May 1966 Brief 66-10182

NASA TECH BRIEF

Subminiaturized Gas Chromatograph Gives Fast, Efficient Analysis

The problem:

In gas chromatography, there are many commercially available devices that, together, can analyze a wide range of gases. For space applications, these devices pose serious weight problems because of the large amounts of carrier gas they must dissipate in effecting an analysis. Additionally, it is desirable to analyze the gases more rapidly than the typical 5 to 10 minutes required of prior art.

The solution:

A subminiaturized gas chromatograph weighing only 100 grams and capable of analyzing samples in a few seconds with a carrier gas flow of one milliliter per minute.

How it's done:

A one-microliter gas sample is injected with the carrier gas into a subminiaturized column (microcolumn) where the selective absorption of the constituents by the column packing causes characteristic delays in traversal time, thus separating the constituents. The column is packed with fine-grain (25-micron) particles of uniform size that are held in place by electronically machined, sintered stainless-steel plugs that allow the gas to pass through while retaining the particles. The small volume of gas from the microcolumn is passed through a subminiature detector that compares the conductivity of the carrier gas and sample with that of the carrier gas alone in separate chambers. Each chamber is equipped with a platinum-rhodium thermal conductivity element hot wire 0.012-inch long and 10^{-5}-inch in diameter, each forming half of a ratio arm of a Wheatstone bridge. Chamber volume is 0.1 microliter and power drain is only 0.5 milliwatt.

Notes:

1. A microcolumn three inches long will separate certain compound constituents in one second with a carrier gas flow rate of only one milliliter per minute. A typical prior art column would be 10 feet long, require a carrier gas flow rate of 60 milliliters per minute, and require 10 minutes to effect the same separation.
2. In extraterrestrial exploration, the system could be used with a mass spectrometer for the detection of life-supporting compounds.
3. Inquiries concerning this invention may be directed to:

   Technology Utilization Officer
   Jet Propulsion Laboratory
   4800 Oak Grove Drive
   Pasadena, California, 91103
   Reference: B66-10182

Patent status:

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

Source: W. F. Wilhite
(JPL-735, 736, 737, and 740)

Category 01