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NUCLEAR PROPERTIES OF 100256

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NUCLEAR PROPERTIES OF 100^{256}

G. R. Choppin, B. G. Harvey, S. G. Thompson, and A. Ghiorso

April 4, 1955

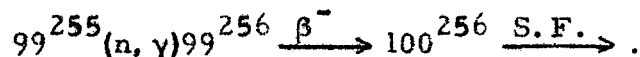
Nuclear Properties of 100^{256}

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April 4, 1955

The nuclide 100^{256} has been made by neutron irradiation of 99^{255} in the Materials Testing Reactor. One purpose of this experiment was to determine the most probable mass assignment of the isotope of element 101 which has been produced recently.¹

Since the irradiated sample had been made earlier from Pu^{239} by successive neutron captures,² it was principally 99^{253} . A short bombardment and fast chemical separation of the 100 fraction from the 99 fraction was used to minimize the amount of 100^{254} which would grow in from its 36-hour 99^{254} parent. The rapid chemical isolation was achieved by the use of precipitation and ion-exchange procedures.³ Even then 17,000 disintegrations of 7.2-Mev alpha particles of 100^{254} and several hundred of 7.1-Mev 100^{255} (from the β^- decay of 99^{255}) were observed with a gridded alpha ionization chamber and a 50-channel differential pulse-height analyzer. This prevented observation of the alpha particles of 100^{256} (predicted to be of the order of 6.9-Mev energy) which would be in much lower abundance. However, a total of 33 spontaneous fission events occurred in the 100 fraction which was well outside the probability of the number of such events (10.8 ± 3) expected from 100^{254} based on the measured alpha-to-spontaneous fission ratio of 1550 for this nuclide.⁴ The additional events are attributed to the nuclide 100^{256} . The spontaneous fission half-life was found to be approximately 3 to 4 hours (Fig: 1). The reaction sequence was:



The predicted value⁵ of the alpha half-life indicates that the alpha-to-spontaneous fission ratio of ${}_{100}^{256}$ must be on the order of 0.04. As the initial amount of ${}_{99}^{255}$ was known from the measured amount of ${}_{100}^{255}$ in equilibrium with it just prior to bombardment, the pile neutron capture cross section of ${}_{99}^{255}$ could be calculated to be about 40 barns. A similar experiment performed several months ago gave results which agreed with those reported here.

An irradiation of a small amount of ${}_{100}^{255}$ in an attempt to produce ${}_{100}^{256}$ gave one spontaneous fission probably attributable to this nuclide. This experiment set an upper limit of 100 barns on the capture cross section of ${}_{100}^{255}$.

Acknowledgment is due to the personnel of the Materials Testing Reactor for their valuable cooperation. We wish to express our appreciation of the continued interest of Dr. G. T. Seaborg.

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 2. G. R. Choppin, S. G. Thompson, A. Ghiorso, and B. G. Harvey, *Phys. Rev.* 94, 1080 (1954).
 3. S. G. Thompson, B. G. Harvey, G. R. Choppin, and G. T. Seaborg, *J. Am. Chem. Soc.* 76, 6229 (1954).
 4. Unpublished data from this laboratory.
 5. R. A. Glass, S. G. Thompson, and G. T. Seaborg, *J. of Inorganic and Nuclear Chemistry*, in press.

FIGURE CAPTION

Fig. 1. Spontaneous fission decay of 100^{256} .

