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B-10 (γ, t)-reaction study

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Currently, the most studied are (γ, n)- and (γ, γ')-reactions. Reactions with the release of charged particles, especially for light nuclei, are much less studied. The main reason for this is the lower cross-sections of these channels in comparison with the (γ, n)-reactions due to the Coulomb barrier. At the same time, the study of photonuclear reactions with the release of charged particles is of considerable interest in connection with the excitation of other states, often inaccessible for the (γ, n) channel. In addition, for such reactions, we can expect a significant contribution of direct and semi-direct processes.
The weighted average yield for the ^{10}B(γ, t)-reaction was obtained by the activation method using a bremsstrahlung γ-beam of electrons with E_{max} = 20 MeV and natural boron targets. The duration of irradiation of natural boron and the tantalum monitor targets was 40 minutes.
The spectra of irradiated targets were measured by Canberra and Ortec gamma spectrometers with ultra-pure semiconductor detectors with a (15-40)% detection efficiency compared to a 3′×3″ NaI(Tl) detector. The energy resolution of the spectrometers was 1.8–2.0 keV on the 1332 keV ^{60}Co γ-line. Gamma transitions from ^{7}Be decay are reliably identified in the studied spectra.
The bremsstrahlung spectrum was simulated using the Geant4 software code.
For the first time, the weighted average yield of ^{10}B equal to 7(2) μbn in the ^{10}B(γ, t)^{7}Be-reaction was obtained at a 20 MeV maximum energy of bremsstrahlung γ-quanta, while the reaction threshold is 18.7 MeV.
According to the modeling results, within the TALYS-1.9 and EMPIRE-3.2 program codes, non-statistical processes dominate.
A discussion of the findings is ongoing.

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