AECD - 2468
(LADC-569)



UNITED STATES ATOMIC ENERGY COMMISSION

# SEARCH FOR SHORT-LIVED Y, Zr, AND Cb FISSION PRODUCTS

by

Leon J. Brown
Seymour Katcoff

Los Alamos Scientific Laboratory



Date of Manuscript: August 13, 1948
Date Declassified: February 14, 1949



Technical Information Branch, Oak Ridge, Tennessee
AEC, Oak Ridge, Tenn., 4-25-49--850-A9525

Printed in U.S.A.
~~PRICE 5 CENTS~~

# SEARCH FOR SHORT-LIVED Y, Zr, AND Cb FISSION PRODUCTS

By Leon J. Brown and Seymour Katcoff

Table II of "Nuclei Formed in Fission," issued by the Plutonium Project,[1] is noteworthy for the great number of gaps it contains where one would expect fission products to exist. In most cases, these missing nuclei have not been identified yet because of their short half-lives and the relatively long time required for their chemical isolation. It has recently been shown[2] that in certain cases the chemical procedures can be shortened by effecting some separation of the fission products from each other during the bombardment by utilizing their different recoil ranges in air. Collimated fission fragments from a thin Pu foil were allowed to pass through air at 140-mm pressure. By placing a few very thin zapon films at the appropriate distances from the Pu, selected fission fragments could be collected completely separated from fragments of very different masses and partially separated from fragments of neighboring mass numbers.

This procedure is most useful for the separation of yttrium from the rare earth activities, since the chemical separation is slow and difficult, and the range method permits a complete and automatic separation. Several runs were made using this technique plus the following chemical operations: one $YF_3$ precipitation, one $Sr(NO_3)_2$ scavenging precipitation from fuming nitric acid, another $YF_3$ precipitation, and a final yttrium oxalate precipitation. Counting was begun as soon as 10 minutes after a 5-minute irradiation. In no case was there a shorter lived component than the previously reported 16.5-minute $Y^{94}$. Therefore any short-lived unidentified Y fission products with an appreciable fission yield must have a half-life shorter than 3 minutes.

In the case of zirconium, it was found that the range separation technique offered no advantages over the chemical separation from neutron irradiated solutions of uranium or plutonium. In the first few runs, when the standard chemical procedure[3] was abbreviated slightly and the final precipitation of zirconium with cupferron was omitted, a new component with a 14-minute half-life appeared in the decay curves. This period was eliminated when four instead of three barium fluozirconate precipitations were performed and when the precipitation with cupferron was included. In the best two runs, counting was begun at 15 minutes after the end of 10-minute bombardments. The characteristic growth of 75-minute Cb from 17-hour Zr was observed, but no short-lived activity was observed. Thus no zirconium isotopes with half-lives between 3 minutes and 17 hours result from fission in appreciable yield.

The experiments with columbium were performed both with and without the fission recoil apparatus. The chemical purifications consisted mainly of repeated $Cb_2O_5$ precipitations and $Bi_2S_3$ scavenging precipitations.[4] Small amounts of short period activities were observed when the purely chemical method was used, but the half-lives and yields varied from run to run, thus indicating that these were contaminations. In the two runs in which the recoil method was used, counting started at about 16 minutes after 3-minute irradiations. Very little activity was found. Thus any new Cb fission products with an appreciable yield must have shorter half-lives than 4 minutes.

REFERENCES

1. J. Am. Chem. Soc. 68:2411 (1946); Rev. Mod. Phys. 18:441 (1946).

2. Katcoff, S., J. A. Miskel, and C. W. Stanley, Report LA-659, Feb. 1948.

3. Hume, D. N., N. E. Ballou, and L. E. Glendenin, Report CN-2815, June 30, 1945; Hume, D. N., National Nuclear Energy Series, Division IV, Volume 9B, 8.8.4, McGraw-Hill Book Company, Inc., New York, in press; also MDDC - 1223-O.

4. Glendenin, L. E., National Nuclear Energy Series, Division IV, Volume 9B, 8.9.1, McGraw-Hill Book Company, Inc., New York, in press; also MDDC - 1223-W.



END OF DOCUMENT