energy of the H-bridge equal to 6 to 7 kcal./mole, as one might expect. This is an additional effect which is superposed on structure relaxation that is typical for all liquids. A comprehensive report will be published soon.[8]

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Mobility of Electrons and Holes in Diamond*

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THE mobility of electrons and holes in a diamond crystal counter has been measured using a method somewhat similar to that of McKay.[1] The range of the carriers (either holes or electrons), released by α-particles entering through one electrode, and the rise time of the pulses were measured in an unpolarized sample 2 mm thick. Polarization was eliminated by illuminating the sample with ultraviolet light from a mercury arc, with no field applied, immediately before measurements were taken. During the time measurements were taken no appreciable polarization charge accumulated.

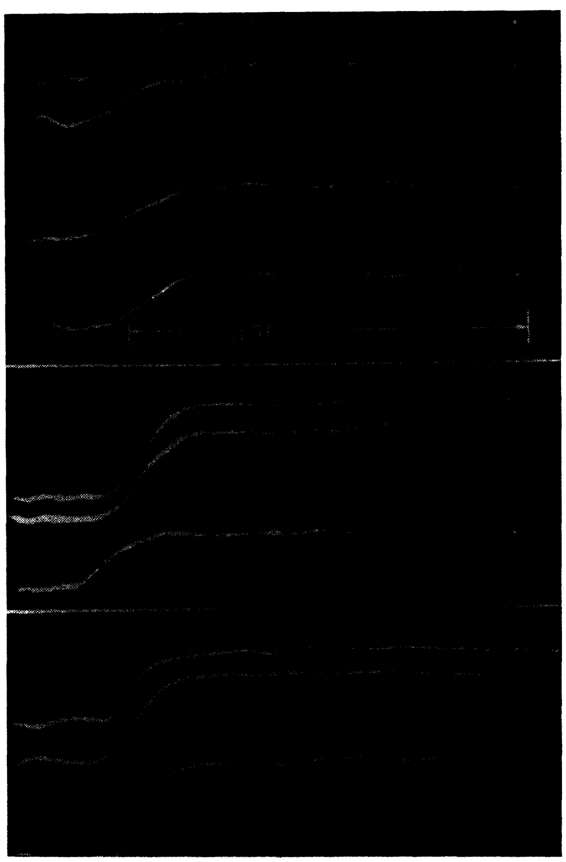

FIG. 1. Electron pulses in diamond. Top: 300 volts across crystal; center: 1200 volts across crystal; bottom: 5000 volts across crystal. Crystal thickness: 2 mm.

The value of range was obtained by measurements of the variation of pulse height with applied voltage. Fields up to 25,000 volt/cm were used. The results give:

$$\text{electrons: } \mu T = 3.5\times 10^{-5} \pm 10\% \text{ cm}^2/\text{volt}$$
$$\text{holes: } \mu T = 3.8\times 10^{-5} \pm 15\% \text{ cm}^2/\text{volt},$$

where μ = mobility, T = mean free time.

Pulse rise times at various voltages were measured from photographs (Fig. 1) of pulses displayed on a cathode-ray oscilloscope. Delay line amplifiers with an over-all rise time (20 to 80 percent) of 0.009 μsec. were used to amplify the pulses in order to display them on the oscilloscope which had characteristics similar to that described by Kelley.[2] The rise time-voltage dependence for electrons was as expected and gave a value $T = 0.009 \pm 10$ percent μsec. The dependence for holes deviates from expectation at higher values of voltage. In the low voltage region, where the behavior appeared normal, the value for holes was $T = 0.008 \pm 15$ percent.

From the values of μT and T the mobility values are:

$$\text{electrons: } \mu = 3900 \pm 15\% \text{ cm}^2/\text{sec.-volt},$$
$$\text{holes: } \mu = 4800 \pm 20\% \text{ cm}^2/\text{sec.-volt}.$$

Preliminary measurements for electrons have been obtained on a second diamond 1.98 mm thick. For this sample both the range and free time are less than for the first diamond. The value of free time was therefore less accurate since the pulse rise times differed less from the amplifier rise time. Results for electrons are

$$\mu T = 2.1\times 10^{-5} \text{ cm}^2/\text{volt} \quad \text{and} \quad T = 0.0076\,\mu\text{sec}.$$

Thus $\mu = 2760$ cm²/sec.-volt with an estimated error considerably greater than that on the first value.

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Upper Limit on the Cross Section for the Scattering of Neutrinos*

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SEVERAL previous experiments have been performed to attempt to detect the scattering of neutrinos. Crane[1] has given a summary of such results. In an experiment very similar to the author's, Nahmias[2] has set the lowest upper limit of 10^{-30} cm²/atom in air. The present availability of tritium in large quantities seemed to make it possible to set a better value for the upper limit of the cross section.

A Geiger counter was used for detection of the neutrinos. It was assumed that any ionizing event in the counter gas due to neutrinos would give a count. The source of neutrinos was 5 curies of tritium.

The procedure was to count alternately with the tritium placed alongside the counter for several hours and then count with the tritium removed to a considerable distance for several hours. Many trials were made of the background counting rate and of the gross counting rate of background plus neutrinos, always alternating between the two.

In each of the two experiments performed, it was found that the net counting rate was less than the probable error computed by statistical means. It was assumed that any counting rate greater than the probable error could have been detected, and an upper limit on the cross section was computed.

Using a Geiger counter filled with neon at 10 cm Hg pressure, a gross counting rate of (23.45 ± 0.10) counts/min. and a background counting rate of (23.63 ± 0.11) counts/min. were obtained. This gave a net counting rate of (-0.18 ± 0.21) count/min. Assuming that any counting rate greater than 0.21 count/min.

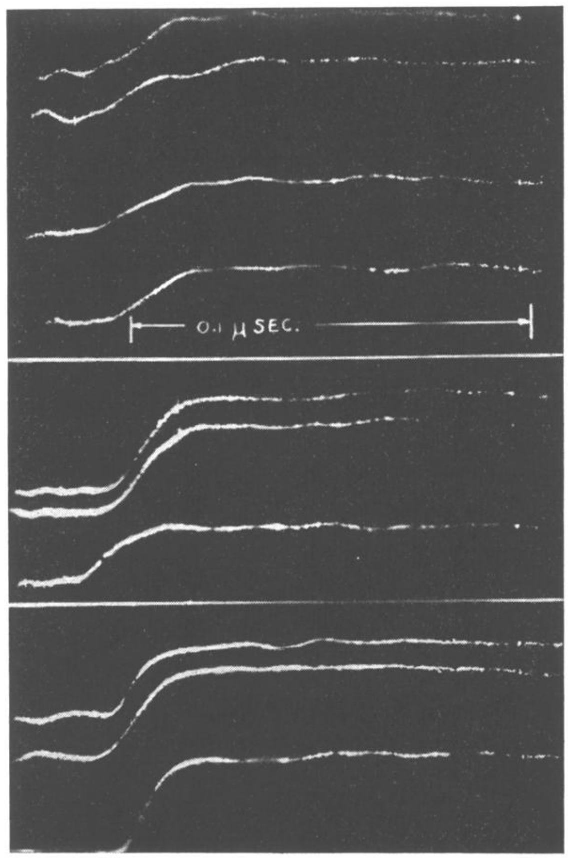

FIG. 1. Electron pulses in diamond. Top: 300 volts across crystal; center: 1200 volts across crystal; bottom: 5000 volts across crystal. Crystal thickness: 2 mm.