

with measurements of the melting points by Giguère and Maass², and by Kubaschewski and Weber³. We have tested two other concentrations, 45.5 per cent w/w and 80 per cent w/w as these showed a similar behaviour, crystallization taking place at $141 \pm 10^\circ$ K. and $157 \pm 10^\circ$ K. respectively. The melting points of these two concentrations were found to be $222 \pm 5^\circ$ K. and $215 \pm 5^\circ$ K., in agreement with published measurements^{2,3}. In all the glass samples the cracks annealed out between 130 and 155° K., that is, before the crystallization took place.

Tests of glass formation were also made using deuterium peroxide, obtained from Laval University. The concentration used was 80 per cent w/w, with 99 per cent deuterium. It was found that a stable glass was produced as above, both in spheres and in a glass tube. Giguère and Secco⁶ have also reported the formation of glasses in deuterium peroxide, but on storing in liquid air for 10 min. they found a spontaneous conversion to crystallization. We have not found this effect and cannot explain the difference between the two results.

These observations were obtained during experiments involving ultra-violet irradiation of hydrogen peroxide-water solutions at 90° K. for electron spin resonance spectroscopy⁷.

The potassium permanganate titrations were performed by Mr. J. M. Richards of this Department. We wish to acknowledge helpful discussions with Mr. R. H. Banfield of Laporte Chemicals, Ltd., and, in particular, for his suggestion of an examination of the eutectic mixtures. The hydrogen peroxide for these measurements was kindly supplied by Laporte Chemicals, Ltd. The deuterium peroxide was given to us by Prof. P. A. Giguère of Laval University, Quebec. This work was supported by the British Empire Cancer Campaign, for the assistance of which we express grateful thanks.

ROBERT C. SMITH
S. J. WYARD

Department of Physics,
Guy's Hospital Medical School,
London.

¹ Livingston, R., and Zeldes, H., *J. Chem. Phys.*, **30**, 40 (1959).

² Giguère, P. A., and Maass, O., *Canad. J. Res.*, **18**, B, 66 (1940).

³ Kubaschewski, O., and Weber, W., *Z. Elektrochem.*, **54**, 200 (1950).

⁴ Cooper, K. A., and Watkinson, J. G., *Trans. Farad. Soc.*, **53**, 635 (1957).

⁵ Bolz, L. H., Mauer, F. A., and Peiser, H. S., as reported in "Formation and Trapping of Free Radicals", edit. by Bass, A. M., and Broda, H. P., 322 (Academic Press, New York and London, 1960).

⁶ Giguère, P. A., and Secco, E. A., *Canad. J. Chem.*, **32**, 550 (1954).

⁷ Smith, R. C., and Wyard, S. J., *Nature*, **186**, 226 (1960).

A Spectrometer for the Far Infra-red

A SPECTROMETER based on a Fresnel zone plate as the focusing and dispersing element has been constructed for use with infra-red radiation between 35μ and 80μ .

The instrument is intrinsically simple. A heated nichrome coil and a Fresnel zone plate are mounted on opposite ends of a 4-m. *I*-beam so that the zone plate produces a series of monochromatic images of the source disposed along the axis of the instrument. A bolometer detector mounted on a carriage moves

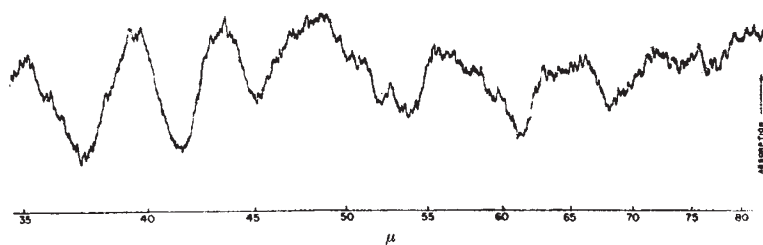


Fig. 1

along a straight track attached to the *I*-beam so as to scan the spectrum. A light chopper in front of the source uses alternating open holes and potassium bromide windows to eliminate virtually all but first-order spectra from the signal. The sample cell is located in the light path close to the source.

The zone plate is of the reflecting type, containing 234 half-wave Fresnel zones. The surfaces of the even-numbered zones are raised 12.5μ above those of the odd-numbered zones to give a maximum optical efficiency at 50μ . The zone radii are calculated to make the system free from spherical aberration at 68μ and to give the zone plate a focal length of 73.5 cm. at that wave-length.

The zone plate focuses a monochromatic image of the source directly on the bolometer element with no intervening collimating mirrors, or movable slits, as in a grating spectrometer. The simplicity of this design leads to ease of construction and good light-gathering power. Fig. 1 shows the absorption spectrum of atmospheric water vapour.

Patents have been applied for.

We wish to thank the Trans Mountain Oil Pipe Line Co. and its president, Dr. D. M. Morrison, for a grant which made possible the construction of this instrument.

R. H. WRIGHT
P. N. DAYKIN

British Columbia Research Council,
Vancouver 8, B.C.

Elimination of a Glow Discharge in an Induction-heated Vacuum Furnace

RECENTLY, J. P. Burden¹ discussed the elimination of a glow discharge in induction-heated vacuum furnaces. As Burden indicated, the glow discharge is troublesome because it robs energy. In addition, in vacuum analysis systems, the discharge is often intolerable because of the consequent evolution of gases from glass furnace parts.

For the past three years, an almost perfect method of eliminating the glow discharge has been employed in this Laboratory. It was found that a small horseshoe permanent magnet placed near the glass furnace wall prevents the initiation of a discharge, or immediately quenches a discharge once started. The exact position of the magnet varies slightly, and must be determined empirically, but is about one centimetre or less from the furnace wall. The system to which the magnet 'trick' has been applied is a conventional vacuum fusion analysis apparatus with an all-glass, air-cooled furnace² inductively heated by a 2.5-kW., 500-kc. oscillator. The idea of using a magnet in the manner indicated was suggested by the common