INDC(NDS)-32

IAEA-NDS-32

Rev. 2

INTERNATIONAL ATOMIC ENERGY AGENCY

NUCLEAR DATA SERVICES

DOCUMENTATION SERIES OF THE IAEA NUCLEAR DATA SECTION

NDS MULTIGROUP CROSS SECTION LIBRARIES

Contents' Summary and Documentation

Abstract

A summary description and documentation of the multigroup cross section libraries which exist at the IAEA Nuclear Data Section are given in this report. The libraries listed, are available either on tape or in printed form.

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December 1981

NDS MULTIGROUP CROSS SECTION LIBRARIES

Introduction

A summary description and documentation of the multigroup libraries which exist at the IAEA Nuclear Data Section are given in this report.

These libraries are kept either on tape or in printed form (hardcopy and/or microfiche).

Libraries on tape are available, costfree, upon request. But the libraries in printed form are available on a first-come first-served basis since NDS library has received a limited number of copies from the authors whose assistance are gratefully acknowledged.

It should be noted that NDS hold only such multigroup cross section libraries that are either of general interest and application similar to evaluated point data libraries, or are related to a scientific project in which NDS is involved (e.g. intercomparison of different data evaluation).

All requests for nuclear calculation computer programs and associated multigroup data library should be addressed directly to the IAEA Liaison Officer at the computer program library of the NEA Data Bank, whose address is

Dr. E. Sartori
NEA Data Bank
B.P. No. 9 (Bat. 45)
F-91190 Gif sur Yvette
France

Broad group (60 or less neutron groups) libraries are typically generated for a particular application and care is required in applying them to problems not closely related to the original application. To avoid using cross-section libraries which may not be appropriate for a given application, users can generate a new library from the basic evaluated data files (i.e. ENDF/B, UKNDL, KEDAK etc.), also available from NDS. The expense of such an approach generally makes it impractical for some users to follow this option. An alternative is to derive application-dependent libraries from a fine-group library (100 or more neutron groups) like EN4-USTT, VITAMIN-C, EURLIB-4 etc.

MULTIGROUP LIBRARIES

A) On tape

ARAMACO : USSR ARAMACO 26-group constant library for 45 nuclides. It contains cross-sections and the inelastic scattering matrices for 26 groups, and subgroups for those groups where the temperature dependence of the cross-sections at resonances must be considered. 5782 logical records.
(see CINDU-11 Suppl.1 p.40)

AUL-FP-G : It contains 127-group data for 192 fission product nuclei. 28056 logical records.
(see CINDU-11, p.49 and Suppl.1, p.18 and Report AAEC/E 214)

CASK : Coupled 22-neutron, 18-gamma-ray-group, P3, cross sections in ANISN format for 26 materials. Used for analysis of fuel element shipping casks.
(RSIC DLC-23E). Codes to be used with: ANISN, DOT, MORSE.

DAMSIG : Damage cross sections library for 13 materials. Data in the 620 group SAND-II format. 4031 logical records.
(see IAEA-NDS-26)

DETAN74 : DETAN-74 Dosimetry file. 620-group data, 36 reactions. 3119 logical records.
(CINDU-11, p.81)

DOSCROS77 : It is a combination of several cross section libraries which are available in the 620 groups SAND-II format. The library contains 49 detector cross section sets and 3 cover cross section sets.
(see IAEA-NDS-27)

EN4-DOS-G : ENDF/B-4 Dosimetry Library for 36 neutron reactions of 26 isotopes. 620-group data in the SAND-II format. 8676 logical records.
(CINDU-11, p.57)

EN5-DOS-G : ENDF/B-5 Dosimetry Library for 35 neutron reactions of 25 isotopes. 620-group data in the SAND-II format. 9407 logical records.
(IAEA-NDS-24)

EN4-USST : ENDF/B-4 Universal Supergroup System (thermal) 460-group scheme for 90 nuclides. 60220 logical records.
(Westinghouse El. Corp., DP-1345, 1974)

