CLAIMS:

1. A blank for a plasma enhanced chemical vapor deposition (PECVD) heated showerhead comprising a stem, back plate and face plate, the blank comprising a stem precursor blank and a back plate precursor blank joined by rotary friction welding.

2. The blank of Claim 1, wherein the stem precursor blank comprises a round bar of aluminum material having a length of at least about 6 inches and diameter of at least about 3 inches and the back plate precursor blank comprises a circular plate of aluminum material having a thickness of at least about 1 inch and diameter of at least about 13 inches, the axial end of the stem precursor blank rotary friction welded to the center of one side of the back plate precursor blank.

3. The blank of Claim 1, wherein the back plate precursor blank includes a raised hub on one side thereof, the raised hub rotary friction welded to the axial end of the stem precursor blank.

4. The blank of Claim 1, wherein the back plate precursor blank comprises a rolled plate of an aluminum alloy and the stem precursor blank comprises an extruded bar of an aluminum alloy.

5. The blank of Claim 4, wherein the aluminum alloy is 6061.

6. A showerhead assembly comprising a face plate and the blank of Claim 1, wherein the blank has been machined to remove weld flash around the weld interface, the stem precursor blank has been machined to desired dimensions of a stem, the back plate precursor blank has been machined to desired dimensions of a back plate, the face plate has been attached to the back plate with a plenum between an inner surface of the face plate and an inner surface of the back plate, and at least one gas passage extending axially through the stem and back plate is in fluid communication with the plenum.

7. The showerhead assembly of Claim 6, wherein the face plate includes a plurality of posts extending vertically upwardly from the inner surface and upper ends of the posts are located in corresponding openings of the back plate in which upper ends of the posts are located.

8. The showerhead assembly of Claim 7, wherein the face plate includes a lower wall and an outer wall extending vertically upwardly from an outer periphery of the lower wall, an upper end of the outer wall sealed to an outer periphery of the back plate.

9. The showerhead assembly of Claim 7, wherein the posts are welded to the back plate and an outer periphery of the back plate is welded to a side wall of the face plate.

10. A method of manufacturing a component of a showerhead assembly useful for depositing material on an upper surface of a substrate in a plasma enhanced chemical vapor deposition apparatus, the method comprising:

cutting a length of extruded solid aluminum bar to provide a stem precursor blank;

cutting a piece of rolled aluminum plate stock to provide a back plate precursor blank;

forming a welded blank by rotary friction welding the stem precursor blank to the back plate precursor blank such that a welded joint is formed across the stem precursor blank and intermetallic phases in the weld joint are elongated in a radially outward direction;

forming a showerhead component blank having an integral stem and back plate by machining the welded blank to remove welding flash.

11. The method of claim 10, further comprising machining the back plate precursor blank to include a raised hub on one side thereof, machining the stem precursor blank to have an axial end perpendicular to a center axis of the stem precursor blank, clamping the back plate precursor blank with the raised hub exposed, rotating the stem precursor blank while pressing the axial end of the stem precursor blank against the raised hub so as to form a fusion weld joint between opposed surfaces of the stem precursor blank and the back plate precursor blank.

12. The method of claim 10, further comprising machining the welded blank to final desired dimensions of a back plate and stem of a showerhead assembly and welding an outer periphery of the back plate to an outer wall of a face plate such that an inner plenum is formed between the back plate and the face plate.

13. The method of claim 12, wherein at least one vertically extending gas passage is machined in the stem and back plate such that the gas passage is in fluid communication with the inner plenum.

14. The method of claim 12, further comprising inserting posts extending from an inner surface of the face plate into holes in the back plate and welding upper ends of posts to the back plate.

15. The method of claim 10, wherein the back plate precursor blank and the stem precursor blank are made of an aluminum alloy having the same composition.

16. The method of claim 10, wherein the rotary friction welding is carried out with an axial pressure of at least 3000 psi while rotating the stem precursor blank at a rotational speed of at least 300 rpm.

17. The method of claim 10, wherein the weld area is at least 30 square inches.

18. The method of claim 10, wherein grain size of the weld zone is elongated in a radially outward direction with intermetallic phases distributed in the grain structure.

19. The method of claim 10, wherein the weld joint is free of voids and cracking.

20. The method of claim 10, wherein the back plate precursor blank has a diameter of at least 12 inches and a thickness of at least 1 inch, and the stem precursor blank has a diameter of at least 2 inches and a length of at least 6 inches.