Letters to the Editor

PROMPT publication of brief reports of important discoveries in physics may be secured by addressing them to this department. The closing date for this department is the third of the month. Because of the late closing date for the section no proof can be shown to authors. The Board of Editors does not hold itself responsible for the opinions expressed by the correspondents. Communications should not in general exceed 600 words in length.

Neutron Yields from the Photo- and Electro-Disintegration of Beryllium

MARCELLUS L. WIEDENBECK*
Department of Physics, University of Notre Dame, Notre Dame, Indiana
February 19, 1946

BY using electrons and x-rays produced with a Van de Graaff generator, the neutron yield from the disintegration of beryllium has been studied. It was of particular interest to investigate this process since it occurs at a lower energy (1.63 Mev)[1-3] than any other $\gamma-n$ process. As such, the electrostatic generator may be conveniently used to produce a moderately strong source of neutrons. Although the cross section for disintegration by x-rays is low, one can obtain appreciable intensities by using large quantities of beryllium in the region of the target.

In these experiments the neutrons were slowed down in a large cylinder of paraffin and detected with a rhodium cylinder counter and by foils of indium. The paraffin and detectors were calibrated by placing a 100-millicurie radon-beryllium source at the point normally occupied by the beryllium sample. The yield curve for x-ray disintegration is shown in Fig. 1. As seen, with an electron accelerat-

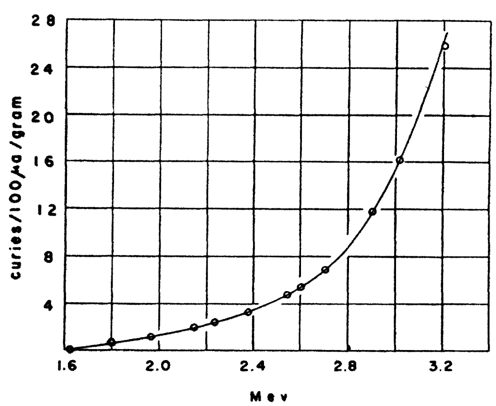

FIG. 1. Neutron yield from the distintegration of beryllium by x-rays. By using 200 grams of beryllium the yield can be increased to 10^3 curies equivalent.

ing potential of 3.2 Mev and with a beam current of 100 microamperes, the yield is 26 curies equivalent per gram of beryllium. Two hundred grams of powdered beryllium can be used with an efficiency of about 20 percent and as such the yield can be made equivalent to 10^3 curies. The curve indicates the great advantage gained in working at higher voltages with this process.

Figure 2 indicates the neutron yield when the electron

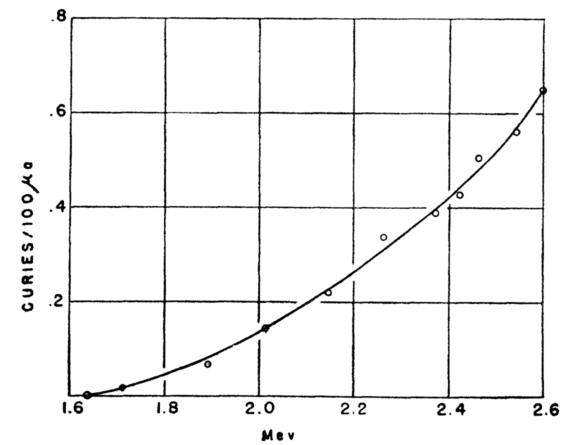

FIG. 2. Neutron yield from the disintegration of beryllium by electrons.

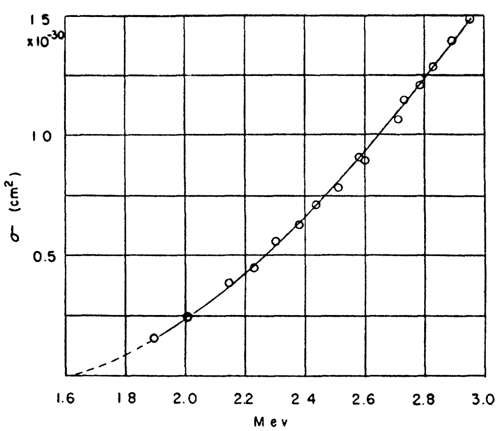

FIG. 3. Cross section for the electro-disintegration of beryllium.

beam of 100 microamperes strikes a thick beryllium target. This is due almost entirely to the electro-disintegration of beryllium. This was shown by placing a second piece of beryllium directly behind the one which stopped the electron. With the second piece in position practically no increase in yield was observed. The efficiency of the electro-disintegration process is very low.

The cross section for the electro-disintegration process was found by determining the yield from a thin sample (12 mg/cm^2) of beryllium bombarded with electrons. This is shown in Fig. 3. At 2.5 Mev the cross section is 8×10^{-31} cm^2 and the variation is quite uniform with voltage. The value of the cross section at 1.73 Mev ($\sim1\times10^{-31}$ cm^2) is in good agreement with the early determination by Collins, Waldman, and Guth.[2]

* Now at the University of Michigan.

[1] J. Chadwick and M. Goldhaber, Proc. Roy. Soc. **151**, 479 (1935).
[2] G. B. Collins, B. Waldman, and E. Guth, Phys. Rev. **56**, 876 (1939).
[3] M. L. Wiedenbeck, Phys. Rev. **67**, 54 (1945).