

Study of (γ , p)-reactions on tungsten isotopes

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The study of the cross-sections and yields of (γ ,p)-reactions allows one to obtain information on the structure of excited levels in the continuous and discrete regions of excitation and the mechanisms of the nuclear reactions' occurrence. Our work aims to study the yields of Ta-185,183,182 in reactions with the proton emission for irradiated targets by the bremsstrahlung gamma quanta with energies in the region of giant dipole resonance.

The study of the weighted average yields was carried out by the activation method on a bremsstrahlung γ -beam for electrons with the 20 MeV maximum energy on natural tungsten targets.

The spectra of irradiated targets were measured on Canberra and Ortec HPGe gamma spectrometers with the (15-40)% detection efficiency compared to the 3'x3' NaI(Tl) detector. The energy resolution of the spectrometers was 1.8–2.0 keV on the Co-60 1332 keV γ -lines.

The gamma transitions from the Ta-185,183,182 decay are reliably distinguished in the spectra.

The weighted average yields of the reactions $^{186}\text{W}(\gamma,p)^{185}\text{Ta}$, $^{184}\text{W}(\gamma,p)^{183}\text{Ta}$, and $^{183}\text{W}(\gamma,p)^{182}\text{Ta}$ have been measured on natural tungsten targets at the 20 MeV maximum energy of bremsstrahlung photons for the first time.

The following values of the weighted average yields were obtained: for $^{186}\text{W}(\gamma,p)^{185}\text{Ta}$ -reaction 0.70(7) mbn, for $^{184}\text{W}(\gamma,p)^{183}\text{Ta}$ -reaction 1.8(3) mbn, and for $^{183}\text{W}(\gamma,p)^{182}\text{Ta}$ -reaction 3.9(13) mbn. We can state the dominance of non-statistical processes as a modeling result within the TALYS-1.9 program code framework. The theoretical weighted average yields were significantly lower than the experimental values. The obtained data are discussed.

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