The Beta-Spectrum of O^{15}*

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O^{15} HAS long been known to be a positron emitter,[1] but its short half-life has hitherto prevented an accurate measurement of the spectrum. Using a hollow probe[2] and a beta-spectrometer for gaseous emitters,[3] this spectrum has now been obtained.

Oxygen[15] was produced by the $N^{14}(d,n)$ reaction using nitrogen gas continuously circulated. The gas passes through the probe and is bombarded through a thin window by 8 Mev deuterons, the current being about 15 microamp. It is then pumped to a disintegration chamber along with the gaseous products of the bombardment, and recirculated.

Six decay curves were taken over a period of 10 half-lives (covering a counting rate variation of 1000), by alternately counting and waiting for 30 sec. periods, beginning 30 sec. after the end of the bombardment. A simple decay curve, corrected for counter background and deadtime, is shown in Fig. 1. The half-life of O^{15} as obtained from the entire series is 118.0 ± 0.7 sec., which is somewhat lower than previous values.[4,5] The linearity of the logarithmic plot of the decay curve indicates that only one activity is present, as would be expected on the basis of the isotopic abundances and relative cross sections involved in the competing reactions.

For the measurement of the energy spectrum, the bombarded gas was pumped through a source chamber, which was fitted with a thin Cellophane window and inserted into a semicircular focusing magnetic spectrometer. The amount of activity in the source chamber so used was monitored by placing a counter next to the pumping line about 5 cm from the chamber. By subtracting backgrounds and taking the ratio of the counts by the spectrometer counter to those by the monitor counter as the magnetic field was varied, the O^{15} spectrum was obtained.

The resulting Fermi plot is shown in Fig. 2. This gives an end point (corrected for the source window absorption at high energies) of 1.683 ± 0.005 Mev, which is in good agreement with the results of cloud chamber[1] and absorption measurements.[5] The graph shown is the result of four runs, normalized to the same value in the intermediate energy region (400–800 kev). The Fermi plot is essentially linear down to an energy of about 300 kev. Below this energy, it deviates sharply. This could be due to an additional group of beta-rays, but is more probably caused by the thickness of the gaseous source (about 0.7 mg/cm²) and window (about 2.5 mg/cm²). Calculations carried out on the basis of the experiments of White and Millington[6] indicate that the straggling of the beta-particles in their passage through this window should produce a perceptible excess of low energy positrons at about 300 kev, as observed. We conclude that the spectrum is of the allowed type. The *ft.* value calculated from $E_0=1.683$ Mev, $\gamma_{\frac{1}{2}}=119.0$ sec., and $Z=7$, is 3910 which would tend to confirm this result.

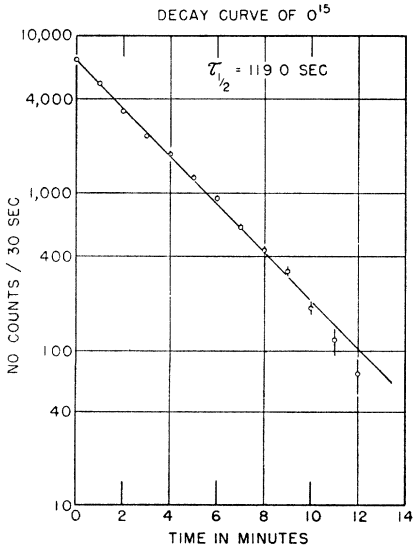

FIG. 1. Decay curve of O^{15}. Each point represents number of counts over a 30 sec. period, corrected for background and counter deadtime. When the statistical error is greater than the size of the points, it is shown by the vertical lines.

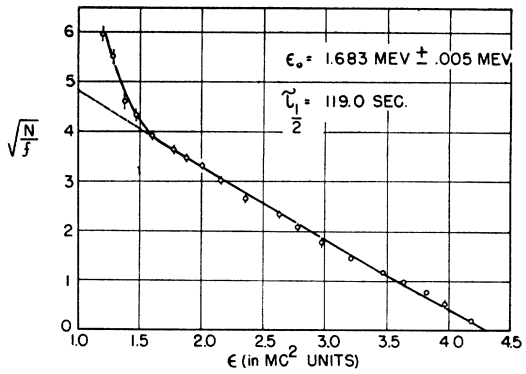

FIG. 2. Kurie plot of the O^{15} spectrum. ϵ is the total energy (rest and kinetic) in units of Mc^2. N is the number of electrons per unit momentum interval. f is the Fermi function $\eta^2F(z,\eta)$. $(N/f)^{\frac{1}{2}}$ is plotted in arbitrary units. Where the statistical error is greater than the size of the points, it is shown by vertical lines.

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[1] Fowler, Delsasso, Lauritsen, Phys. Rev. **49**, 561 (1936).
[2] H. Brown and V. Perez-Mendez, Phys. Rev. **75**, 1286 (1949).
[3] H. Brown and V. Perez-Mendez, Phys. Rev. **75**, 1276 (1949).
[4] W. Bethe and W. Gentner, Zeits. f. Physik **112**, 45 (1939).
[5] Sherr, Meuther, and White, Phys. Rev. **75**, 282 (1949).
[6] White and Millington, Proc. Roy. Soc. A **120**, 701 (1928).

Erratum: The Production of Mesons by Photons and Electrons

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THE Editor regrets that, due to an oversight, certain changes which the authors of the above article had requested were not made. The title should have read, "The Production of Positive Mesons by Photons and Electrons." The following note should have been added to the paper:

"The above discussion applies only to the production of positive mesons where the corrections due to the neglect of the relativistic terms in the meson-nucleon Hamiltonian that we have made are unimportant. In the production of negative mesons this is not true, as has been pointed out to us by M. L. Goldberger, so that even at threshold there is a larger production of negative pseudoscalar mesons than positive pseudoscalar mesons. This correction is of the order of μ_0/M and therefore can be appreciable."