MULTI-LAYERED POLISHING PADS

FIELD

The present disclosure relates to polishing pads useful for the polishing of substrates, and systems for and methods of using such polishing pads.

BACKGROUND

Various articles, systems, and methods have been introduced for the polishing of ltrahard substrates. Such articles, systems, and methods are described, for example, in E. Kasman, M. Irvin, CS Mantech Conference, May 17-20th 2010, Portland Oregon; and K.Y. Ng, T. Dumm, CS Mantech Conference, April 23rd-26th, Boston , MA.

SUMMARY

According to an aspect of the present invention, there is provided a system for polishing a substrate, the system comprising:

a carrier assembly configured to receive and hold the substrate;

a polishing pad comprising:

a base layer having a first major surface and a second major surface opposite the first major surface, wherein the first major surface includes a plurality of cavities that extend into the base layer from the first major surface, and

a platen, wherein the polishing pad is coupled to the platen such that the second major surface is the working surface; and

a polishing solution disposed between the polishing pad and the substrate, wherein the polishing solution comprises:

a fluid component, and

ceramic abrasive composites, wherein the ceramic abrasive composites comprise individual abrasive particles dispersed in a porous ceramic matrix, and wherein the ceramic abrasive composites are dispersed in the fluid component; and

wherein the system is configured such that the polishing pad is movable relative to the substrate to carry out a polishing operation.

WHAT IS CLAIMED IS:

1. A system for polishing a substrate, the system comprising:

a carrier assembly configured to receive and hold the substrate;

a polishing pad comprising:

a base layer having a first major surface and a second major surface opposite the first major surface, wherein the first major surface includes a plurality of cavities that extend into the base layer from the first major surface, and

a platen, wherein the polishing pad is coupled to the platen such that the second major surface is a working surface; and

a polishing solution disposed between the polishing pad and the substrate, wherein the polishing solution comprises:

a fluid component, and

ceramic abrasive composites, wherein the ceramic abrasive composites comprise individual abrasive particles dispersed in a porous ceramic matrix, and wherein the ceramic abrasive composites are dispersed in the fluid component; and

wherein the system is configured such that the polishing pad is movable relative to the substrate to carry out a polishing operation.

2. The system for polishing a substrate of claim 1, wherein the base layer comprises polypropylene.

3. The system for polishing a substrate of claim 1, wherein the base layer has a thickness of between 0.125 mm and 10 mm.

4. The system for polishing a substrate of claim 1, wherein the individual abrasive particles are uniformly distributed throughout the porous ceramic matrix

5. The system for polishing a substrate of claim 4, wherein the abrasive particles comprise diamond, cubic boron nitride, fused aluminum oxide, ceramic aluminum oxide, heated treated aluminum oxide, silicon carbide, boron carbide, alumina zirconia, iron oxide, ceria, or garnet.

6. The system for polishing a substrate of claim 5, wherein the abrasive particles comprise diamond.

7. The system for polishing a substrate of claim 5, wherein the ceramic abrasive composites have an average particle size of less than 500 microns

8. The system for polishing a substrate of claim 5, wherein the average size of the ceramic abrasive composites is at least about 5 times the average size of the abrasive particles.

9. The system for polishing a substrate of claim 5, wherein the porous ceramic matrix comprises glass comprising aluminum oxide, boron oxide, silicon oxide, magnesium oxide, sodium oxide, manganese oxide, or zinc oxide.

10. The system for polishing a substrate of claim 5, wherein the concentration of the abrasive composites in the fluid component is between 0.065% and 6.5% by weight.

11. The system for polishing a substrate of claim 5, wherein the porous ceramic matrix comprises at least 50% by weight glassy ceramic material.

12. The system for polishing a substrate of claim 5, wherein the porous ceramic matrix consists essentially of glassy ceramic material.