The hfs anomaly for the Ag isotopes has also been calculated by Eisinger[8] and by Staub,[9] with results comparable to those above.

Slightly prior to our measurements on Ag^{107} and Ag^{109}, reported here, Staub[10] and his colleagues in Zürich obtained similar results.

The authors gratefully acknowledge discussions with W. D. Knight concerning the resonance in the metallic sample.

[8] J. T. Eisinger (private communication).
[9] H. H. Staub (private communication).
[10] Brun, Oeser, Staub, and Telschow, Phys. Rev. **93**, 172 (1954).

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A New Neutron-Deficient Isotope of Krypton*

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A new neutron-deficient isotope of krypton, Kr^{76}, with a half-life of 9.7±0.5 hours has been produced by the spallation of yttrium. Its genetic relationship with its 17.2-hour Br^{76} daughter was established by isolation experiments. Kr^{76} decays by weak positron emission (probably >0.6 Mev). A search for electron capture by this nuclide gave negative results.

WHILE investigating the spallation reactions which occurred when yttrium was bombarded with 150-, 175-, and 240-Mev protons in the Rochester cyclotron, a new krypton isotope, Kr^{76}, with a (9.7 ±0.5)-hour half-life was observed.

About 200 mg of spectroscopically pure yttrium oxide[1] placed in a rectangular envelope of 5-mil aluminum foil about 2 mm×2 mm×3 cm and clamped to the cyclotron probe, was exposed to the internal beam for one hour. At the end of the bombardment the yttrium oxide was removed from the envelope and placed in a distilling flask containing carriers of niobium, zirconium, strontium, rubidium, bromine, selenium, arsenic, and germanium, together with sufficient nitric acid to dissolve the yttrium oxide. The distilling flask was attached to an all-glass gas collecting system which consisted of a helium inlet tube, a trap containing carbon tetrachloride at 0°, two potassium hydroxide coated glass wool filled traps at dry-ice temperature, and finally a charcoal filled U-tube trap at liquid nitrogen temperature. With helium flowing slowly through the system the distilling flask was heated until all the yttrium oxide had dissolved. The bromide carrier was oxidized to bromine and trapped in the carbon tetrachloride trap. The two traps at dry-ice temperature prevented water vapor and acid gases from reaching the charcoal trap. The krypton was adsorbed on the charcoal U tube at liquid-nitrogen temperature and sealed from the line. The U tube was cemented to a Lucite disk for counting.

The decay of the krypton activities, as counted through the glass walls of the U tubes (0.5–1.0 mm thick), was followed with a scintillation counter having a NaI(Tl) phosphor and a beta-proportional counter. The gross decay curve (Fig. 1) on either counter showed the 1.1-hour Kr^{77},[2] followed by the growth of 17.2-hour

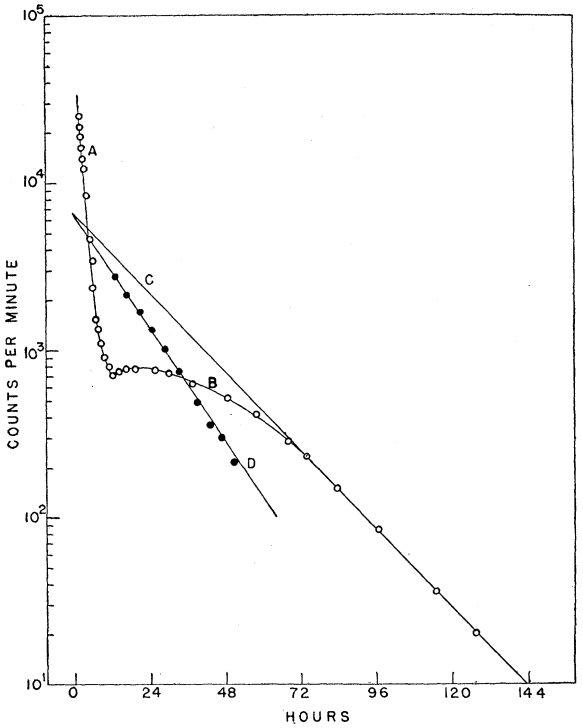

FIG. 1. Open circles—observed activity. Solid circles—subtraction of observed curve from extrapolated asymptote. Curve *A*, decay of 1.1-hour Kr^{77}. Curve *B*, growth and decay of Br^{76}. Curve *C*, extrapolated asymptote to curve *B*. Curve *D*, difference curve obtained by subtracting curve *B* from curve *C*. Curve *D* shows a half-life of (9.7±0.5) hours for Kr^{76}.

