September 1969 Brief 69-10411

AEC-NASA TECH BRIEF

Hydrogen Flash Lamps Studied

Many hydrogen-filled lamps were tested recently for determination of the effect of each of several parameters on the intensity and shape of the radiation pulse (*1*). The parameters were gas pressure, type of gas (hydrogen or deuterium), tube voltage, and electrode gap. A flash lamp was designed and built that is simple, inexpensive, and easily disassembled.

Hydrogen-filled lamps have many favorable characteristics as sources of pulsed radiation; their light flashes can be made extremely fast (to decay in less than 1 nsec), and the spectral distribution of the radiation from these flashes contains a continuum from about 4000 Å to about 1600 Å. Several earlier investigations, of specific characteristics of hydrogen-filled lamps, were of limited scope.

For many years a hydrogen-filled flash lamp was used by the authors, in a fluorescence decay-time apparatus, as a source of fast radiation pulses to excite scintillation solutions. Since their equipment was well suited for measuring the decay time of very fast pulses over a wide spectral range, the parameters that affect the speed and brightness of the flashes, and the interrelation of the characteristics of the radiation pulse, were studied. The purpose of these investigations was clearer understanding of how the various parameters affect operation of these tubes, so that an efficient and inexpensive flash tube could be designed. Moreover, a troublesome feature of radiation pulses from flash tubes (the slow component) was studied and minimized.

The characteristics were (1) the relative intensity of the flash as a function of wavelength, (2) the decay time of the pulse as a function of the gas pressure and type of gas, and (3) the relative intensity of the long component (the longtail). The variable parameters were the type of gas, the gas pressure, gap spacing, the voltage across the thyratron, and the material of the electrodes. More than 50 flash tubes were assembled and tested.

The results show that deuterium-filled tubes, with 2-mm gaps, emit about 65 ± 10% more photons per discharge than do similarly operated hydrogen-filled tubes. The parameters favorable for high-intensity discharge are wide gap with deuterium filling instead of hydrogen; for a rapid discharge, high pressure and voltage.

Reference:

1. I. B. Berlman, O. J. Steingrager, and M. J. Benson, "Hydrogen flash lamps" (Argonne National Laboratory, August 1967).

Notes:

1. This information may interest designers or manufacturers of electrooptical devices.
2. Inquiries concerning this innovation may be directed to:

Office of Industrial Cooperation
Argonne National Laboratory
9700 South Cass Avenue
Argonne, Illinois 60439
Reference: B69-10411
Source: I. B. Berlman, O. J. Steingrager, and M. J. Benson
Radiological Physics Division
(ARG-10419)

Patent status:

Inquiries concerning rights for commercial use of this innovation may be made to:

Mr. George H. Lee, Chief
Chicago Patent Group
U.S. Atomic Energy Commission
Chicago Operations Office
9800 South Cass Avenue
Argonne, Illinois 60439

Category 02