LETTERS TO THE EDITOR

IDENTIFICATION OF ^{159}Yb ISOTOPE

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On the basis of the analysis of gamma spectrum of $A = 159$ isobars the ^{159}Yb isotope has been identified. Its half-life $T_{1/2} = (1.75 \pm 0.20)$ min. has been measured. The ^{159}Yb decay is followed by the emission of 166.1 and 177.0 keV gamma-rays.

Our investigation was carried out using the equipment made in the Laboratory of Nuclear Problems of the Joint Institute for Nuclear Research in Dubna for the YASNAPP programme [1]. Neutron deficient isotopes of rare-earth elements (REE) were obtained by the spallaction reaction from a tantalum target irradiated with $E_p = 660$ MeV protons of the JINR synchrocyclotron. Separation of the reaotion products was achieved by the method described in Ref. [2]. The proton irradiated tantalum foil, 0.05 mm thick and weighting 0.3—0.4 g, was put in a vaporizer of an ion source of the mass-separator. The ion source was heated up to temperature $T = 2500$–3000 K. The REE isotopes were diffused from the target, ionized and then separated into isobars. The mass separator parameters were chosen for maximum efficiency of ytterbium isotopes.

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The gamma spectra of the sources with the mass of $A = 159$ were investigated using gamma spectrometers with 0.5 and 45 cc Ge(Li) detectors. Their energy resolutions were 0.7 keV, at the energy of 120 keV, for the one detector and 2.5 keV, at the energy 1333 keV, for the other. The time interval between the end of the target irradiation and the beginning of the gamma-ray spectra measurements did not exceed 3.5 min.

In addition to the known gamma transitions arising in the decay of ^{159}Tm, ^{159}Er and ^{159}Ho [3] we have discovered the gamma transitions with the energy of 166.1 keV and 177.0 keV (Table I) with the intensity decrease $T_{1/2} = (1.75 \pm 0.20)$ min. (Fig. 1)

TABLE I

Energies and intensities of the gamma transitions following the decay of ^{159}Yb

E_γ(keV)	ΔE_γ	I_γ	ΔI_γ
K_{α_1}		120	33
166.1	0.2	100	
177.0	0.3	55	15

in the gamma-ray spectrum of $A = 159$ isobars. We have also observed K_{α_1} and K_{β_1} X-rays transitions of thulium. The half-life of their intensity decrease was the same (Fig. 1 and 2). An analysis of the gamma spectrum shows that the admixtures of the ^{158}Yb and ^{160}Yb isotopes (transitions 74.2 keV and 173.7 keV [4, 5] respectively) were absent,

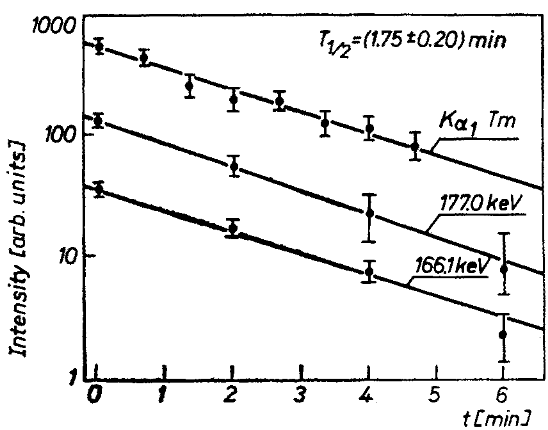

Fig. 1. Decay curves of the gamma and X-ray transitions

within the error limits, thus the K_{α_1} and K_{β_1} X-rays of thulium, have to be attributed to the mass of $A = 159$.

The ratios of intensity of KX to gamma transitions 166.1 or 177.0 keV excluded the possibility of any of them being a high multipolarity isomeric transition in Tm. Still we cannot entirely exclude the possibility that they are the members of a cascade whose low energy isomeric transition (below 50 keV) is unobservable in our gamma spectra.

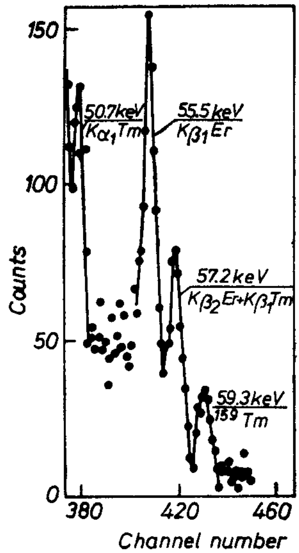

Fig. 2. Part of the isobars of $A = 159$ X-ray spectrum

Under this stipulation the results obtained indicate that ^{159}Yb isotope has the half--life $T_{1/2} = (1.75 \pm 0.20)$ min. The preliminary results of this work have been reported in Ref. [6].

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