Letters to the Editor

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L-Converted Isomeric Transition*

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PRELIMINARY to an investigation of the activation of Ir by resonance neutrons, it seemed of interest to study the radiations associated with the 1.5 min. Ir activity produced by slow neutron capture[1] in Ir. These radiations had been previously believed to be β-rays, and on that basis an atomic activation cross section for thermal neutrons of 2×10^{-24} cm^2 was ascribed to this activity by Seren, Freidlander, and Turkel.[2] By studying the absorption in Be and Al of the radiations detected with a mica window Geiger counter we found, however, that they were largely x-rays of the L region of Ir. The main L emission lines of $_{77}$Ir and its neighbors, $_{76}$Os and $_{78}$Pt, are shown in Fig. 1, together with the K absorption edges of the elements from Fe–Se. There are three possible ways to account for such L radiation: (1) L electron capture in Ir leading to Os (L radiation of Os). (2) Internally converted isomeric transition in Ir (L radiation of Ir). (3) β-emission from Ir followed by a strongly internally converted γ-ray (L radiation of Pt). Number 3 could be excluded because no β-rays of an energy sufficiently high to be compatible with the short half-life of 1.5 min. could be found. To distinguish experimentally between the theoretically unlikely case number 1, and number 2, critical absorption measurements were made on the x-rays. Because of the wide spread in wave-length of the L radiations, it was important to isolate some of the L components for this work. This was accomplished by using a Zn filter (23.5 mg/cm^2) which practically completely removes all but the L III$-M$ V and L III$-M$ IV components of Ir and Os. These components were then shown to be more strongly absorbed in Cu than in Zn, indicating Ir L x-rays arising from the removal of an L III electron. The radiation filtered by 28.2 mg Cu/cm^2 was shown to be about equally well absorbed by further layers of Cu, Ni, or Fe, which excludes Os L x-rays.

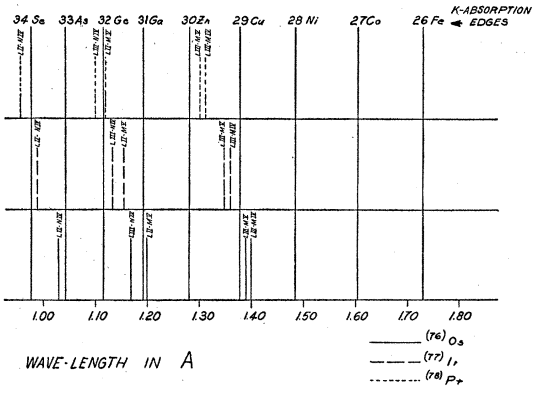

FIG. 1. The L emission lines of Os, Ir, Pt and the K absorption edges of the elements from Fe to Se.

In a few percent of the isomeric transitions unconverted γ-rays are emitted. Absorption in Pb and other elements shows that these are not homogeneous. An approximate energy of 60 Kev was obtained for the highest energy γ-rays present. Internal conversion electrons were detected with an ionization chamber, having a window equivalent to 1.5 mg Al/cm^2 in stopping power, and their energy compared with those from Co^{60} (10.7 min.).[3] In this manner a value of ~47 Kev was found for the internal conversion electrons of Ir. When the value of the Ir L work function is added, one obtains ~60 Kev as the energy of the isomeric transition, in agreement with the result deduced from Pb absorption for the hardest γ-rays. If we identify the excitation energy of the metastable state with this value it is definitely lower than the work function for a K-electron of Ir (76 Kev). The softer photons found have about one-half of the energy of the hard component. They are possibly due to "two-quantum" transitions.[4]

The atomic activation cross section of Ir (1.5 min.) for thermal neutrons can be estimated to be of the order of 100×10^{-24} cm^2. Unpublished experiments carried out at the Argonne Laboratory and at the University of Illinois make it probable that the 1.5 min. Ir activity is associated with a metastable state of Ir^{192} (70 d).

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[1] E. McMillan, M. Kamen, and S. Ruben, Phys. Rev. **52**, 375 (1937).
[2] L. Seren, H. N. Freidlander, and S. H. Turkel, Bull. Am. Phys. Soc. **22**, 6 (1947).
[3] M. Deutsch and L. G. Elliott, Phys. Rev. **62**, 588 (1942).
[4] See M. Goeppert-Maier, Ann. d. Physik **9**, 273 (1931); R. G. Sachs, Phys. Rev. **57**, 194 (1940).

Magnetic Moment of the Triton

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WE have measured the ratio of the nuclear g values of the triton and the proton by the method of nuclear induction.[1] Our experimental arrangement was a modification of those which have been used by Bloch, Hansen, and Packard,[1b,d] and by Purcell, Torrey, and Pound.[1a] We were able to observe the nuclear induction peaks of both the triton and the proton simultaneously on the same cathode-ray oscillograph screen while both these substances were in the same magnetic field.