EURLIB-4 : 100-neutron-groups, 20-gamma-ray-groups coupled multigroup set transport calculations, particularly for reactor shielding and fusion. 21936 logical records.
(ESIS Newsletter No.4). Codes to be used with: ANISN, DOT, MORSE

LIB-IV : A library of multigroup constants (50-group, 101 isotopes) generated from ENDF/B-4 at LASL. Includes self-shielding factors, delayed neutron yields and spectra by time group. 192283 logical records. Utility codes LINX, BINX and CINX are also available.
(LA-6260-M, 1976). Codes to be used with: ANISN, DOT, MORSE

MACKLIB : Multigroup kerma factors produced with MACK code from ENDF/B and other data.
(RSIC, DLC-29). Codes to be used with: GAM

SAND-2 : 620-group SAND-2 dosimetry library. 8065 logical records.
(CINDU-11, p.81)

SPOTS4 : Group data library and computer code, preparing ENDF/B-4 data for input to LEOPARD code. The data library is based on ENDF/B-4 and consists of 2 parts in TEMPEST format (246 groups) and MUFT format (54 groups) respectively. From this library the SPOTS4 programme produces a 172+42 group library for LEOPARD input.

UKCTR1 : 46-group (25 materials) cross-sections for fusion reactor calculations of neutron fluxes and reaction rates. 34709 logical records.
(T. Beynon et al.: Birmingham University Internal Report No. 79-02, 1979)

VITAMIN-C : Generated from ENDF/B-4. It consists of 3 separate files:
1) SMUG: 36-group photon cross-sections
2) LAPHNGAS: 171-neutron and 36 gamma group cross sections
3) AMPX: 171-group neutron cross sections. All in AMPX interface format.
Processing codes also available. 283713 logical records. (RSIC, DLC-41)

B) Report (H: hardcopy; M: microfiche)

(H) ACT-MG : A consistent set of multigroup neutron cross sections developed for nuclides in the production chain from Pu-244 to Es-253.
(R.W. Benjamin et al.: A consistent set of heavy actinide multigroup cross sections, DP-13914, December 1975)

(R) BARC-SCT : BARC multigroup P8-Elastic Scattering matrices of main reactor elements. They have been generated using angular distribution, Legendre coefficient and elastic scattering cross-section data from the basic ENDF/B library. These matrices can be directly used as input to the transport codes ANISN and DOT.
(S.B. Garg, V.K. Shukla; Multigroup P8-elastic Scattering Matrices of Main Reactor Elements, B.A.R.C.-1001)

(R) BARC-SSH : B.A.R.C. multigroup resonance self-shielding factors and cross-sections of main reactor elements. 26-group self-shielding factors and cross-sections have been generated for main reactor elements from the ENDF/B library. These data are in a format which is consistent for their input to the fast reactor codes FCC-IV and 1DX.
(S.B. Garg; Multigroup Resonance Self-Shielding Factors and Cross Sections of Main Reactor Elements, B.A.R.C.-1003, 1979)

(H) BIBGRFP : Group constants of 584 fission products. For each isotope the following quantities are given:

- Thermal-neutron fission product yields of U-235, Pu-239, Pu-241 and 1 MeV neutron fission product yields of U-235, U-238, Pu-239 and Pu-241,

- Decay data,

- Microscopic cross-sections for thermal neutron capture and resonance integrals, branching ratios for (n,γ) reactions,

- 13 and 12-groups sources of γ rays and mean energies of charged-particle radiation released due to radioactivity

(J. Hep, V. Valenta: Group Library of Fission Products BIBGRFP, ZJE-188 (1976), J. Hep, V. Valenta: Corrections and Supplement to the Fission Product Libraries BIBFP and BIBGRFP, ZJE-228 (1978)).

