

High Speed Thermometry

A "sonic thermometer," useful in the study of shock waves and in wind tunnel investigations in regions of subsonic flow, has been developed which permits measurement of the temperature behind a traveling shock wave with a high degree of accuracy. Measurements of temperature, velocity, pressure, and density of a flowing gas, especially under transient conditions, are of interest to workers in aerodynamics and ballistics. Well developed methods for determining pressure and density have been known for some time, but the measurement of temperature and velocity in an interval of a few microseconds has posed a difficult problem.

A quartz crystal, inlaid in the wall of the flow channel so that a smooth, unbroken surface is presented to the gas, is excited at its resonant frequency by a medium-power oscillator, and emits a beam of plane ultrasonic waves which cross the gas stream to the opposite wall where they are absorbed in an inlaid stratum of felt or other dissipative material. A pulse of light from a high-intensity spark source traverses the beam at right angles and then falls on a photographic plate, making a shadow picture of the ultrasonic waves and any shocks, turbulence, or vorticity which may be present in the gas stream. Since the velocity of sound in a gas depends on temperature only, a wavelength measurement on the developed plate, combined with the known frequency, will permit calculation of the temperature.

Because the gas is streaming past the crystal, each wave emitted by the latter is carried parallel to itself downstream a short distance before the next wave appears, so that the beam boundaries are deviated from the perpendicular to the crystal face. The tangent of the angle between the beam boundary and the crystal normal is theoretically equal to the Mach number, but the precision of this determination is poor because of diffraction. The instrument permits temperature measurements accurate to about three percent; the particle velocity can also be determined, but with much poorer accuracy.

D.G.M.

A Method for the Instantaneous Measurement of Velocity and Pressure. By D. G. Marlow, C. R. Nisewanger, and W. M. Cady. *J. App. Phys.* 20: 771, August, 1949.

Chips

A microplaner, helpful in studying diffusion in metals, has been developed which will take as many as fifty cuts per millimeter from a sample. Tiny chips weighing as little as one tenth of a microgram may be removed for analysis from any sample with an approximately plane surface. The almost invisible chip is picked up by an electrified quartz fiber and a centrifuge transfers it to a capillary for annealing. A precision x-ray diffraction photograph is then made in a vacuum camera.

Such methods are best for analyzing most binary solid solutions, although microcolorimetry and spectroscopy are possible. The device may also be used in studying the composition gradients in meteorites to throw light on the time-temperature history of these interesting objects. The microplaner may be useful as well in obtaining samples for x-ray diffraction and structure analysis from intermediate phases formed by diffusion between pairs of elements.

C.S.S.

Microsampling and Microanalysis of Metals. By Donald F. Clifton and Cyril S. Smith. *Rev. Sci. Inst.* 20: 583, August, 1949.

Tritium Target

When a triton reacts with a deuteron there are produced an alpha particle, a neutron, and an energy release of approximately seventeen million electron volts. The importance of this reaction as a source of fast, single energy neutrons would be greatly enhanced if a convenient method could be found of using tritium so that the loss of the isotope might be reduced to a value consistent with its rarity. This paper describes the results of a search for a stable, tritium-containing target for use with a low voltage Cockcroft-Walton accelerator.

Various methods of producing such a target were considered, and of those tried the most successful was the use of metal-hydrogen systems. Although there is much literature on the subject, it largely concerns equilibrium systems under hydrogen gas pressure, a situation not at all similar to the target problem. Methods for preparing metal-tritium systems reaching atomic ratios of approximately one are described for both tantalum and zirconium. Results of using such targets are given, and the precautions necessary to minimize tritium loss are discussed.

E.R.G.

Preparation and Use of Tritium and Deuterium Targets. By E. R. Graves, A. A. Rodrigues, M. Goldblatt, and D. I. Meyer. *Rev. Sci. Inst.* 20: 579, August, 1949.