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 are arranged in a plurality of rows, and wherein the plurality of protrusions include one of conical and frustoconical,

wherein a first row of the plurality of rows is offset from a second row of the plurality of rows, wherein the offset is from 10° to 60°.

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

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

~~4~~3. The pad conditioner of claim 1, wherein the plurality of protrusions are uniformly spaced.

~~5~~4. The pad conditioner of claim 1, wherein the plurality of protrusions are formed of a silicon carbide having a diamond coated cutting surface.

~~6~~5. The pad conditioner of claim 1, wherein a density of the plurality of protrusions is from ~~at or about~~ 0.10 per mm^2 to ~~at or about~~ 25 per mm^2.

~~7~~6. The pad conditioner of claim 1, wherein a protrusion distance from the substrate is from ~~at or about~~ 15 μm to ~~at or about~~ 100 μm.

~~8. The pad conditioner of claim 1, wherein the offset is from at or about 10° to at or about 60°.~~

~~9~~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 are arranged in a plurality of rows, and wherein the plurality of protrusions include one of conical and frustoconical,

wherein a first row of the plurality of rows is offset from a second row of the plurality of rows, wherein the offset is from 10° to 60°.

~~10~~8. The assembly of claim ~~9~~7, wherein the plurality of pad conditioners are spaced circumferentially about the backing plate.