

STUDY OF THE EXCITATION OF ISOMERIC STATES IN THE REACTIONS (γ, n), ($n, 2n$) AND (n, γ) ON BARIUM ISOTOPES

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In this work, we studied the excitation cross sections of isomeric states in nuclear reactions of the (γ, n), ($n, 2n$) and (n, γ) type on barium isotopes. The isomeric yield ratios were measured by the induced radioactivity method. Samples of natural Ba (the barium peroxide samples) have been irradiated in the bremsstrahlung beam in the energy range of $10 \div 35$ MeV with energy step of 1 MeV. For 14.1 MeV neutron irradiation, we used the NG-150 neutron generator. For the (n, γ) reaction, experiments were carried out at the BB3-CM research reactor of the Institute of Nuclear Physics of the Academy of Sciences of the Republic of Uzbekistan[1].

The gamma spectra reactions products were measured with a spectroscopic system consisting of HPGe detector CANBERRA with energy resolution of 1.8 keV at 1332 keV gamma ray of ⁶⁰Co, amplifier 2022 and multichannel analyzer 8192 connected to computer for data processing. The filling of the isomeric and ground levels was identified according to their γ lines. Using the isomer yield ratio and the total cross section of the (γ, n) reaction [2] received the cross sections of (γ, n)^m and (γ, n)^g reactions. The cross section isomeric ratios at $E_\gamma = E_m$ are estimated.

The isomeric cross-section ratios was determined in the case of the reaction ($n, 2n$). In order to obtain the absolute values of the cross sections for the ground state and for the isomeric state, use was made of methods based comparing the yields of the reaction under study and the monitoring reaction. The reaction ²⁷Al(n, α)²⁴Na ($T_{1/2} = 15$ h, $E_\gamma = 1368$ keV). For reaction (n, γ), ¹⁹⁷Au(n, γ) was used as a monitor reaction.

The experimental results have been discussed, compared with those of other authors as well as considered by the statistical model. The dependence of isomeric ratios on the mass number of the isotope was obtained. Theoretical values of the isomeric ratios have been calculated by using code TALYS-1.6.

1. <http://www.inp.uz>

2. A.V. Varlamov et al. Atlas of GDR. INDS(NDS)-394.// Vienna: IAEA, 1999.