

2.2 The Isotope  $96^{240}$ . In a second bombardment of  $Pu^{239}$  (March 1945) helium ions of energy 40 Mev were used to bombard 100 mg of  $Pu^{239}$  for 63.1 microampere-hours. A sample was treated by the same chemical procedure as already described and the final element 96 fraction contained about  $2 \times 10^5$  alpha particle disintegrations per minute.

It was found that 20% of this activity was the  $96^{242}$  activity described above while the remaining 80% was due to another alpha-emitter which emits alpha-particles with a range of  $4.95 \pm 0.1$  cm in air at  $15^\circ C$  and 760 mm of mercury pressure. The over-all decay rate of this sample gave a half-life of about 1 month indicating that the half-life of the 4.95 cm range activity was somewhat less than one month and later resolution (Fig. 6) < Fig. 6 gave the value 26.8 days. This activity was thought to be due to either  $96^{241}$  or  $96^{240}$  produced by the reaction  $Pu^{239}(\alpha, 2n)96^{241}$  or  $Pu^{239}(\alpha, 3n)96^{240}$ .

A sample of this activity was set aside and allowed to decay from the second to the fourth day after shut-down of the cyclotron. The plutonium fraction was then isolated and the pulse analysis curve (Fig. 7a) < Figs. 7a and 7b as well as the alpha decay curve (Fig. 7b) of this plutonium sample gave definite evidence of  $Pu^{236}$  whose radioactive properties had been definitely established. (5) The element 96 fraction was then allowed to grow plutonium again (77 days of growth) and the amount of  $Pu^{236}$  which had grown was quantitatively determined by the addition of  $Pu^{239}$  tracer to establish the chemical loss in the process of separation of the plutonium from the element 96. The additional details of this experiment which allowed a calculation of the half-life of the element 96 parent were as follows:  $1.38 \times 10^5$  alpha counts/minute of the  $96^{242} - 96^{240}$  mixture of which initially 70.2% were due to  $96^{240}$  decayed for 77 days. At the end of that time the plutonium fraction was isolated after addition of 1935 counts per minute of  $Pu^{239}$  and the resulting plutonium sample pulse analyzed.