(H) CNEN-26 : A 26-group (15 isotopes) library with self-shielding factors for fast reactor calculations from the UK Nuclear Data File.
(E. Menapace et al.: a 26-Group Library with Self-Shielding Factors for Fast Reactor Calculations from the UK Nuclear Data File, RT/FI(73)15)

ENDL-175 (H) + (M) : ENDL 175 neutron group constants library: includes cross sections, average energy deposits per neutron collision, mean paths and mean number of secondary neutrons per fission.
(UCRL-50400 Vol.16, 1979)

(M) FARE-MG : 29-group fast reactor cross section library consisting of 34 different isotopes. The multigroup constants were generated by ETOX (a code which calculates group constants for nuclear reactor calculations) using the ENDF/B-II for fundamental nuclear data input.
(R.B. Kidman, R.E. Schenter: Group Constants for Fast Reactor Calculations, HEDL-TME-71-36, March 1971)

(M) FTR-MG : A 30-group (25 materials) multigroup cross sections library for fast test reactor design. Group constants were generated using the ETOX code with ENDF/B-II data as input. The resulting infinitely dilute cross sections were modified for several isotopes to give calculational agreements with fast reactor integral experiment.
(R.E. Schenter et al.: FTR set 300 multigroup cross sections for FTR design, HEDL-TME-71-153, October 1971)

(H) GARG : 27-group cross sections covering the energy range thermal to 15 MeV for 9 rare-earth and concrete elements based on ENDF/B data. This set is particularly suited to study the (n,2n), (n,p) and (n,α) reactions.
(S.B. Garg: A 27 Group Cross Sections Set Derived from ENDF/B Library, INDC(IND)-21/G or B.A.R.C.-892)

(H) 1GRFP : One-group capture cross-sections for fission products condensed from the 1971 Lucas Heights data and the Australian and Italian combined evaluation of 1967, over the energy range 10 MeV to 0.0001 eV using a typical fast reactor spectrum
(C.J. Dean: One Group Fission Product Capture Cross Sections, AEEW-M-1242, January 1974)

(M) JAERI-MG1: JAERI Fast Reactor Group Constants Systems, Part I. 70-group cross section tables and 25-group cross section tables for infinite dilution inelastic scattering matrices, 70-group fluxes for

several values of admixture cross section σ_0 and tables of self-shielding factor f were given for 15 materials.
(S. Katsuragi et al.: JAERI Fast Reactor Group Constants Systems Part I, JAERI-1195, August 1970)

(M) JAERI-MG2: JAERI Fast Reactor Group Constants Systems Part II-1. Improvements have been made for the treatments of effective cross section of heavy nuclides in the resonance energy region, and fast reactor group constants in this energy region have been produced for U-235, U-238, Pu-239, Pu-240 and Pu-241. For analysis and design studies of fast reactor systems, these group constants should be used together with those of JAERIMG1.
(S. Katsuragi et al.: JAERI Fast Reactor Group Constants Systems, Part II-1, JAERI1199, December 1970 and Supplement No.1, June 1971)

(M) JAERI-V2 : JAERI Fast Reactor Group Constants set, version 2. Group constants of 25 nuclides have been provided for both 70 and 25-group structures. Self-shielding factors are also given in forms of tables or formulas. Applicability of the set was assessed through the benchmark tests for many fast critical assemblies.
(H. Takano et al.: JAERI Fast Reactor Group Constants Set, Version II, JAERI-1255, March 1978)

(M) MGBEGAS : Delayed beta and gamma group-energy spectra were calculated for 180 individual FP nuclides having spectral data in ENDF/B-IV FP files. The beta spectra, in uniform-grid 75-group structure, and the gamma spectra, in uniform-grid 150-group structure between 0 and 7.5 MeV, are sufficiently detailed for collapsing to any desired practicle group structure. These spectra have been used in decay heat summation calculations for comparisons with corresponding experimental beta and gamma spectra.
(T.R. England, M.G. Stametelatos: Multigroup beta and gamma spectra of individual ENDF/BIV Fission Products, LA-NUREG-6622-MS)

(H) UKCTR-III: Neutron reaction cross-section data for the energy range from thermal to 15 MeV. It is intended, primarily for use in studies of transmutation and activation of fusion reactor structural and coolant materials.
(O.N. Jarvis: Description of the transmutation and activation data library UKCTRIII, AERE-R-9601, October 1979)