NASA TECH BRIEF

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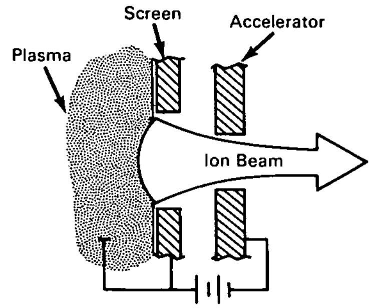
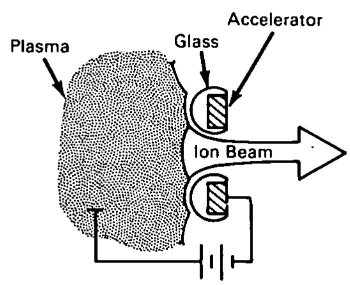
Glass Coated Single Grid for Charged Particle Acceleration



CONVENTIONAL GRIDS



SINGLE GLASS COATED GRID

The problem:

To develop a successful single grid accelerator system for ion thrusters. Previous systems conventionally employ a double grid system consisting of a screen grid and an accelerator grid. Single grid systems are less complex, reduce ion chamber power loss, and eliminate problems of thermal buckling and warping which may result in poor ion focusing and reduced grid life. Previous attempts to develop single grid accelerator systems were only partially successful due to the difficulty in obtaining a satisfactory grid coating. Coatings previously used included boron nitride, aluminum oxide, and ceramic cements.

The solution:

A glass coating for the single grid. This eliminates previous coating problems of excessive thickness, degradation, porosity, and inadequate bonding to the grid.

How it's done:

A glass slurry, consisting of finely milled glass particles in water, is sprayed onto the upstream surface and the walls of the holes of the accelerator grid. The coating is allowed to dry, and the assembly heated to a temperature high enough to fuse the glass particles together and bond the glass to the grid. The type of glass used, thickness of slurry sprayed coating, and

(continued overleaf)

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the oven temperature are carefully chosen to insure that the glass will fuse and bond properly without filling in the holes of the grid, and that the glass will not later melt or degrade at the accelerator operating temperature. The fused assembly is allowed to cool. The result is a uniformly thin, smooth, dense, impervious glass coating with a high dielectric strength, firmly bonded to the accelerator grid.

Notes:

1. The effective electrical breakdown strength of the glass coating was increased approximately eight times by fusing it sequentially in helium and argon to minimize bubbles in the fused glass, as described in Tech Brief 68-10214.
2. This invention should be useful in a variety of applications where charged particles are accelerated, such as multielement vacuum tubes, electron beam devices, sputtering processes, and plasma generators.
3. Inquiries concerning this invention may be directed to:

   Technology Utilization Officer
   Lewis Research Center
   21000 Brookpark Road
   Cleveland, Ohio 44135
   Reference: B68-10215

Patent status:

Inquiries about obtaining rights for the commercial use of this invention may be made to NASA, Code GP, Washington, D.C. 20546.

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