

Center of Nuclear Physical Data (CNPD)

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Compilation activity

This year the compilation of experimental data was performed in frame of Project # RP2-2403-SR-02 “Compilation and Evaluation of Alpha-Induced Nuclear Reaction Cross Sections for Astrophysics” of the U.S. Civilian Research and Development Foundation (CRDF). There have been compiled data on alpha-induced reactions for the nuclei with $8 \leq Z \leq 32$ (^{24}Mg , ^{28}Si , ^{32}S , ^{36}Ar , ^{40}Ca) and $E_{c.m.} \leq 20$ MeV. Five transmission tapes (TRANS F015, F016, F017, F018 and F019) have been prepared. More than 120 entries were included into the EXFOR data library.

Besides, a great amount of work on data digitizing was performed. The processed data were included to the entries with the “T” identifier.

Brief review and analysis of the compiled works are presented in the technical paper for the International Conference “Nuclear Data for Science and Technology”, Santa-Fe, USA, [1].

Evaluation activity

Processing of compiled data allowed obtaining parameters of Woods-Saxon potential with volume absorption in the α -particle energy range lower and higher than the Coulomb barrier for the $^{36}\text{Ar}+\alpha$ and $^{40}\text{Ca}+\alpha$ systems. They were obtained as a result of existing optical potentials modification and are intended to be used in a statistical Houser-Feshbach model widely applied in astrophysical calculations of nuclear reaction cross-sections.

It was planned to obtain estimated data using the EMPIRE-2 code. However some of the drawbacks revealed (isospin mixing is not taken into account in this code) necessitated addressing Prof. T. Rauscher, leading programmer of the NON-SMOKER code. There has been made an arrangement with him to perform the calculations with the optical model parameters obtained.

The results of work on obtaining optical model parameters are presented in the technical paper for the International Conference “Nuclear Data for Science and Technology”, Santa-Fe, USA, [2].

Data base development

This year there has been completed the creation of a new “SaBa” database version – library of evaluated and experimental data on charged particles interaction with light nuclei. The data on more than 120 reaction channels are available in it today. The library is oriented to solve astrophysics problems and contains information useful for the developers of astrophysics applications. The following essential changes occurred in the library.

1. The interface is updated.
2. The library was supplemented with new data. There appeared the opportunity to compare the cross-sections values stored in SaBa to the data from ECPL and FENDL libraries.

3. The rate values of all reactions presented in SaBa were calculated and introduced. For these values there also exists the possibility of comparing them to the data from NACRE library.

4. There appeared new means making it possible to qualitatively realize fitting of experimental data:

- the resonance part fitting is realized;
- the extrapolation to the area of low energies is performed.

5. There was realized the possibility of experimental data introduction by the user immediately.

Now the testing takes place and the execution of documentation is coming to an end. At the beginning of the coming year we shall be ready to expose the library for free access.

1. S.Dunaeva, V.McLane, M.Savin, S.Taova. Review of experimental data on alpha induced reactions of some nuclei (Mg-24, Si-28, S-32, Ar-36, Ca-40) in terms of astrophysical applications.
2. A.Zvenigorodskii, L.Generalov, S.Taova. Optical model parameters of alpha induced reactions on Ar-36.