

Measurement of Cross-Section of the $p + {}^7\text{Li}$, $d + \text{Li}$, $p + {}^{11}\text{B}$, and $d + \text{B}$ Reactions at Ion Energies up to 2.2 MeV

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The interaction of a deuteron beam with lithium is characterized by a high yield of neutrons, their high energy and a large variety of reactions. The interaction of a proton with boron-11 is considered a promising reaction for neutronless fusion energy. Reliable data for these reaction cross-sections are important for many applications, including radiation testing of advanced materials and equipment, neutron yield, neutronless fusion, astrophysics and hadron therapy. Experimental data on cross-sections differ greatly from one author to another; for a number of reactions there is no data on the cross-section in the databases. Measurements of the reaction cross-section were carried out at the accelerator-based neutron source VITA at the Budker Institute of Nuclear Physics (Novosibirsk, Russia) using a HPGe γ -spectrometers, an α -spectrometers, and a diamond neutron spectrometers. The ${}^7\text{Li}(p,p'\gamma){}^7\text{Li}$, ${}^7\text{Li}(p,\alpha){}^4\text{He}$, ${}^6\text{Li}(d,\alpha){}^4\text{He}$, ${}^6\text{Li}(d,p){}^7\text{Li}$, ${}^6\text{Li}(d,p){}^7\text{Li}^*$, ${}^7\text{Li}(d,\alpha){}^5\text{He}$, ${}^7\text{Li}(d,n\alpha){}^4\text{He}$, ${}^7\text{Li}(d,n){}^8\text{Be}$, ${}^{11}\text{B}(p,\alpha_0){}^8\text{Be}$, ${}^{11}\text{B}(p,\alpha_1){}^8\text{Be}^*$, ${}^{10}\text{B}(d,\alpha){}^8\text{Be}$, ${}^{10}\text{B}(d,p){}^{11}\text{B}$, ${}^{11}\text{B}(d,\alpha){}^9\text{Be}$, and ${}^{11}\text{B}(d,p){}^{12}\text{B}$ reaction cross-sections at ion energies up to 2.2 MeV have been measured. Measurements of the differential cross section of the reactions were carried out for two angles, which made it possible to determine the angular distribution of emission of reaction products and calculate the total reaction cross section. The results obtained are distinguished by their reliability. The report will present and discuss the results obtained, and declare plans.

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