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MENDL-2P

Proton reaction data library for nuclear activation (Medium Energy Nuclear Data Library)

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Abstract: The library includes proton cross-sections for 505 nuclei with atomic number from 13 to 84 and energies up to 200 Mev. The total number of reactions is equal to 87,196.

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The present database package should be sited as follows.

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1. Introduction

These diskettes contain catalogue and arj-packed files of the library MENDL-2P (Medium Energy Nuclear Data Library). The library includes proton cross-sections for 505 nuclei with atomic number from 13 to 84 at the energies up to 200 MeV. Total number of reactions is equal to 87.196.

The method used to obtain the cross-sections is described in the IAEA report INDC(CCP)-410, 1998.

The diskettes contain the following information.

Data	Diskette number
Catalogue	1
Z = 13 - 21	2
Z = 22 - 27	3
Z = 28 - 32	4
Z = 33 - 36	5
Z = 37 - 40	6
Z = 41 - 44	7
Z = 45 - 48	8
Z = 49 - 51	9
Z = 52 - 54	10
Z = 55 - 57	11
Z = 58 - 61	12
Z = 62 - 63	13
Z = 64,65,67	14
Z = 66,68,69	15
Z = 70,71,73	16
Z = 72,74,75	17
Z = 76 - 78	18
Z = 79 - 81	19
Z = 82 - 84	20

COMMENT OF PHYSICAL PRINCIPLES

MENDL-2 (proton) are calculated on the base ALICE-IPPE which differs from the ALICE-91 as follows.

Algorithm for the level density calculation according to the generalized superfluid model was tested, corrected and improved. Pre-equilibrium cluster emission calculation is included in the code. Calculation of the alpha-particle spectra is performed taking into account the pick-up and knock-out processes. The phenomenological approach is used to describe direct channel for the deuteron emission. The triton and He-3 spectra are calculated according to the coalescence pick-up model of Sato, Iwamoto, Harada. The description of the models used may be found in Acta.Phys. Slovaca 45 (1995) 705, IAEA report INDC(CCP)-385, 1995, and in INDC(CCP)-410, 1998.

Double precision calculations is used in all code.

The correction was made for cross-sections calculations taking into account gamma-ray emission. The contribution for residual Z-XX-A nucleus production due to photon and sequential particle emission to residual Z-XX-(A-1) or (Z-1)-XX-(A-1) nuclei is considered directly by introducing the CORG array.

The corrections were made for the algorithm of multiple pre-compound proton emission spectra calculation near threshold, Kalbach systematic treatment, angular distribution printing algorithm, gamma-spectra printing and for some other instructions.

ALICE91

ALICE91 (released April 1991) initially also called ALICE-90 differs from earlier releases in the following respects:

Level density options due to Kataria/Ramamurthy with inclusion of shell corrections may be selected. Level density option due to Ignatyuk (superfluid nuclear model) may be selected. Some work needs to be done on fine tuning input for this option.

Kalbach systematics for pre-compound angular distributions is an option; it provides much faster algorithm than the option based on n-n scattering kinematics and gives better agreement with experimental results.

Gamma ray spectra are given for the reactions, and gamma rays compete with nucleon emission. This helps to mitigate problems with trapped protons for very proton rich nuclei.

This version may be used to calculate for isotopically mixed targets, e.g. natural isotopic composition.

ALICE85/300

Alice85/300 differs from Alice/Livermore82 as follows:

The fixed 1 Mev bin size is now variable.
The maximum excitation energy has been increased from 200 to 300 Mev.
Level densities differ according to ejectile mass.
Pre-compound angular distributions may be calculated for nucleon induced reactions (input variables "iadst,irfr,imxx").
Some inconsistencies in pairing treatment have been corrected.
Modified rotating finite range fission barriers due to A.J. Sierk may be chosen.

REFERENCES

Some discussion of code physics may be found in:

- Phys.Rev.28, 1475(1983), and in LLNL report no. UCID 19614 (1982)

- INDC(CCP)-385, 1995, "Cross-Section Data Library MENDL-2 to Study Activation and Transmutation of Materials Irradiated by Nucleons of Intermediate Energies, Yu. N. Shubin, V.P.Lunev, A.Yu.Konobeyev, A.I.Dityuk;

- INDC(CCP)-410, 1998, “New advanced version of the computer code ALICE-IPPE”, M. Blann, A.Yu. Kobeyev, V.P. Lunev, Yu. N. Shubin, A.I. Dityuk

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