CLAIMS

What is claimed is:

1. A pad conditioner for a chemical mechanical planarization (CMP) assembly, comprising:

a substrate having a first surface and a second surface opposite the first surface; and

a plurality of protrusions protruding away from the first surface in a direction that is normal to the first surface, wherein the plurality of protrusions is arranged in a plurality of rows and a plurality of columns,

wherein a plurality of protrusions in a first row of the plurality of rows is offset in a direction perpendicular to an adjacent direction from a plurality of protrusions in a second row, which is adjacent to the first row in the adjacent direction, of the plurality of rows,

wherein an angle between a plurality of protrusions in the first row and a plurality of protrusions in the second row is from 35º to 55º, and

wherein the first row of the plurality of rows is offset from the second row of the plurality of rows by a distance O;a first column of the plurality of columns is separated from a second column of the plurality of columns by the distance O;

neighboring protrusions within the first row and the second row are separated by a distance S;

the distance O is equal to or greater than 0.1S and equal to or less than 0.5S; and

a density of the plurality of protrusions is from 0.10 per mm^2 to 25 per mm^2.

2. The pad conditioner of claim 1, wherein the plurality of protrusions includes a uniform geometry.

3. The pad conditioner of claim 2, wherein the plurality of protrusions includes one of conical and frustoconical.

4. The pad conditioner of claim 1, wherein the plurality of protrusions is uniformly spaced.

5. The pad conditioner of claim 1, wherein the plurality of protrusions is formed of a silicon carbide having a diamond coated cutting surface.

6. The pad conditioner of claim 1, wherein a protrusion distance from the substrate is from 15 μm to 100 μm.

7. A chemical mechanical planarization (CMP) pad conditioner assembly, comprising:

a backing plate having a first backing plate surface; and

a plurality of pad conditioners secured to the first backing plate surface, each of the plurality of pad conditioners comprising:

a substrate having a first surface and a second surface opposite the first surface; and

a plurality of protrusions protruding away from the first surface in a direction that is normal to the first surface, wherein the plurality of protrusions is arranged in a plurality of rows and a plurality of columns, ,

wherein a plurality of protrusions in a first row of the plurality of rows is offset in a direction perpendicular to an adjacent direction from a plurality of protrusions in a second row, which is adjacent to the first row in the adjacent direction, of the plurality of rows,

wherein an angle between a plurality of protrusions in the first row and a plurality of protrusions in the second row is from 35º to 55º, and

wherein the first row of the plurality of rows is offset from the second row of the plurality of rows by a distance O

a first column of the plurality of columns is separated from a second column of the plurality of columns by the distance O;

neighboring protrusions within the first row and the second row are separated by a distance S;

the distance O is equal to or greater than 0.1S and equal to or less than 0.5S; and

a density of the plurality of protrusions is from 0.10 per mm^2 to 25 per mm^2.

8. The assembly of claim 7, wherein the plurality of pad conditioners is spaced circumferentially about the backing plate.