**STUDYING THE INTERACTION OF DEUTRONS WITH 13C NUCLEI AT AN ENERGY OF 18 MEV**

*Maulen Nassurlla* 1,*2****,*** *S.K. Sakhiyev1, N. Burtebayev 1,2, S.B. Sakuta3, A.S. Demyanova3, A.N. Danilov3, Marzhan Nassurlla1, V.S.. Zhdanov1****, D.A. Issayev1,2,*** *V.I. Starastin3, R.A.* [*Khojayev1,*](https://www.scopus.com/inward/authorDetails.uri?authorID=57218644004&partnerID=5ESL7QZV&md5=1f3ad9dc345e1c5112cde7a7463604f8) *A. Sabidolda*1

1 Institute of Nuclear Physics, Ministry of Energy of Republic of Kazakhstan, Almaty 050032, Kazakhstan

2 Department of Physics and Technology, Al-Farabi Kazakh National University, Almaty 050040, Kazakhstan

3 NRC “Kurchatov Institute”, Moscow 123182, Russia

The states of the р-shell nucleons of the 13C nucleus of negative parity and the sd-shell nucleons of positive parity, taking into account their connection with the ground and first excited states of the 12C nucleus, are correctly described within the framework of the shell model. Some alpha cluster levels appear at higher excitation energies in the region of the corresponding thresholds. Available detailed information on 13C energy levels up to 10 MeV is presented in [1].

Hoyle states studied in detail on “Nα” nuclei, for example, the second excited state 12C (02+ at E\* = 7.65 MeV) [2], can also exist on neighboring nuclei [3]. In the case of the 13C nucleus, the valence neutron can be associated with the 12C core, which is the Hoyle state. Such states have spin ratios of 1/2− and 1/2+, lie near the «12С(02+) + n» (12.60 MeV) threshold and can exhibit features characteristic of this cluster configuration.

To carry out such studies, the differential cross sections of nuclear reactions 13C(d,d)13C, 13C(d,t)12C and 13C(d,p)14C were measured at the U-150M isochronous cyclotron of the Institute of Nuclear Physics (Almaty) at an energy of 18 MeV.

After processing the measured energy spectra of the above reactions, differential scattering cross sections were obtained for the following levels of the 13C nucleus: *Jπ* = 1/2-, 0.0 MeV; *Jπ* =1/2+, 3.09 MeV; *Jπ* = 3/2-, 3.68 MeV and *Jπ* = 3/2+, 6.86 MeV. The differential cross sections 13C(d,t)12C were obtained for the following levels of the 12C nucleus: *Jπ* = 0+, 0.0 MeV; *Jπ* = 2+, 4.44 MeV and *Jπ* = 0+, 7.6 MeV. The differential cross sections 13C(d,р)14C were obtained for the following levels of the 14C nucleus: *Jπ* = 0+, 0.0 MeV; *Jπ* = 1-, 6.09 MeV; *Jπ* = 3-, 6.72 MeV and *Jπ* = 2-, 7.34 MeV.

The analysis of data on elastic scattering of deuterons on 13C nuclei at an energy of 18 MeV was carried out within the framework of the optical model of the nucleus. Three sets of optical potentials have been established (shallow, medium and deep), which describe the experimental data equally well.

In the future, using these sets of optical potentials, a comprehensive analysis of the differential cross sections for the nuclear reactions 13C(d,d)13C, 13C(d,t)12C and 13C(d,р)14C will be performed within the framework of the coupled channel method.

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