EXCITATION OF ISOMERIC STATES IN REACTIONS (γ,n) AND (n,2n) ON ^{45}Sc, ^{76}Ge AND ^{81}Br

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This work presents results of investigation of the isomeric yield ratios $\eta = Y_m/(Y_m + Y_g)$ of the ^{45}Sc(γ,n)^{44m,g}Sc, ^{45}Sc(n,2n)^{44m,g}Sc, ^{76}Ge(γ,n)^{75m,g}Ge, ^{76}Ge(n,2n)^{75m,g}Ge, ^{81}Br(γ,n)^{80m,g}Br and ^{81}Br(n,2n)^{80m,g}Br reactions. The isomeric yield ratios were measured by the induced radioactivity method. Samples of natural Sc, Ge and Br have been irradiated in the bremsstrahlung beam of the betatron SB-50 in the energy range of 10÷35 MeV with energy step of 1 MeV. For 14 MeV neutron irradiation we used the NG-150 neutron generator.

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 ^{60}Co, 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. The results of calculation are given in the table below (28÷30 MeV).

Reaction	$E_{\gamma max}$, MeV		
	28	29	30
^{45}Sc(γ,n)^{44m,g}Sc	0,18±0,02	0,17±0,02	0,17±0,02
^{76}Ge(γ,n)^{75m,g}Ge	0,56±0,01	0,56±0,02	0,55±0,02
^{81}Br(γ,n)^{80m,g}Br	0,31±0,02	0,32±0,02	0,31±0,02

In the range 26-35 MeV the isomeric yield ratios Y_m/Y_g of the reaction (γ,n) on ^{76}Ge, ^{82}Se and ^{81}Br are obtained at first. Using the isomer yield ratio and the total cross section of the (γ, n) reaction on Sc, Ge and Br [1] we estimated the cross sections of $(\gamma, n)^m$ and $(\gamma, n)^g$ reactions. The cross section isomeric ratios at $E_\gamma = E_m$ are estimated.

The experimental results have been discussed, compared with those of other authors as well as considered by the statistical model [2]. Theoretical values of the isomeric yield ratios have been calculated by using code TALYS-1.0.

References

1. A.V. Varlamov et al. Atlas of GDR. INDS(NDS)-394.// Vienna: IAEA, 1999.
2. V.M. Mazur // Physics of elementary particles and atomic nuclei.2000.V.31. P.1043.