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INVESTIGATION OF (d, d) AND (d, t) REACTIONS ON ^{11}B NUCLEI AT ENERGY OF 14.5 MeV

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The differential cross sections of elastic and inelastic scattering of deuterons on 11B nuclei with excitation of low-lying states of 0.0 MeV ($3/2^-$), 4.445 MeV ($5/2^-$) and 6.74 MeV ($7/2^-$), as well as the reaction (d,t) with transitions to the ground (0^+) and excited states with energies of 0.718 MeV (1^+), 1.74 MeV (0^+, T = 1), and 2.15 MeV (1^+) have been measured at an energy of 14.5 MeV. From the scattering analysis, the optical potentials of the ^{11}B + d system were found, with which a good description of the experimental sections of elastic and inelastic scattering in the full range of angles was obtained, and the value of the quadrupole strain parameter β_2 = 0.80 ± 0.2 was extracted in accordance with the results obtained from scattering of protons, α particles and ^{3}He.
Assuming a direct neutron capture mechanism in reaction (d, t), it is possible to describe fairly well the angular distributions for transitions to the ground (0^+) and excited states with energies of 0.718 MeV (1^+), 1.74 MeV (0^+, T = 1), and 2.15 MeV (1^+) ^{10}B nucleus. Spectroscopic amplitudes extracted from the analysis are consistent with the theoretical predictions of the shell model. The possible contribution to the reaction of the exchange mechanism of the transfer of the heavy ^{8}Be cluster in the reaction ^{11}B (d,^{10}B) t, which is physically indistinguishable from the reaction (d, t), is estimated. It was shown that both single-stage (with ^{8}Be transfer) and two-stage (with sequential transfer of α-particles) mechanisms do not play a significant role at a deuteron energy of 14.5 MeV.

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