrasive tool of claim 29, further comprising a plate having a plate body configured to removably couple to the CMP pad conditioner.

32. The abrasive tool of claim 31, wherein the plate comprises a cavity extending radially inward into the plate body from a front surface and configured to contain the CMP pad conditioner.

33. The abrasive tool of claim 32, wherein the cavity comprises a first cavity portion and a second cavity portion, and wherein the CMP pad conditioner is configured to be engaged within the first cavity portion.

34. The abrasive tool of claim 33, wherein the second cavity portion comprises a smaller width than the first cavity portion.

35. The abrasive tool of claim 32, further comprising a pad configured to be contained within the cavity.

CLAIMS

1. An abrasive tool for use as a CMP pad conditioner comprising:
a plate; and
an abrasive article comprising:
 - a solid substrate having a first major surface and a second major surface opposite the first major surface and a coupling surface having a depression configured for complementary engagement with the plate;
 - a first single layer of abrasive grains attached to the first major surface;
 - a second single layer of abrasive grains attached to the second major surface; andwherein the plate and abrasive article are removably coupled via a coupling mechanism configured for reversible operation of the abrasive article, wherein the first single layer of abrasive grains and second single layer of abrasive grains are spaced apart from the plate.
2. The abrasive tool of claim 1, wherein the coupling mechanism includes an engagement structure attached to the abrasive article.
3. The abrasive tool of claim 1, wherein the coupling mechanism includes a coupling surface on the plate.
4. The abrasive tool of claim 1, wherein the engagement structure includes a structure selected from the group of structures consisting of latches, fasteners, clamps, interference fit connections, and a combination thereof.
5. A method of dressing a CMP pad comprising:
coupling an abrasive article to a dressing machine, the abrasive article comprising:
 - a plate; and
 - a CMP pad conditioner removably coupled to the plate, the CMP pad conditioner comprising a solid substrate having a first major surface and a second major surface opposite the first major surface, wherein the abrasive article comprises a

first single layer of abrasive grains at the first major surface of the substrate spaced apart from the plate, and a second single layer of abrasive grains at the second major surface of the substrate spaced apart from the plate, and wherein the abrasive article is mounted on the dressing machine to expose the first abrasive surface;

contacting the first abrasive surface to a surface of a first CMP pad and moving the first CMP pad relative to the first abrasive surface to condition the first CMP pad;
inverting the abrasive article to expose the second abrasive surface; and
contacting the second abrasive surface to a surface of a second CMP pad and moving the second CMP pad relative to the second abrasive surface to condition the second CMP pad.

6. The method of claim 5, wherein the plate is directly coupled to the dressing machine.

7. The method of claim 6, wherein inverting the abrasive article comprises:

removing the abrasive article from the plate;

inverting the abrasive article; and

coupling the abrasive article to the plate, wherein the second single layer of abrasive grains is exposed to conduct a conditioning operation.

8. The method of claim 7, wherein during removing the abrasive article from the plate, the plate remains coupled to the dressing machine.

9. The method of claim 5, wherein the first single layer of abrasive grains is used for an expected conditioning lifetime before the abrasive article is inverted.

10. The abrasive tool of claim 1, further comprising a first bonding layer overlying the first surface of the substrate and having the first single layer of abrasive grains contained therein.

11. The abrasive tool of claim 1, wherein the wherein the first single layer of abrasive grains comprises a flatness of not greater than about 0.02 cm as measured by optical, auto-focusing technology.

12. The abrasive tool of claim 10, wherein the first bonding layer comprises a transition metal.

13. The abrasive tool of claim 1, further comprising a second bonding layer overlying the second surface of the substrate and having the second single layer of abrasive grains contained therein.

14. The abrasive tool of claim 1, wherein the substrate comprises a material selected from the group consisting of metals, metal alloys, ceramics, and a combination thereof.

15. The abrasive tool of claim 1, wherein the substrate comprises a material having an elastic modulus of at least 2E3 MPa.