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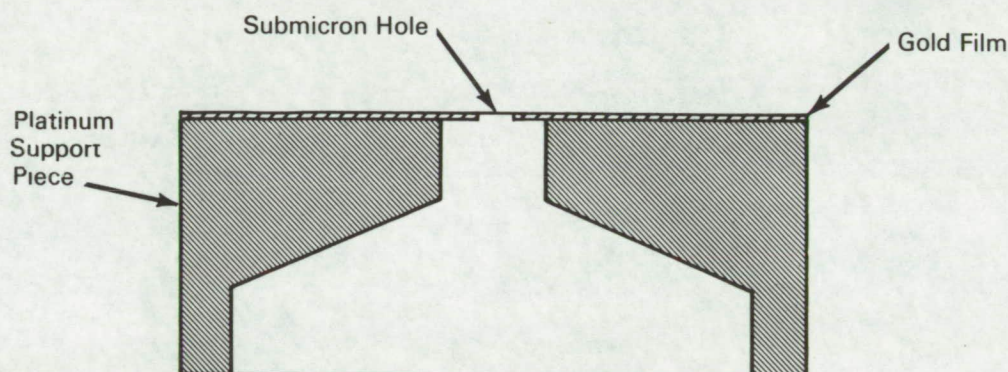
Brief 66-10380

NASA TECH BRIEF



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Submicron Holes in Thin Films Increase Sampling Range of Mass Spectrometers



The problem:

To devise a process of forming thin-film apertures of less than 1 micron in diameter to allow accurate mass spectrometer sampling of gas mixtures at pressures on the order of 100 torr. To ensure proper sampling, the aperture must not only have a diameter smaller than the mean free path of the gas molecules but also a channel length of only a few diameters.

The solution:

A process involving the vapor deposition of a gold film onto a glass slide containing submicron latex spheres which are then removed, leaving submicron holes in the gold film.

How it's done:

Evaporate a wetting agent to a thickness of several hundred angstroms onto a glass slide. Spray the coated surface with a dispersion of submicron latex spheres. Evaporate a gold film, 500 to 1000 angstroms thick, onto the surface, so that the latex spheres leave

"shadow holes" in the gold film. Remove the latex spheres, using an air stream and a wash in benzene and acetone. Cut the remaining gold foil into small squares and strip them from the glass slide onto a water surface. Lift a gold square from the water surface by means of a hollow, cylindrical platinum support piece, and position the square so that the submicron hole is approximately centered over the hole in the support piece. Fusion bond the gold square to the support piece.

To prevent plugging of the submicron hole by particles that may be carried in the gas stream, it is necessary to provide a filter. The filter is constructed using the same procedure described above, except that a dispersion of smaller latex spheres is used so that a larger number of holes is obtained in the gold film. A specially designed fixture is used to mount the thin film assembly in an opening through a wall of the spectrometer housing.

(continued overleaf)

Note:

Inquiries concerning this innovation may be directed to:

Technology Utilization Officer
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Patent status:

No patent action is contemplated by NASA.

Source: R. H. Willens
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