Title

CARRIER-FREE RADIOISOTOPES FROM CYCLOTRON TARGETS. XII. PREPARATION AND ISOLATION OF Be 7 FROM LITHIUM

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Berkeley, California

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CARRIER-FREE RADIOISOTOPES FROM CYCLOTRON TARGETS XII. PREPARATION AND ISOLATION OF Be^7 FROM LITHIUM*

Herman R. Haymond, Warren M. Garrison and Joseph G. Hamilton.

September 20, 1950

Crocker Laboratory, Radiation Laboratory, and Divisions of Medical Physics, Experimental Medicine, and Radiology; University of California, Berkeley and San Francisco, California.

The radionuclide, Be^7, produced from lithium by the nuclear reaction[1] $Li^7(p,n)Be^7$ using the 10 Mev proton beam of the 60-inch cyclotron at Crocker Laboratory, has been isolated without added isotopic carrier by a separation procedure based on the radio-colloidal[2] properties of Be^7. Other radioisotopes produced concurrently by proton bombardment of lithium are short-lived and had decayed prior to the separation reported here. The principal radioactive by-product observed was 112-minute F^{18} produced[1] by proton bombardment of the small amount of oxygen which was present as lithium oxide on the target surface.

Five grams of C.P. lithium metal[3] was pressed onto a grooved water-cooled copper plate and bombarded in vacuo for 120 μa hr. at an average beam intensity of 8 μa. The bombarded lithium was dissolved in 100 ml of water with the gradual addition of dilute HCl. The acid solution was filtered and adjusted to pH 9 with dilute NH_4OH[4]. This "solution" containing lithium hydroxide, ammonium hydroxide

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1 G. T. Seaborg and I. Perlman, Rev. Mod. Phys. 20, 585 (1948)

2 O. Hahn, Applied Radiochemistry, Cornell University Press, Ithaca, New York (1936)

3 Beryllium could not be detected by spectrographic analysis.

4 Previous experiments had shown that between pH 2 and pH 9, the amount of Be^7 which could be removed by filtration increased with pH.

and Be^7 presumably as a radio-colloid, was slowly drawn through a pyrex sintered-glass filter, the pore size of which was of the order of 5 microns. Over 90 percent of the carrier-free Be^7 remained adsorbed on the glass filter disc[5]. After washing the filter with 2 ml of water, which removed less than 5 percent of the activity, the Be^7 was quantitatively removed with 2 ml of 0.1 N HCl. The resultant solution after neutralization was used as a tracer for biological studies. Approximately 30 minutes were required for the separation which had an overall yield of approximately 90 percent. The Be^7 was identified by the 52-day half-life and 0.48 Mev gamma ray previously reported[6,7].

We wish to thank Professor G. T. Seaborg for helpful suggestions and Mr. T. Putnam, Mr. G. B. Rossi and the crew of the Crocker Laboratory Cyclotron for bombardments.

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[5] Filtration through Whatman No. 40, removed only 30-50 percent of the Be^7.

[6] E. Segrè and C. E. Wiegand, Phys. Rev. 75, 39 (1949).

[7] S. Rubin, Phys. Rev. 69, 134 (1946).