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THE URANIUM ISOTOPE U^{236}

A. Ghiorso, J. W. Brittain. W. M. Manning, and
G. T. Seaborg

December 20, 1950

Berkeley, California

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THE URANIUM ISOTOPE U^{236}

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Argonne National Laboratory,+ Chicago, Illinois
December 20, 1950

Following the early observation[1] that U^{235} captures slow neutrons to an appreciable extent in competition with the fission reaction, an attempt was made to detect the expected alpha particles from the resultant U^{236} and the negative result led to the placement of a lower limit of 3×10^5 years for this half-life.[2] A little later the isotope U^{236} was detected with the mass spectrograph[3] in a sample of enriched U^{235} which had been irradiated with slow neutrons in the uranium chain reacting pile.

In the summer of 1945 a sample of enriched U^{235} which had been strongly irradiated with slow neutrons became available for measurements of the alpha radiation. It was estimated from the (n,γ) cross section for U^{235} and the amount of the neutron irradiation that the ratio of U^{236} to U^{235} in the sample should amount to approximately 1.7 percent. Measurements with the alpha pulse analyzer apparatus[4] on the chemically purified uranium indicated alpha particle activity of energy about 4.5 Mev (i.e., slightly greater than that of the main group of U^{235} alpha particles) with intensity about half as great as that of

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+Work performed under auspices of Manhattan District (Contract No. W-7401-eng-37) in 1945 at the then Metallurgical Laboratory (now Argonne National Laboratory).

the U^{235}. This corresponded to an alpha half-life for U^{236} of about 2×10^7 years. Measurements a little later on another sample similarly prepared containing approximately U^{236} by weight, led to the same result.

This alpha particle energy corresponds very well with that expected for U^{236} from the alpha systematics.[5] The half-life is just that expected for a nucleus of atomic number 92 of the even-even type, in which case the decay is not prohibited. The isotope U^{236} is, of course, expected to be beta stable.

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[1]Wilson, Williams, Segrè, and co-workers, unpublished work at the Los Alamos Scientific Laboratory (1943).

[2]H. Anderson and D. Nagle, Manhattan Project Metallurgical Laboratory report CP-1389, p. 10 (February, 1944).

[3]D. Williams and P. Yuster, Los Alamos Scientific Laboratory report LAMS-195 (January, 1945).

[4]Ghiorso, Jaffey, Robinson, and Weissbourd, National Nuclear Energy Series, Plutonium Project Record, Vol. 14B, "The Transuranium Elements: Research Papers," Paper No. 16.8 (McGraw-Hill Book Co., Inc., New York, New York, 1949).

[5]Perlman, Ghiorso, and Seaborg, Phys. Rev. 77, 26 (1950).