POLISHING PADS AND SYSTEMS AND METHODS OF MAKING AND USING THE SAME

FIELD

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

SUMMARY

In a first aspect, the present disclosure provides a polishing pad comprising a polishing layer having a working surface and a second surface opposite the working surface;

wherein the working surface includes a plurality of precisely shaped pores, a plurality of precisely shaped asperities and a land region;

wherein each pore has a pore opening, each asperity has an asperity base, and a plurality of the asperity bases are substantially coplanar relative to at least one adjacent pore opening;

wherein the depth of the plurality of precisely shaped pores is less than the thickness of the land region adjacent to each precisely shaped pore and the thickness of the land region is less than about 5 mm; and

wherein the polishing layer comprises a unitary polymeric layer.

In an embodiment, the present disclosure provides a polishing pad including the previous polishing layer, wherein the polishing layer includes a plurality of nanometer-size topographical features on at least one of the surface of the precisely shaped asperities, the surface of the precisely shaped pores and the surface of the land region.

In another embodiment, the present disclosure provides a polishing pad including any one of the previous polishing layers, wherein the height of at least about 10% of the plurality of precisely shaped asperities is between about 1 micron and about 200 microns.

In another embodiment, the present disclosure provides a polishing pad including any one of the previous polishing layers, wherein the depth of at least about 10% of the plurality of precisely shaped pores is between about 1 micron and about 200 microns.

In another embodiment, the present disclosure provides a polishing pad including any one of the previous polishing layers, wherein the polishing layer further includes at least one macro-channel.

What is claimed is:

1) A polishing pad comprising a polishing layer having a working surface and a second surface opposite the working surface;

wherein the working surface includes a plurality of precisely shaped pores, a plurality of precisely shaped asperities and a land region;

wherein each pore has a pore opening, each asperity has an asperity base, and a plurality of the asperity bases are substantially coplanar relative to at least one adjacent pore opening;

wherein the depth of the plurality of precisely shaped pores is less than the thickness of the land region adjacent to each precisely shaped pore and the thickness of the land region is less than about 5 mm; and

wherein the polishing layer comprises a unitary polymeric sheet.

2) The polishing pad of claim 1, wherein the depth of at least about 10% of the plurality of precisely shaped pores is between about 1 micron and about 200 microns.

3) The polishing pad of claim 1, wherein the polishing layer is free of through-holes.

4) The polishing pad of claim 1, wherein the polishing layer contains less than 1% by volume inorganic abrasive particles.

5) The polishing pad of claim 1, wherein the ratio of the surface area of distal ends of the precisely shaped asperities to the surface area of the precisely shaped pore openings is between about 0.0001 and about 4.

6) The polishing pad of claim 1, further comprising at least one macro-channel.

7) The polishing pad of claim 6, wherein the depth of at least a portion of the plurality of precisely shaped pores is less than the depth of at least a portion of the at least one macro-channel.

11) The polishing pad of claim 10, wherein at least one of the receding contact angle and advancing contact angle of the secondary surface layer is at least about 20° less than the corresponding receding contact angle or advancing contact angle of the bulk layer.

12) The polishing pad of claim 1, wherein the receding contact angle of the working surface is less than about 30°.

13) The polishing pad of claim 1, wherein the polishing layer is substantially free of inorganic abrasive particles.

14) The polishing pad of claim 1, wherein the polishing layer further comprises a plurality of independent or inter-connected macro-channels.

15) The polishing pad of claim 1, further comprising at least one second polishing layer having a working surface and a second surface opposite the working surface; wherein the working surface includes a plurality of precisely shaped pores, a plurality of precisely shaped asperities and a land region;