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MECHANISM OF THE 11B(α, t)12C REACTION AT AN ENERGY OF 40 MeV

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The experiment was performed on a α-particle beam extracted from the isochronous cyclotron U-150M of the Institute of Nuclear Physics (Almaty, Kazakhstan).
The differential cross sections of tritons from the 11B (α, t) reaction with transitions to the ground (0+) and to excited states of the 12C nucleus at Ex = 4.44 MeV (2+), 7.65 MeV (0+), 9.64 MeV (3-) and 14.08 MeV (4+) MeV have been measured at the beam energy of 40 MeV. A typical energy spectrum of tritons is shown in Fig. 1. Analysis of the measured angular distributions was carried out in the framework of the coupled reaction channels method 1 with considering the contribution of the 8Be cluster exchange mechanism. It is shown that the direct mechanism with proton transfer dominates at energy of 40 MeV, and the heavy particle transfer is noticeable only at large angles. An exception is the transition to the 14.08 MeV (4+) state, which is possible only by the transfer of the 8Be cluster. It is established that the couplings between the excited states of 12C, arising from the non-sphericity of the nucleus, have little effect on the (α, t) reaction cross sections in the forward hemisphere, but strongly affect the cross sections at large angles.

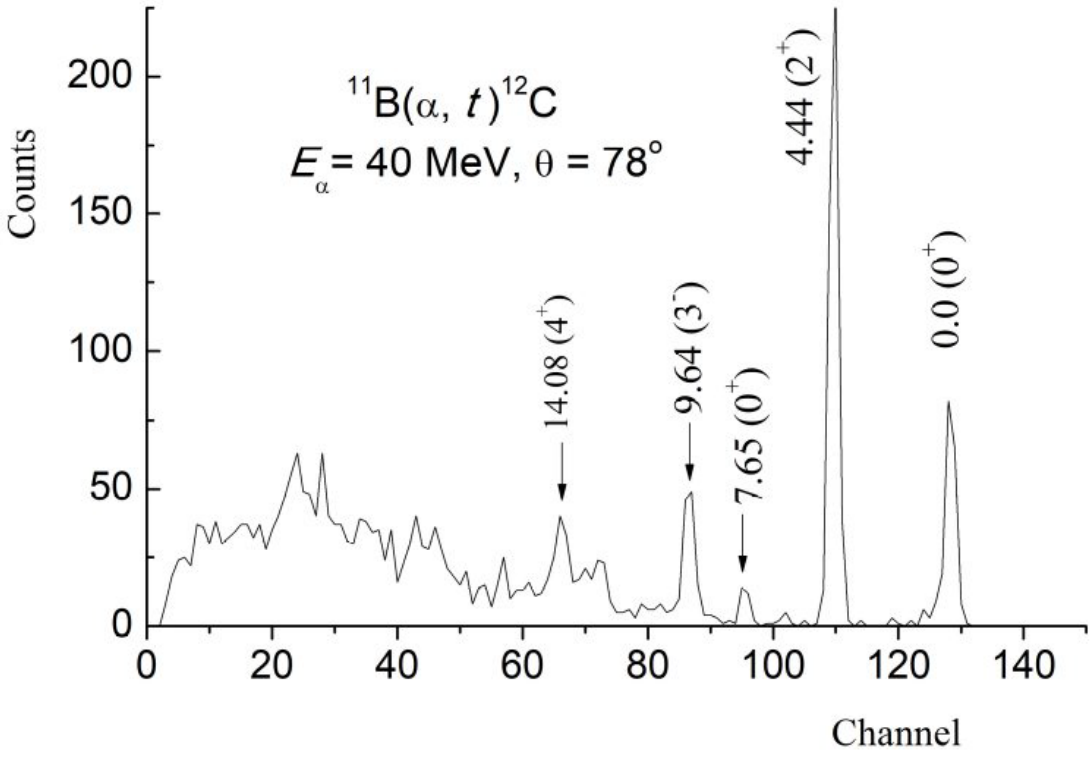

Figure 1: The energy spectrum of the tritons from the reaction (α, t) on the 11B nuclei measured at 78° at the beam energy of 40 MeV.

1. I.J. Thompson // Comput. Phys. Rep. 1988. V.7. P.167.

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