

HALF-LIVES OF THE GROUND AND ISOMERIC STATES OF Lu¹⁷⁴

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IT is known that Lu¹⁷⁴ has two isomers^[1]. Bonner et al.^[2] measured the half-lives of these isomeric states: 140 ± 10 days and 1300 ± 150 days. They did not, however, draw any conclusion as to which of the periods corresponds to the isomeric and which to the ground state of Lu¹⁷⁴.

Last year we measured the conversion electron spectrum of Lu^{173,174} in the energy range 540–1450 keV by means of a β spectrometer with twofold $\pi\sqrt{2}$ focusing^[3]. In the spectrum we detected lines corresponding to 994 and 1243 keV transitions in Lu¹⁷⁴.

This year we repeated the measurements of these lines with the same source. The uniformity of the experimental conditions was checked by measuring the half-life of Lu¹⁷³ for the K 272.5 and 636.7 keV lines. The value of $T_{1/2} = 550 \pm 80$ days which we obtained is in agreement with the result of 499 ± 5 days reported in^[2].

After 340 days, the period that had elapsed between the two series of measurements, the K 1243-keV line intensity had hardly changed at all ($T_{1/2} > 800$ days). The K 994 keV line intensity had decreased in accordance with the half-life $T_{1/2} = 150 \pm 40$ days.

In order to determine which of the periods corresponds to the ground state and which to the isomeric state, we estimated the half-life of the L-line intensity of the 59.1 and 67.1 keV transitions. These transitions, according to^[1,4], discharge the isomeric state of Lu¹⁷⁴. According to our data, $T_{1/2} < 200$ days. This result is at variance with the data obtained by Kovrigin and Latyshev^[5]

who attribute a period of 1300 days to the isomeric transitions.

From the results of our investigations, the following conclusions can be drawn: 1) the ground state of Lu¹⁷⁴ decays with a period of $T_{1/2} = 1300$ days; 2) the isomeric state of Lu¹⁷⁴ decays with a period of $T_{1/2} = 140$ days; 3) the 1243 keV transition is excited from the ground state; 4) the 994 keV transition is excited from the isomeric state.

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²Bonner, Goishi, Hutchin, Iddings, and Tewes, Phys. Rev. 127, 217 (1962).

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⁴Harmatz, Handley, and Mihelich, Phys. Rev. 119, 1345 (1960).

⁵O. D. Kovrigin and G. D. Latyshev, Spektrometr c dvojnoi fokusirovkoj (Spectrometer with Twofold Focusing), AN Kaz. SSSR, Alma-Ata, 1962, pp. 35-41.

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