the contact potential changed to 0·64 eV., but after cleaning the two electrodes returned to 0·55 eV. If the work function of tungsten is assumed to be 4·52 eV.[6,7], then the work function of the uranium carbide is 3·97 ± 0·015 eV. This result cannot be compared directly with the two previous measurements since it represents an arithmetic average over the area of any high and low work function patches on the cathode and also refers to the temperature inside the tube (about 300° K.). The previous measurements are thermionic work functions true only at 0° K. If the normal positive temperature coefficient of the work function is assumed for uranium carbide only the results of Haas and Jensen (2·94 eV.) are compatible with the present measurement.

The properties of uranium carbide are thought to vary according to the mode of preparation and subsequent treatment. Uranium, oxygen, nitrogen and uranium oxide are all possible contaminants. During the high-temperature treatment of the cathode mentioned previously it is probable that these impurities were removed since the oxide is known to decompose at temperatures in excess of 1,800° C. and uranium has a vapour pressure of 0·03 mm. mercury at 2,000°C. In spite of this the probability that values quoted for the work function of uranium carbide in this and the previous work are characteristic of a pure compound is not high. While variations of the order of tenths of an electron volt from cathode to cathode would be regarded as normal with a thermionic emitter, larger deviations must be expected until workers can be more confident in the homogeneity of their surfaces. Further, this report is based on measurements from a single experimental tube; as soon as data are available from other tubes a fuller account of this work will be published elsewhere.

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Gamma-Ray Spectrum obtained with a Lithium-drifted *p–i–n* Junction in Germanium

Pulse-height spectra from lithium-drifted *p-i-n* junctions in silicon, irradiated by γ-rays, have been published[1]. The photopeaks in these spectra are from about 1/20 to about 1/100 the height of the Compton distribution, rendering useful γ-ray spectroscopy difficult. The photoelectric cross-section varies as Z^5, where Z is the atomic number of the absorbing element, the Compton cross-section varying as Z. Thus a high atomic number-absorbing medium will produce more useful γ-ray spectra.

This communication reports on pulse-height spectra obtained from lithium-drifted *p-i-n* junctions in germanium, for which the atomic number is 32 compared with 14 for silicon. Lithium-drifted *p-i-n* junctions were prepared in germanium using a technique similar to that used by other workers[2] in silicon. Lithium was initially diffused into 6Ω-cm. *p*-type germanium from the vapour phase at a temperature of 350° C. for 2 min. The ion-drift process was carried out in air at an average temperature of 70° C. and an average reverse bias of 25 V. Fig. 1 shows the pulse-height spectrum obtained from one of these junctions exposed to the 663-keV. γ-rays from cæsium-137. The junction was 1·5 cm.² in area and the depletion region or active region had a thickness of 1·5 mm. at the operating voltage of 12 V. The junction was cooled to liquid-air temperature and the reverse current at this temperature was less than 10^{-8} amp. The pulses were amplified by a standard '1430 *A*.' Dynatron Ltd. amplifier and the pulse-height spectrum obtained with a single channel pulse-height analyser and scaler. The channel width was 1 V.

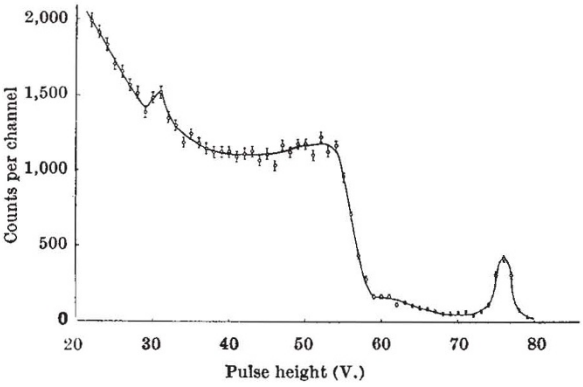

Fig. 1. Pulse-height spectrum from a *p-i-n* junction in germanium due to 663 keV. γ-rays from cæsium-137

The photopeak in Fig. 1 exhibits a line width (full width at half-maximum height) of 21 keV. giving a resolution for the 663 keV. γ-ray of cæsium-137 of 3·2 per cent. It can be seen from Fig. 1 that the height of the photopeak is about one-third that of the edge of the Compton distribution. The ratio of the pulse heights at the photopeak and the point halfway up the Compton edge differed from the theoretical value by less than 4 per cent.

Measurements of the total noise due to the junction and to the amplifier and of the noise due to the amplifier alone revealed no measurable noise contribution from the junction. Contributions to the width of the photopeak other than amplifier noise and the finite channel width of the pulse height analyser were smaller than the errors in the measurements.

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