CLAIMS

1. A process tuning kit useful in a chemical deposition apparatus, the kit comprising a carrier ring, set of three horseshoes and sets of three shims wherein:

each of the shims has an upper surface, a lower surface parallel to the upper surface, an end wall, a U-shaped sidewall extending from the end wall and a bore of the shim extending between the upper and lower surfaces, a first set of three shims having the same thickness and a second set of the shims having a different thickness than the first set of shims;

each of the horseshoes has an upper surface, a lower surface parallel to the upper surface, an end wall, a U-shaped side wall extending from the end wall, a bore of the horseshoe extending between the upper and lower surfaces, and a slot opening in the end wall and extending less than half way across the upper surface, the bore of the horseshoe having the same diameter as the bore of the shims;

the carrier ring having an upper surface, a lower surface parallel to the upper surface, an outer side wall, an inner side wall, and three alignment pins extending from the lower surface.

2. The kit of claim 1, wherein the shims include at least ten sets having different thicknesses.

3. The kit of claim 1, wherein the bore of the horseshoe is tapered outwardly an upper end of the bore of the horseshoe.

4. The kit of claim 1, wherein the carrier ring, horseshoes and shims are made of high purity alumina.

5. The kit of claim 1, wherein the horseshoe has a length of about 0.8 inch, a width of about 0.5 inch, a thickness of about 0.5 inch, the bore of the horseshoe having a diameter of about 0.15 inch, the slot having a width of about 0.19 inch and a height of about 0.25 inch, the bore of the horseshoe aligned with the slot, the side wall having a pair of parallel straight sections connected by a semicircular section having a radius of about 0.26 inch measured from a center of the bore of the horseshoe, the bore of the horseshoe having a uniform diameter portion extending about 0.16 inch from the lower surface and a conical portion extending into the upper surface of the horseshoe, the conical portion forming a chamfer with an angle of about 80° and the slot having chamfered edges along the end wall and upper surface.

6. The kit of claim 1, wherein the shim has a length of about 0.8 inch, a width of about 0.5 inch, the bore of the shim having a diameter of about 0.15 inch, and a thickness of

0.0465 inch, 0.0470 inch, 0.0475 inch, 0.0480 inch, 0.0485 inch, 0.0490 inch, 0.0495 inch, 0.0500 inch, 0.0505 inch, 0.0510 inch, 0.0515 inch, 0.0520 inch, 0.0525 inch, 0.0530 inch, 0.0535 inch, 0.0540 inch, 0.0545 inch, 0.0550 inch, 0.0555 inch, 0.0560 inch, 0.0565 inch, 0.0570 inch, 0.0575 inch, 0.0580 inch, 0.0585 inch, 0.0590 inch, 0.0595 inch, 0.0600 inch, 0.0605 inch, 0.0610 inch, or 0.0615 inch.

7. The kit of claim 1, wherein the carrier ring has an outer diameter of about 15 inches, an inner diameter of about 11.7 inches, a thickness of about 0.1 inch, each of the three alignment pins having a length of about 0.2 inch with a uniform diameter portion extending about 0.06 inch from the lower surface and a tapered portion extending to a free end of the alignment pin, and an annular recess extending into the inner wall and the upper surface, the annular recess formed by a vertical wall having a diameter of about 11.9 inches and extending about 0.03 inch from the upper surface and a horizontal wall extending about 0.08 inch from the inner wall.

8. A pedestal assembly comprising the kit of claim 1, wherein the pedestal assembly includes three rectangular openings in which the shims underlie the horseshoes and the carrier ring is supported on the horseshoes.

9. The pedestal assembly of claim 8, wherein the pedestal assembly includes locating pins, the locating pins extending through the bores of the shims and part way through the bores of the horseshoes, the alignment pins of the carrier ring extending into the bores of the horseshoes.

10. A method of processing a semiconductor substrate in a chemical deposition apparatus, comprising:

transporting the substrate on a ceramic carrier ring into a vacuum chamber of the chemical deposition apparatus and placing the carrier ring on a pedestal assembly having a set of ceramic horseshoe and ceramic shims of a process tuning kit according to claim 1 which support the carrier ring, the horseshoes having bores which receive alignment pins extending from a lower surface of the carrier ring, the substrate being lifted off the carrier ring by minimum contact area supports on the pedestal assembly such that an underside of the substrate is located a predetermined offset distance form an upper surface of the carrier ring;

depositing a layer of material on the substrate while heating the substrate and maintaining the predetermined offset distance such that backside deposition on the substrate is minimized.

11. The method of claim 10, wherein the pedestal assembly includes an annular recess and three rectangular openings which extend into an outer periphery of the pedestal assembly and open into the annular recess, each of the rectangular openings having a shim and horseshoe mounted therein with a locating pin on the pedestal assembly extending through bores of the shims and part way through bores of the horseshoes, each of the shims having the same thickness and providing the predetermined offset distance which limits backside deposition to 50 Å or less at 3 mm from a bevel edge of the substrate.