REVIEW

domestic scientific consultant for a thesis Nassurlla Maulen "Effects of cluster structure of stable boron and lithium isotopes to form the outputs of nuclear reaction in the interaction with deuterium and helium isotopes" submitted for the degree of Doctor of Philosophy (PhD) in specialty 6D060500- Nuclear Physics

The dissertation by Nassurlla M. is devoted to the experimental study and theoretical analysis of the differential cross sections of nuclear processes ^{7}Li (d, d) ^{7}Li, ^{7}Li (d, t) ^{6}Li, ^{11}B (d, d) ^{11}B, ^{11}B (d, t) ^{10}B, ^{11}B (α, α) ^{11}B and ^{11}B (α, t) ^{12}C at energies of 7-10 MeV/nucleon within the framework of various theoretical models.

Recently, interest in studying the structural characteristics of light nuclei is due to the possibility of using the features of their cluster structures to test various theoretical models and to clarify the nature of the formation of cross sections of nuclear reactions at these nuclei at low energies.

Available literature data on the scattering of complex particles (hydrogen and helium ions, heavy ions) with light nuclei at energies above 10 MeV/nucleon show that scattering cross sections in the full angular range form two mechanisms: potential scattering and exchange processes (to make the main contribution to the region large angles). It was found that the contribution of exchange processes is directly related to the structure of interacting systems. A comprehensive theoretical analysis of such data makes it possible to use the nature of the cross section of reactions at large angles to study the effects of clustering in various states of the studied nuclei. The most favorable objects of such a study are the nuclei of the 1p shell with a pronounced cluster structure.

Additional possibilities for obtaining reliable spectroscopic factors for the ^{3}He + t and 2α + t cluster configurations on ^{6}Li, ^{11}B nuclei, respectively, can be reactions ^{7}Li (d, t) ^{6}Li, ^{11}B (d, t) ^{10}B and ^{11}B (α, t) ^{12}C. Therefore, the study of the interaction of charged particles with lithium and boron nuclei is of great interest.

The differential cross sections measured by the applicant for the processes ^{7}Li (d, d) ^{7}Li, ^{7}Li (d, t) ^{6}Li, ^{11}B (d, t) ^{10}B and ^{11}B (α, t) ^{12}C at energies of 7-10 MeV/nucleon can significantly supplement the world nuclear data bank.

The obtained data on the cross sections for the interaction of deuterons and α particles with ^{7}Li and ^{11}B nuclei at low energies and the structural characteristics of the studied nuclear systems can be used in calculating the energy balance of nuclear power plants, as well as in theoretical calculations of nucleosynthesis reactions in stars and interstellar spaces.

Scientific research on the dissertation was carried out at the U-150M cyclotron of the Institute of Nuclear Physics (Almaty, Kazakhstan) as part of an international collaboration with research groups from the Kurchatov Institute (Moscow, Russia) and the University of Saitama (Japan). Along with this, the applicant Nassurlla M. took an active part in international experiments conducted at the University of Warsaw's heavy ion accelerator (Poland) and the RIKEN accelerator complex (Japan).

In the course of the dissertation, Nassurlla M. mastered the methodology of experiments on accelerator complexes and data processing using the ROOT program, as well as a number of theoretical approaches for analyzing the obtained experimental data using the FRESCO program code. He proved himself to be an independent scientist who completed the full cycle of research from choosing a topic, setting tasks to directly obtaining reasonable results.

The dissertation materials have been repeatedly discussed at many international scientific conferences and seminars, including in foreign countries. Based on the results of the work, 10 articles were published, including 7 articles with non-zero impact factor in journals indexed by Thomson Reuters and Scopus, and 3 in journals recommended by Education and Science Monitoring Committee of the Ministry of Education and Science of the Republic of Kazakhstan, as well as 1 patent of the Russian Federation "Semiconductor detector with internal gain".

I believe that the dissertation of Nassurlla M. meets all the requirements for doctoral dissertations of PhD, and can be recommended for defense for the degree of Doctor of Philosophy PhD in specialty 6D060500 - Nuclear Physics.

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