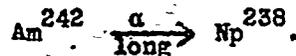


The first detection and half-life measurement of the actual process of beta particle decay of Am²⁴² was achieved by Manning and Asprey in samples investigated soon after termination of irradiation in the Argonne pile. (10) A decay curve obtained in recent experiments at this laboratory is given in Figure 6 for the Am²⁴² beta particles. A long-lived background activity is present due to the electromagnetic radiations from Am²⁴¹ and the radiations arising in a long-lived isomer of Am²⁴² to be described later. The predominant activity due to 17-hour Am²⁴² consists of the beta particles whose aluminum absorption characteristics are shown graphically in Figure 7. < Fig. 6 < Fig. 7

A sample of thermal-neutron-activated Am²⁴¹ was carefully purified and allowed to stand for several months. At the time of purification the 17-hour Am²⁴² should have been completely gone from the sample. A combined plutonium and neptunium fraction was then removed from the sample and purified by oxidation-reduction cycles. Samples of the neptunium-plutonium fraction were observed to contain beta-particle activity which decayed with a 2.0 day half-life. The aluminum absorption characteristics of the beta particles were entirely consistent with those of Np²³⁸ (16) whose half-life is 2.0 days (Figure 8). < Fig. 8

Np²³⁸ is a "shielded" isotope in the sense that it is not produced by either negative beta particle emission or by orbital electron capture, the hypothetical parents of Np²³⁸ by these processes being Pu²³⁸ and U²³⁸, respectively. Each of these is stable with reference to the process by which it would produce Np²³⁸. Since the Np²³⁸ was observed to grow in the irradiated americium sample, a long-lived Am²⁴², decaying by the emission of alpha particles must be responsible:



After allowing time for restoration of the Am²⁴²-Np²³⁸ equilibrium