

DECAY OF ^{145}Sm

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The ground state of ^{145}Sm decays by electron capture to ^{145}Pm , with a half-life of 340 days. From gamma-ray spectra, recorded with a small, 1.4 ccm Ge(Li) detector, energy levels at 61, 121, and 492 keV in daughter nuclei were suggested.¹⁾ However, no direct gamma transitions from the 492-keV level to lower levels were observed. Also, the observed gamma transition of 121 keV energy is ambiguous because of the possible pile-up events.

In this work, gamma-ray spectra following the decay of ^{145}Sm were investigated using a 48 ccm Ge(Li) detector. The ^{145}Sm source was prepared by irradiating a Sm_2O_3 target, enriched 96.6% with ^{144}Sm isotope, with a flux of thermal neutrons. A few weeks after irradiation, only radioactive impurities of Eu, Ir and Pm were found in the source, Eu impurities being particularly inconvenient, due to the intense and complex gamma-ray spectra. Separation of Eu from the source was performed using the electrolysis procedure with the amalgam cathode.

A gamma-ray peak at $E = (431.3 \pm 0.4)$ keV was observed. This peak corresponds to the gamma transition from the 492 to the 61 keV level. The decay rate of this transition, observed during a four-months period, shows the same variation of intensity as the 492 keV transition. No gamma-ray peak at 121 keV was observed, although the system used would allow the detection of gamma-rays which are ten times less intense than the reported value.¹⁾

The ratio of intensities, $I(431 \text{ keV})/I(492 \text{ keV})$ calculated from the detector efficiency curve is $(1.6 \pm 0.2) \times 10^{-2}$. This result is larger by a factor of 100 than the simple Weisskopf single particle estimate.

Reference

1. D. Berenyi, A. Szalay, D. Varga, F. Molnar, J. Uchrin, Acta Physica Acad. Sci. Hung. 28 (1970), 431