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[1] Part of the yttrium oxide was supplied through the courtesy of the Ames Laboratory, Iowa State College, Ames, Iowa.

[2] Hollander, Perlman, and Seaborg, "Table of isotopes," Revs. Modern Phys. **25**, 469 (1953).

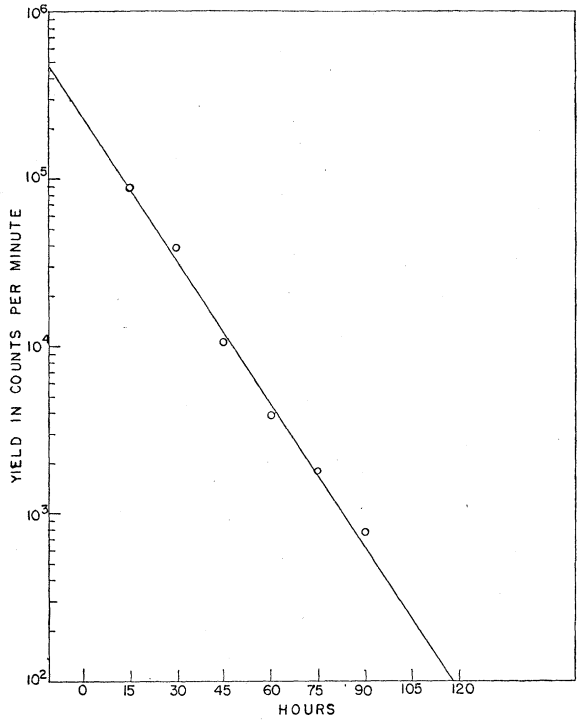

FIG. 2. Yields of 17.2-hour Br^{76} daughter at successive 15-hour separations from krypton parent. The curve shows the half-life of Kr^{76} to be (10.0±0.5) hours.

Br^{76} from Kr^{76}. This growth results from the fact that Br^{76} has a 3.57-Mev positron[3] and several hard gammas whereas its krypton parent has soft positrons which are easily absorbed by the glass walls of the U-tube. The resolution of the portion of the growth curve not masked by the 1.1-hour Kr^{77} decay was done as follows: The observed activity at various times was subtracted from the extrapolated asymptote corresponding to the 17.2-hour Br^{76}. The resulting difference curve was exponential and gave a half-life of (9.7±0.5) hours for Kr^{76}.

Parent-daughter isolation experiments were performed both to confirm the half-life of Kr^{76} and its genetic relation with Br^{76}. The separation was based on the procedure followed by Dropesky and Wiig[4] which assumes the complete desorption of krypton from charcoal at elevated temperatures and the retention of the bromine daughters by use of silvered charcoal. For this purpose a line consisting of a series of six glass U-tube traps filled with silvered charcoal held in place by glass wool was attached to a Cenco Hyvac pump. Every 15 hours a krypton-bromine isolation was made by moving the liquid nitrogen from one trap to the next. Each U tube was followed for the decay of the bromine daughters by counting with the scintillation counter. Only the first U tube showed the 57-hour Br^{77}, daughter of 1.1-hour Kr^{77}, in addition to 17.2-hour Br^{76}. The graph of the yields of Br^{76}, extrapolated to time of isolation, *versus* the time of the parent-daughter isolations (Fig. 2) gave (10.0±0.5) hours for the half-life of Kr^{76}, in good agreement with our other data. On several occasions the bromine was extracted from the charcoal by adding bromide carrier and digesting with sodium cyanide. The bromine was precipitated as AgBr and mounted for use in a low resolution beta spectrometer. The spectrum of the bromine showed the 3.57-Mev positrons of Br^{76}.

On one run the krypton was adsorbed on a silvered charcoal filled U tube as usual and then 10 hours later it was transferred to a small vacuum-tight sample holder lined with an aluminum cup having a 5-mil aluminum window. The krypton activity was counted in this manner with an x-ray proportional spectrometer. The x-ray counting chamber had a 30-mil beryllium window and was filled to a pressure of 2 atmospheres with argon-methane mixture. The x-ray spectrum showed a peak at about 12-kev which is about correct for bromine x-rays. The decay of the x-ray peak gave a value of 34.0 hours for the half-life corresponding to Kr^{79}, with no evidence of any activity of shorter half-life. It is thus concluded that Kr^{76} decays predominantly by soft positron emission, with its maximum positron energy less than 0.6 Mev. If its maximum positron energy were above this value, it would have been directly detected in our experiments.

[3] S. C. Fultz and M. L. Pool, Phys. Rev. **86**, 347 (1952).

[4] B. Dropesky and E. O. Wiig, Phys. Rev. **88**, 683 (1952).