Estimates have been made of the mobility of carriers in microcrystalline selenium with carrier densities based on the capacity of rectifiers. In view of the failure of rectifier theory to explain the observed results in selenium rectifiers and the demonstration of the presence of selenides at the intersurfaces of such rectifiers,[2] the results are considered unreliable. The existence of grain boundary resistance in the case of microcrystalline selenium can readily explain the large difference in mobilities of such samples and single crystals.

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Production of C^{15}

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THE bombardment of C^{14} with deuterons has been shown to yield d,n and d,α reactions, both of which were recently reported.[1] We have utilized the larger generator of the Carnegie Institution of Washington to make bombardments with deuterons of energy up to 2.8 Mev in order to look for the $C^{14}(d,p)C^{15}$ reaction. The mass estimated for C^{15} is[2] 15.0165, which would indicate that this reaction would have a Q-value of about -2 Mev.

A target of $BaCO_3$ (containing about 40 percent C^{14}), of weight about 400 $\mu g/cm^2$, was used in our bombardments.[3] A preliminary check showed that, when bombarding with deuterons of 2.4-Mev energy, a beta-emitter of half-life much greater than that of B^{12} was also formed. We were able to measure the half-life by simply following the activity of the target with a stop-watch; counts were recorded after the bombarding beam had been shut off for varying lengths of time. The results of these observations are shown in Fig. 1, where the data for three separate runs have been combined and averaged. All of the sets of data indicated a half-life of 2.4 seconds, with an estimated error of about 0.3 second. Some scatter in the points is probably caused by non-uniformity of the target and slight variations in bombarding current.

When it was established that the half-life is so much greater than that of B^{12} (formed in the competing (d,α) reaction) it was possible to make absorption measurements on the beta-rays from C^{15} decay—again by taking observations directly after bombardment was stopped. It was found that the extrapolated end point of the beta-ray spectrum corresponds to 4.6 g/cm² of aluminum absorber; this would indicate a beta-ray energy of 8.8 Mev, with a tentatively estimated error of about 0.5 Mev. This value of the energy, together with the half-life measurement, indicates that the postulated $C^{15}-N^{15}$ decay is a first-forbidden transition.

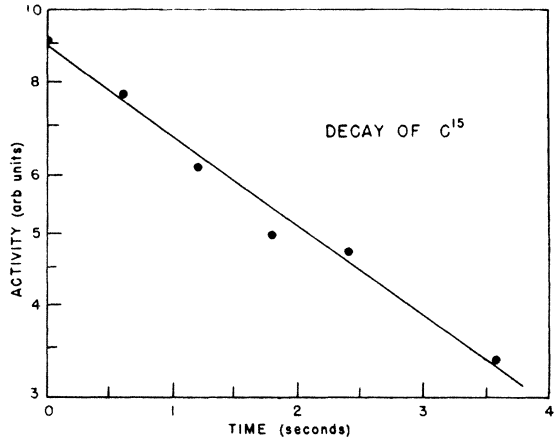

FIG. 1. Activity of C^{15} as measured by counting of beta-rays emitted at various times following deuteron bombardment of C^{14}.

We have also obtained a rough excitation curve; it rises smoothly with increasing energy of deuterons in the region from 1.4 to 2.8 Mev, except for some indication of a resonance at about 1.9 Mev. This, however, must be confirmed.

The calculated mass of C^{15}, based on the beta-ray data, is 15.01434, which makes the Q-value for $C^{14}(d,p)C^{15}$ only slightly negative. However, decay of C^{15} may not be to the ground state of N^{15}, which would alter this mass value as calculated. Indeed, we have some evidence for delayed gamma-emission.

Bombardment of normal $BaCO_3$ was also made, and no beta-emitter of appreciable intensity and of half-life comparable to 2.4 seconds was observed.

More complete details of this investigation will be published in the near future.

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[3] Target material was obtained from Oak Ridge; the estimated value of enrichment was supplied by L. D. Norris (private communication).

Dependence of the F^{19} Nuclear Resonance Position on Chemical Compound*

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MOST unexpectedly, it has been found that for F^{19} the value of the applied magnetic field H_0 for nuclear magnetic resonance at a fixed radiofrequency depends on the chemical compound containing the fluorine nucleus. The assumption has generally been made that the time average of all internal magnetic fields is zero, excluding of course the small diamagnetic field at the nucleus due to the Larmor precession of its atomic electrons in H_0. Nuclear resonance shifts in metals,[1] interpreted as being due to the conduction electrons, are larger by about an order of magnitude than those reported here.[2]

To investigate the effect in fluorine, two identical magnetic resonance absorption bridges,[3] both fed by the same oscillator, were employed. The two sample holders were placed side by side in the magnet so that the F^{19} resonance traces occurred simultaneously on separate recording milliammeters. This "null" method allows a precision of about 0.0005 percent of the applied field in measuring relative shifts of resonance position and has been used by the author in measuring such shifts due to the addition of paramagnetic ions.

The maximum separation of F^{19} resonances observed so far is 1.05 gauss (see Fig. 1) for $C_2F_3Cl_3$ (freon 113) and BeF_2 in a magnetic field $H_0 \approx 7000$ gauss, the freon resonance coming at the lower *applied* field. Although the resonances in SbF_3 and BeF_2 are separated by 0.99 gauss when observed in separate samples, the separation reduces to 0.82 gauss for a mixture of the two compounds (see Fig. 2). On the other hand, the resonances in SbF_3 and HF are separated by 0.83 gauss in separate samples, but a half and half mixture of the two results in a single resonance located halfway between the positions where the separate resonances would be expected. Increasing the relative amount of SbF_3 shifts