

Claims:

1. An apparatus for use in supporting a plurality of workpieces each having first and second sides and an outer peripheral edge inside a plasma chamber having a processing space for simultaneously dry etching the first and second sides of each workpiece with a plasma, the apparatus comprising:

a fixture configured to be supported inside the processing space, said fixture including a horizontally-oriented carrier plate comprising:

a planar top surface;

a planar bottom surface; and

a plurality of first openings extending through the thickness of said carrier plate from said planar top surface to said planar bottom surface, each of said plurality of first openings having a first annular surface that is beveled relative to said planar top surface, a second annular surface that is beveled relative to said planar bottom surface, and an annular groove extending circumferentially about each of said first annular surfaces,

wherein each of said annular grooves is configured to contact one of the workpieces over an annular region at an outer peripheral edge so that substantially all of the first and second sides of each of the workpieces are exposed to the plasma.

2. The apparatus of claim 1 wherein said carrier plate includes one or more second openings extending through the thickness of said carrier plate, said one or more second openings configured to pass a process gas used to generate the plasma.

3. The apparatus of claim 1 wherein said carrier plate includes an outer rim extending about said planar top surface and raised relative to said planar top surface, and said outer rim includes one or more exterior edges beveled relative to said planar bottom surface with an included angle greater than 90°.

4. The apparatus of claim 1 wherein said annular groove is separated from said planar top surface by said first annular surface.

5. The apparatus of claim 1 wherein each of said plurality of openings is round and has a diameter slightly less than the diameter of the workpieces.
6. The apparatus of claim 1 wherein each of said first annular surfaces is frustoconical and each of said second annular surfaces is frustoconical.
7. The apparatus of claim 1 wherein each of said first annular surfaces is inwardly and downwardly angled relative to the planar top surface.
8. The apparatus of claim 18 wherein each of said second annular surfaces is inwardly and downwardly angled relative to the planar bottom surface.
9. The apparatus of claim 1 wherein each of said second annular surfaces is inwardly and downwardly angled relative to the planar bottom surface.
10. The apparatus of claim 1 wherein said planar top surface and said planar bottom surface are contained in parallel planes separated by a thickness of said carrier plate, and said first annular surface and said second annular surface are separated by a distance that is less than said thickness of said carrier plate.
11. The apparatus of claim 10 wherein said distance decreases with decreasing distance from a centerline of each of said first openings.

What is claimed is:

Claims:

1. An apparatus for use in supporting a plurality of workpieces inside a plasma chamber for simultaneously dry etching first and second sides of the workpieces with a plasma, the apparatus comprising:

a fixture configured to be supported inside the processing space, said fixture including a carrier plate and a plurality of first openings extending through the thickness of said carrier plate, said carrier plate configured to contact each of the workpieces over an annular region at an outer peripheral edge so that substantially all of the first and second sides of each of the workpieces are exposed to the plasma.
2. The apparatus of claim 1 wherein said carrier plate includes one or more second openings extending through the thickness of said carrier plate, said one or more second openings configured to pass a process gas used to generate the plasma.
3. The apparatus of claim 1 wherein said carrier plate includes a planar first surface, a planar second surface, and an outer rim extending about said planar first surface and raised relative to said planar first surface, and said outer rim includes one or more exterior edges beveled relative to said planar second surface with an included angle greater than 90°.
4. The apparatus of claim 1 wherein said carrier plate includes a planar surface perforated by said plurality of first openings and a plurality of annular surfaces each extending about a respective one of said plurality of first openings, and each of said plurality of annular surfaces beveled relative to said planar surface.

5. The apparatus of claim 1 wherein said carrier plate includes a plurality of annular lips each contacted by the annular region at the outer peripheral edge of the respective one of the workpieces, each of said plurality of annular lips extending circumferentially a respective one of said plurality of said first openings, and each of said annular lips separated from said planar surface by a respective one of said annular surfaces.
6. The apparatus of claim 1 wherein each of said first plurality of openings is round and has a diameter slightly less than the diameter of the workpieces.
7. An apparatus for use in supporting a plurality of workpieces inside a plasma chamber for simultaneously dry etching first and second sides of the workpieces with a plasma, the apparatus comprising:
- a fixture configured to be supported inside the plasma chamber, said fixture including a carrier plate and a plurality of posts that project outwardly from said carrier plate, each of said posts including a first section attached to said carrier plate, and said first section is configured to support a respective one of the workpieces by contacting a central aperture extending through the respective one of the workpieces.
8. The apparatus of claim 7 wherein said first section includes a flange with an outer rim and a first annular surface that extends radially inward from said outer rim, said first annular surface contacted by the annular portion of the respective workpiece.
9. The apparatus of claim 8 wherein said flange of said first section includes a second annular surface extending radially inward from said first annular surface, said second annular

surface raised relative to said first annular surface and having an outer diameter approximately equal to a diameter of the central aperture in the workpiece.

10. The apparatus of claim 8 wherein said post includes a second section detached from said carrier plate, said second section having a flange configured to be positioned on said flange of said first section such that the annular portion of the respective workpiece is located between said flange of said first section and said flange of said second section.

11. The apparatus of claim 1 wherein each of said plurality of posts is composed of an electrical insulator.

12. A method for simultaneously dry etching first and second sides of a plurality of workpieces within a plasma chamber, the method comprising:

supporting the workpieces between first and second electrodes inside the plasma chamber with the first and second sides of each workpiece substantially uncovered;

generating a plasma within the plasma chamber; and

simultaneously exposing the uncovered first and second sides of each of the workpieces to the plasma to perform the dry etching.

13. The method of claim 12 wherein supporting the workpieces between first and second electrodes comprises:

loading the workpieces into a plurality of first openings in a carrier plate while contacting an annular region of each workpiece about an outer peripheral edge;

moving the carrier plate and the workpieces as an assembly into a plasma chamber configured to generate and confine the plasma in a process space; and

supporting the carrier plate and the workpieces in the process space between the first and second electrodes.

14. The method of claim 13 wherein the plasma is generated from a process gas, and further comprising:

transferring the process gas through one or more second openings extending through the thickness of the carrier plate.

16. The method of claim 12 wherein each of the workpieces includes a central aperture extending between the first and second sides, and supporting the workpieces between first and second electrodes comprises:

contacting an annular region extending circumferentially about the central aperture of each workpiece with a post that extends outwardly from the first electrode.