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AEC-NASA TECH BRIEF

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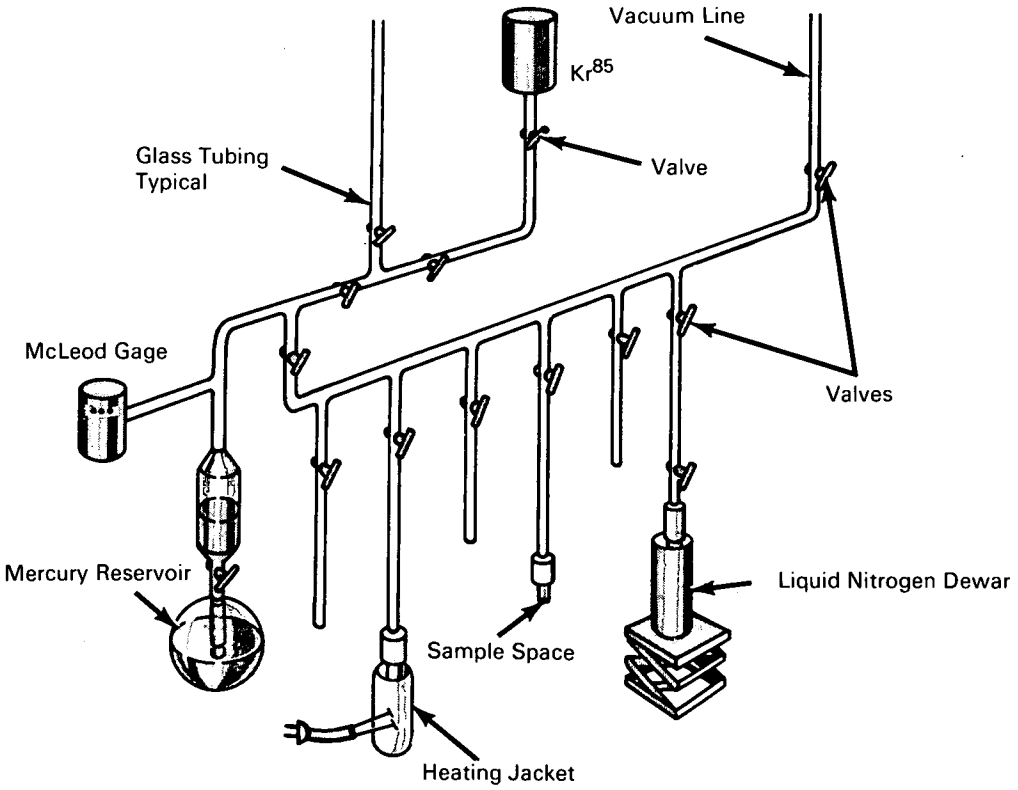
Radioactive Method Enables Determination of Surface Areas Rapidly and Accurately



The problem:

Reaction rates of processes such as oxidation and sublimation are dependent on the exposed surface areas available as sites for reaction. The common laboratory methods of determining the surface areas of materials are time consuming since only one sample can be tested per setup and each setup requires calibration. When surface areas of many samples of materials such as graphite, ceramics, and metals have to be determined on a daily basis, a more rapid and accurate process is required.

The solution:

A technique which utilizes the adsorption of radioactive krypton (95% krypton–5% Kr^{85}). Measurement of the activity of Kr^{85} in counts per minute is directly related to the sample surface area.

(continued overleaf)

How it's done:

In the apparatus shown, six sample area determinations can be made simultaneously. The sample is heated to 300°F and evacuated to a pressure of 10^{-3} mm of mercury. The heating is continued for one half hour. The sample is then cooled to room temperature and then to liquid nitrogen temperature by placing a dewar of N_2 around the sample flask. The radioactive krypton is admitted to the samples to a pressure of about 1 mm of Hg. This pressure is maintained as adsorption continues by diminishing the system volume through the admission of mercury from the mercury reservoir.

When adsorption equilibrium has been established, as indicated by constancy of the pressure measurements, each sample is removed and scanned using a sodium iodide scintillation counter to determine the number of counts per minute. The number of Kr^{85} counts per minute is related to the sample surface area by a predetermined proportionality constant. Using this procedure and apparatus, 12 surface area determinations can be made per 8 hours. This can be increased by increasing the number of sample containers.

Note:

Inquiries concerning this innovation may be directed to:

Technology Utilization Officer
AEC–NASA Space Nuclear Propulsion Office
U.S. Atomic Energy Commission
Washington, D.C. 20545
Reference: B66-10710

Patent status:

No patent action is contemplated by AEC or NASA.

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