NASA TECH BRIEF

NASA Pasadena Office

Improved Dispensing Targets for Ion Beam Particle Generators

High-energy particle generators are presently used in neutron radiography, reactor pulsing, nuclear safeguard studies, and other related fields. They are also used in the search for new sources of oil and as aids in locating desired ores in mining operations.

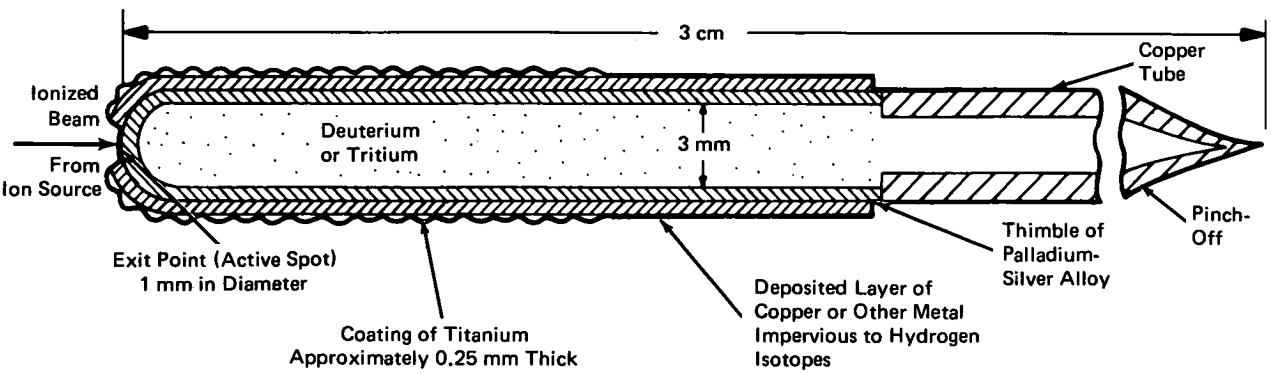
The basic structure of a common particle generator comprises an ion beam source, and a particle dispensing target which incorporates either deuterium or tritium sealed in a container. Deuterium is used for generating protons, and tritium, for generating neutrons. When the ion beam impinges on the target, the reaction generates the desired particles.

In a newly-designed dispensing target the container is a sealed palladium enclosure holding the deuterium or tritium gas at atmospheric or higher pressures (see figure). The enclosure is a drawn thimble made of palladium-silver alloy that is welded or brazed to a copper tube. The container inside diameter is approximately 1/8 inch (3 mm) and the length 1 inch (3 cm).

In use, the ion beam impinges on the palladium-silver tube, which is the target, and heats the impinged surface causing a local hot spot. The contained gas diffuses through the hot spot to meet the incoming beam and produce the desired particles. When the ion beam is turned off, the target spot cools and stops dispensing the contained gas.

All the surface of the tube other than the tip is coated with either copper, silver, or molybdenum. These metals are impervious to diffusion of the contained gas even when hot. As a result, they confine the effusion only to the active spot, as shown in the figure.

The uncoated exit point of up to 1 mm in diameter is formed by masking the tip during the deposition of the impervious metal. A further coating of titanium or zirconium, or of a suitable rare earth metal such as erbium, on the protective coating is used to absorb unreacted deuterium or tritium. This maintains the vacuum at the desired level of less than 10^{-4} torr during operations.



Dispensing Target

(continued overleaf)

Notes:

1. The dispensing targets described may be of interest to manufacturers of nuclear reactors and to mining and petroleum firms.
2. Requests for further information may be directed to:

   Technology Utilization Officer
   4800 Oak Grove Drive
   Pasadena, California 91103
   Reference: TSP74-10108

Patent status:

This invention has been patented by NASA (U.S. Patent No. 3,646,348). Inquiries concerning nonexclusive or exclusive license for its commercial development should be addressed to:

Patent Counsel
NASA Pasadena Office
4800 Oak Grove Drive
Pasadena, California 91103

Source: Charles G. Miller of
Caltech/JPL
under contract to
NASA Pasadena Office
(NPO-13112)

☆ U.S. GOVERNMENT PRINTING OFFICE: 1974—636-114