nuclei in emulsion and for lead, and corresponding solutions $\bar{n}(E)$ are being computed in an investigation of the effect of mass number of the target nucleus. It is hoped that a complete account can be published shortly.

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Half-Life and Radiations of Tc^{100}

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SEVERAL years ago a preliminary report[1] was made on an 80±10-second activity which appeared to follow the chemistry of technetium. Subsequent 14-Mev deuteron and 7-Mev proton bombardments of 90.2 percent Mo^{100} by the present senior author, however, showed the half-life to be 70±2 sec, and the charged particle energy to be 2.1±0.2 Mev. Magnetic deflection measurements, in addition, indicated these particles were positrons. Although positron emission in Tc^{100} was unexpected, the possibility of its occurrence could not be excluded since this radionuclide is isobaric with stable Mo^{100} as well as with Ru^{100}.

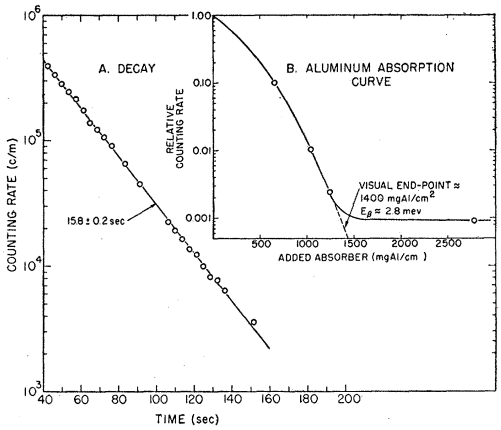

FIG. 1. A. Decay of gamma-radiations from Tc^{100} measured through 1.96 g Pb/cm². B. Aluminum absorption curve for 15.8-sec Tc^{100} constructed from isochrone on decays through varying thicknesses of aluminum.

Additional chemical tests were made, since the half-life and radiations of the ostensible technetium activity were very similar to those reported for F^{17} ($T_{\frac{1}{2}}$=69 sec; 2.1-Mev positrons). The rapid volatility procedure employed earlier to separate Tc from irradiated Mo^{100} metal was modified to include a separation of HF. The 70-second period was then found only in the fluoride fractions. Presumably the 70-sec F^{17} activity previously confused with technetium resulted from $(d, 2n)$ and (d, n) reactions on very small amounts of oxygen remaining in the probe target after the reduction of $Mo^{100}O_3$ to molybdenum metal with hydrogen.

Additional proton and deuteron irradiations of Mo^{100} were then made in a careful search for Tc^{100}. After chemistry no new technetium activities were observed with a Geiger counter, from which it was concluded that the half-life of Tc^{100} was either less than 30 seconds, or greater than several years. Because of the time required for chemistry, it was not possible to decide if a reported[2] 18-second beta-emitting activity produced in natural molybdenum by 7-Mev protons should be assigned to technetium. Recently, however, the preparation of Tc^{100} without the need for ultra-rapid chemical separations has become possible by reason of the availability of fractional gram amounts of long-lived, fission product Tc^{99}. Milligram amounts of purified Tc metal[3] and TcO_2 were irradiated with thermal neutrons for 20 to 30 second periods in the Oak Ridge graphite pile. The decay of the induced activity was measured through varying thicknesses of aluminum and lead using a mica end-window beta-proportional counter as a detector and strip chart recording. A typical decay curve of the gamma radiations is shown in Fig. 1A, while a rough aluminum absorption curve taken from an isochrone is given in Fig. 1B. It has been concluded that Tc^{100} decays with a 15.8±0.2 second half-life and that beta-rays of 2.8±0.2-Mev maximum energy are emitted together with gamma-radiations. Almost certainly the beta- and gamma-spectrum of Tc^{100} is complex.[4] Numerous levels in Ru^{100} have been seen in the decay of 20-hr Rh^{100}, while the logft value for 15.8-sec Tc^{100} is but 4.45 when it is assumed that no other beta-rays than the 2.8-Mev group occur in the decay. Quantitative measurements of the radiations of Tc^{100} are in progress.

A search was also made for a possible long-lived isomeric state of Tc^{100} with negative results. Ten milligrams of technetium metal were irradiated with slow neutrons until an integrated flux, nvt, of 1.8×10^{18} neutrons/cm², was accumulated. The irradiated metal was converted to pertechnetate, and the latter purified by anion exchange chromatography. Sources were prepared and examined within 32 hours after bombardment using a (Tl+Na)I scintillation spectrometer and a krypton-filler beta-proportional spectrometer. No quantum radiations other than those which could be attributed to very small amounts of 92.8-hr Re^{186} and 26.8-hr As^{76} impurity were seen. This finding appears to be consistent with the observed absence of Tc^{100} in mass spectrographically analyzed fission product Tc^{99}.[5]

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High Energy Photodisintegration of the Deuteron*

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RECENT experiments[1–3] on the photodisintegration of the deuteron by high energy quanta have indicated that above the meson threshold the cross section for this process rises appreciably over the photoelectric cross section of the phenomenological theory.[4,5] The excitation function and angular distribution in this region are of considerable interest in connection with meson theory and current speculation about an isobaric state of the nucleon. We therefore felt it desirable to extend to higher energy the measurements of Benedict and Woodward[1] who investigated the photodisintegration up to 160 Mev.

Bremsstrahlung from the Cornell 310-Mev electron synchrotron was allowed to strike equivalent targets of H_2O and D_2O. Charged particles emitted at a given laboratory angle were detected in a coincidence-anticoincidence counter telescope which defined their ranges and selected protons by means of their specific ionization. Figure 1 shows the ranges of angle and energy used for the experiment. By subtracting the H_2O count from the D_2O count, one obtains an effect that can be due only to the process $D(\gamma, n)p$, since the contribution from the oxygen cancels out and meson production cannot give recoil protons in the ranges selected. We have so far examined the disintegration produced by quanta of about 180 and 260 Mev in the laboratory, corresponding to 165 and 230 Mev in the center-of-mass system. The gamma flux was measured with an ionization chamber placed behind 1 cm of lead. This had previously been calibrated against a pair spectrometer[6] and by means of a shower curve analysis.[7] The estimated error