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# NASA TECH BRIEF

*Lyndon B. Johnson Space Center*



## Reconstituted Asbestos Matrix for Fuel Cells

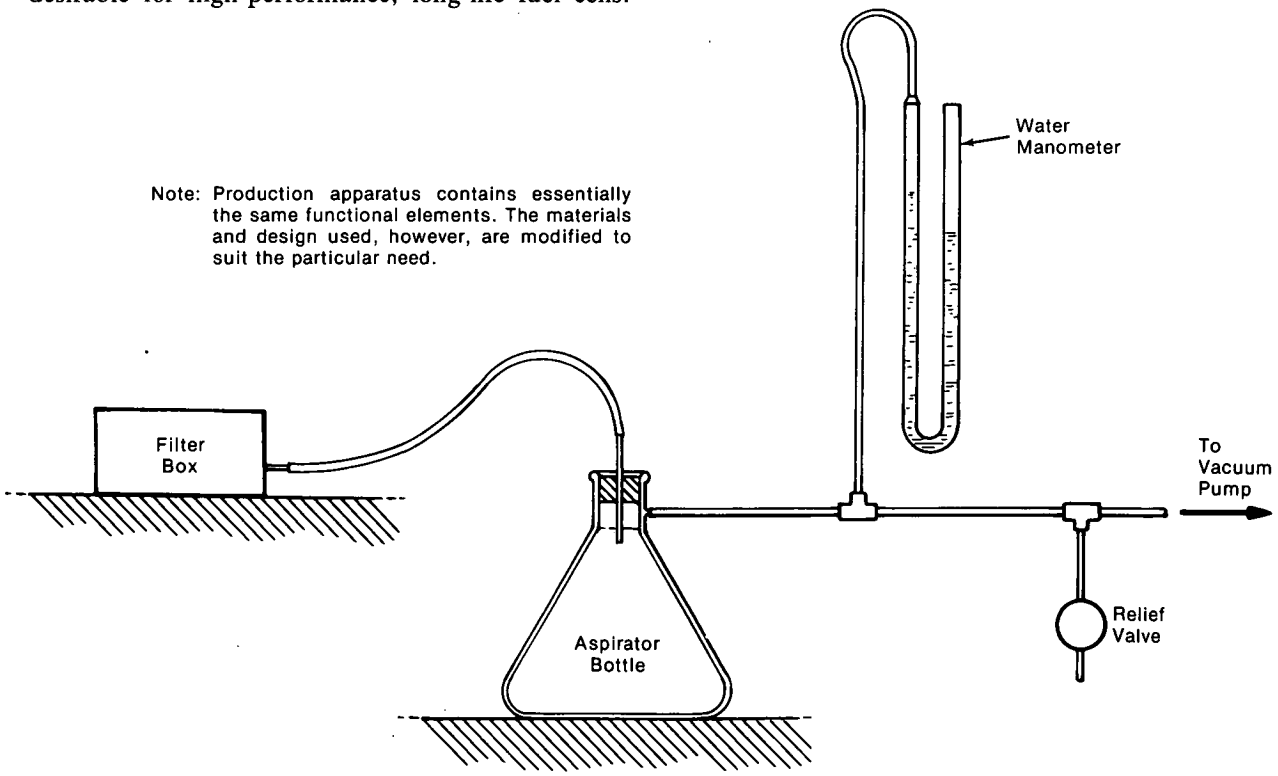
**The problem:**

Asbestos matrices are used in alkaline fuel cells as spongelike material to contain the electrolyte between the two porous electrodes. The capability of a matrix to hold a quantity of electrolyte is determined by its void volume in the form of pores and the capillarity (surface tension) of the pores. The higher the void volume of a given matrix, the greater the quantity of electrolyte it can contain. The smaller the pore, the higher the surface tension of the pore and the stronger the retention force for the electrolyte. Thus, a high void volume comprised of many small pores is desirable for high-performance, long-life fuel cells. Commercially-available asbestos matrix material is not adequate for cells requiring operating lifetimes exceeding about 2,000 hours and producing power of 800 W/ft$^2$ (8,600 W/m$^2$) or more.

**The solution:**

Commercially-available fuel cell-grade asbestos matrix stock can be reprocessed to yield highly improved matrices with greater porosity and bubble pressure (due to increased surface tension), improved homogeneity, and greater uniformity.

Note: Production apparatus contains essentially the same functional elements. The materials and design used, however, are modified to suit the particular need.




Laboratory Apparatus for Reconstituting Asbestos Matrices for Use in Fuel Cells and Electrolysis Cells

(continued overleaf)

**How it's done:**

The new process is initiated by forming a slurry from shredded commercial fuel cell-grade asbestos stock and water. The shredding can be performed with a conventional kitchen-type blender. A low-temperature boiling hydrocarbon such as methanol also can be used instead of water. The mixture is placed in a filter box (see figure). The new matrix is formed by drawing the liquid component of the slurry through a porous plaque (located in the filter box, not shown) by vacuum, stirring all the while to enhance uniform dispersal of asbestos fibers. A commercially-available filter paper, such as Whatman No. 40, or equivalent, is placed on the plaque prior to adding the slurry. The paper easily separates the formed matrix from the reusable plaque. The formed matrix is then vacuum dried, and the liquid collected in the aspirator bottle is discarded.

The filtering fixture (a tank to hold a required amount of asbestos fiber slurry with the porous plaque and filter paper in the bottom) is usually sized slightly large so that final dimensions of the matrix can be realized by die stamping or cutting, as with a papercutter. For larger production requirements, the tank is usually sized for multiple matrices in a single filtration, with the final matrix sized as described above. The quantity of fiber desired in the matrix is determined by the weight of the initial asbestos shredded per unit volume of slurry. Final and uniform thickness is accomplished by rolling techniques which also serve to smooth the surface of residual ripples.

**Note:**

Requests for further information may be directed to:

Technology Utilization Officer
Johnson Space Center
Code AT3
Houston, Texas 77058
Reference: TSP75-10339

**Patent status:**

This invention has been patented by NASA (U.S. Patent No. 3,910,814). Inquiries concerning non-exclusive or exclusive license for its commercial development should be addressed to:

Patent Counsel
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Source: H. McBryar
Johnson Space Center
(MSC-12568)

Categories: 01 (Electronics - Components and Circuitry)
04 (Materials)