CLAIMS:

1. An apparatus for growing diamonds, the apparatus comprising:

one or more chambers, each chamber is in fluid connection with each other or one ~~or more other chambers~~ another, each chamber comprising one or more substrate stage assembly within the chamber to support a substrate stage having a plurality of diamond seeds disposed thereon~~.~~.

characterised in that each chamber is adopted to allow gas to flow through such that the purity of the gas improves as it passes through each chamber.

2. The apparatus as claimed in claim 1, wherein the chamber further comprise a microwave arrangement for supplying microwave energy into the chamber.

3. The apparatus as claimed in Claim 1 or 2, wherein the chambers may be arranged in a series with gas flow pipes between each chamber.

4. The apparatus as claimed in claim 1 or 2, wherein the chambers ~~may be~~are arranged in a network such that each chamber is connected to an adjacent chamber so as to allow gas flow between the chambers.

~~5. The apparatus as claimed in any one of the preceding claims, wherein the microwave arrangement generates a 2.45GHz microwave and directs the microwave energy into the vacuum chamber in the region of the substrate stage to form an oblate spheroidal plasma region.~~

~~6~~5. The apparatus as claimed in any one of the preceding claims, wherein the chamber has a casing adapted for housing the substrate stage assembly therein.

~~7~~6. The apparatus as claimed in any one of the preceding claims, wherein the substrate stage assembly comprises a plate, a substrate stage, a peripheral reflector, the substrate stage and the peripheral reflector being supported on top of the plate.

~~8~~7. The apparatus as claimed in claim ~~7~~6, wherein the plate is made of a metal with high thermal conductivity.

~~9~~8. The apparatus as claimed in any one of claims ~~7~~6 or ~~8~~7, wherein the substrate stage comprises

a substantially circular planar base;

a peripheral raised edge to the base, the peripheral raised edge thereby defining a central recessed substrate receiving surface, the central recessed substrate receiving surface being substantially planar, the peripheral raised edge to the base comprising an inner edge and an outer edge, the inner edge comprising a bevel.

~~10~~9. The apparatus as claimed in Claim ~~9~~8, wherein the peripheral raised edge comprises an annular groove.

~~11~~10. The apparatus as claimed in Claim ~~9~~8 or ~~10~~9, wherein the peripheral raised edge comprises an upper surface and a lower surface and the peripheral raised edge comprises an annular groove in at least one of the upper and lower surfaces.

~~12~~11. The apparatus as claimed in any one of Claims ~~9~~8 to ~~11~~10, wherein the peripheral reflector comprises a cylindrical body around the substrate stage and the peripheral reflector is spaced laterally from the peripheral raised edge of the substrate stage.

~~13~~12. The apparatus as claimed in any one of claims ~~9~~8 to ~~12~~11, wherein the bevel defines an upper sharp edge and a lower sharp edge, the upper sharp edge and the lower sharp edge together assisting in defining a plasma region in use.

~~14~~13. The apparatus as claimed in any one of claims ~~7~~6 to~~13~~12, wherein the substrate stage is made of molybdenum.

~~15~~14. The apparatus as claimed in any one of claims ~~7~~6 to ~~14~~13, wherein the outer periphery of the substrate stage is isolated from the main bulk of the substrate assembly by ~~the~~ annular or slotted grooves which are preferably on both the top and bottom surfaces of the substrate stage.

~~16~~15. The apparatus as claimed in any one of the preceding claims, further comprising one of more of: ~~A~~a gas supply arranged before the first chamber of the apparatus ~~of claims 1 to 15~~ and adapted to supply gases to form diamonds in the chambers;~~.~~

~~17.~~ ~~A~~a vacuum pump arranged after the final chamber of the apparatus ~~of claims 1 to 15~~ and adapted to evacuate all the chambers and draws through the series of chambers process gases from the gas entry into the first chamber;~~.~~

~~18.~~ ~~A~~a measuring means secured on each of the chamber of the apparatus ~~of claims 1 to 15~~ and adapted to measure gas quality ratio within the chamber;~~.~~ and

~~19.~~ ~~A~~a pressure measuring means being secured on each of the chambers of the apparatus ~~of claims 1 to 15~~ and adapted to measure pressure within the chamber.

~~20~~16. A chamber comprising one or more substrate stage assembly within the chamber to support a substrate stage having a plurality of diamond seeds disposed thereon.

~~21. The chamber as claimed in claim 20, further comprise a microwave arrangement for supplying microwave energy into the chamber.~~

17. The apparatus as claimed in any one of claims 2 to 16, wherein the microwave arrangement generates a 2.45GHz microwave and directs the microwave energy into the vacuum chamber in the region of the substrate stage to form an oblate spheroidal plasma region.