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********************************** BIB-SECT
*
* REFERENCE    (C.-BLASH 2 BOE.(6802) PH
*               CONTRIBUTION.
*              (P,EANDC(E)-89,37,6802)
*              (J,NP/A,116,9,6805) FINA
*               MEASUREMENTS.
* AUTHOR       (H.K.VONACH,W.G.VONACH,H
* TITLE        -PRECISION MEASUREMENTS
*               OF (N,P),(N,A) AND (N,2
*               13.5 - 14.7 MEV NEUTRON
* INSTITUTE    (2GERMUN)
* N-SOURCE     (D-T  ) BOMBARDMENT OF A
*               DEUTERONS. A RANGE OF T
*               WERE USED BY VARYING TH
* FACILITY     (VDG  ) 400KEV VAN DE GR
*               FUR STRAHLENFORSCHUNG.
* METHOD       (ACTIV) GAMMA PULSES EX
*               TA-180M WHERE BETAS WER
* PART-DET     (DG   ) DECAY GAMMAS.
* SAMPLE       .NATURAL MATERIALS. ME
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*               CORRESPONDING TO 30
*               ENERGY, AND SUBTENDE
*               DISTANCE OF 100MM
* CORRECTION   .ANGULAR DEPENDENT NE
*               ELASTICALLY SCATTERE
*               SCATTERING CONTRIBUT
*               DECAY CORRECTIONS.
* ERR-ANALYS   .SYSTEMATIC ERRORS, TA
*               ATTENUATION CORRECTION
*               (0.05 PC), DECAY CORRE
*               SHIFTS (0.1 PC). MAXIMU
*               THAN 0.9 PERCENT. STATI
*               IN THE TOTAL ERROR.
* DETECTOR     (NAICR) 5X5INCH WELL CRY
*              (PROPC) CH4 FLOW COUNTER
*               TA-180M.
* STATUS       .FROM TABLES IN CONFERENC
* HISTORY      (781017C) PDJ. RECOMPILE
*              (790219E)
*              (800115A) REACTION STRING
*               022 AND 023 CHANGED.
*              (800115E)
*              (800424A) DATA HEADINGS
*              (800603E)

* END BIB-SECTION ******************

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* REACTION     (23-V-51(N,A)21-SC-48,,S
*               RATIO TO THE 14.7 MEV C
* STATUS       .PUBLISHED TABLE.
* HISTORY      (781018C) PDJ.
*              (790219E)
*              (800424A) DATA HEADINGS
*              (800603E)

* END BIB-SECTION ******************

* NO COMMON-SECTION ****************

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        EN          EN-ERR       DATA
       MEV          MEV          ARB-UNI

    1   13.6        0.075        0.820
    2   13.7        0.075        0.836
    3   13.8        0.075        0.852
    4   13.9        0.075        0.867
    5   14.0        0.075        0.885
    6   14.1        0.075        0.902

* END DATA-SECTION ****************
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NNDEN/38

NEUTRON NUCLEAR DATA EVALUATION NEWSLETTER

NEA DATA BANK
BANQUES DE DONNÉES DE L'AEN

JULY 1986

NNDEN/38

NEUTRON NUCLEAR DATA EVALUATION NEWSLETTER

NEA DATA BANK
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JULY 1986

37934

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NEUTRON NUCLEAR DATA EVALUATION NEWSLETTER

NNDEN/38

The Newsletter reports:

1. Evaluation work on particular nuclides.
2. Development of codes for nuclear model calculations, and other codes needed for nuclear data work.
3. Publications relevant to the neutron data field.

Contributions on evaluation activities and nuclear model codes have been received from:

		Page
FRANCE	CEN, Cadarache	7
	CEN, Bruyères-le-Châtel	9
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ITALY	ENEA, Bologna	13
JAPAN	Nuclear Data Centre, JAERI	15
NETHERLANDS	ECN, Petten	19
PEOPLE'S REP. OF CHINA	Institute of Atomic Physics, Beijing	21
UNITED KINGDOM	AERE, Harwell	22
	Nuclear Physics Laboratory, OXFORD	23
	AEE, Winfrith	25
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IAEA	Nuclear Data Section, Vienna	37
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The next issue of NNDEN has been scheduled for December 1986 and contributors are asked to send in their reports by 15th November 1986.

NEA Data Bank, July 1986

NEW EVALUATIONS A) COMPLETED
B) IN PROGRESS

NUCLIDE	DATA TYPE	ENERGY RANGE	PAGE A	PAGE B	PAGE C
1 -H -1	MANY	10^{-5}eV-20MeV	31		
1 -H -3	R MATRIX	UP TO 20MeV	31		
2 -HE-3	R MATRIX	UP TO 10MeV	31		
3 -LI-6	(N,T),(N,N)			31	
3 -LI-6	MANY	UP TO 4MeV	31		
3 -LI-7	MANY		38		
4 -BE-	MANY		38		
4 -BE-9	MANY		31		
5 -B -10	MANY	10-5eV-20MeV	31		
5 -B -10	(N,α),(N,N)			31	
5 -B -11	MANY			31	
7 -N -15	MANY			31	
13-AL-	MANY			38	
14-SI-	RES.PAR.,(N,γ)		11		
14-SI-	MANY			38	
23-V -	MANY			31	
24-CR-	(N,N'),(N,2N)		16		
24-CR-50	PHOTON PROD.	1KeV-8MeV	13		
24-CR-51	(N,γ)		25		
24-CR-52	MANY	1MeV-20MeV		31	
24-CR-52	PHOTON PROD.	1KeV-8MeV	13		
24-CR-53	MANY	1MeV-20MeV		31	
24-CR-53	PHOTON PROD.	1KeV-8MeV	13		
24-CR-54	PHOTON PROD.	1KeV-8MeV	13		
24-CR-NAT	PHOTON PROD.	1KeV-8MeV	13		
25-MN-55	(N,P),(N,α)			23	
26-FE-	(N,N'),(N,2N)		16		
26-FE-54	(N,P),(N,α)			24	
26-FE-56	MANY			31	
26-FE-56	(N,P),(N,α)			24	
27-CO-				31	
27-CO-59	MANY			21	
27-CO-59	(N,P),(N,α)			23	

NUCLIDE	DATA TYPE	ENERGY RANGE	PAGE A	PAGE B	PAGE C
28-NI-	(N,N'),(N,2N)		16		
28-NI-		HIGHEST		31	
28-NI-	MANY	10^{-5}eV-20MeV	15		
28-NI-	MANY			20	
28-NI-58	MANY	1MeV-20MeV	31		
28-NI-58	(N,P),(N,α)			24	
28-NI-60	MANY	1MeV-20MeV	31		
28-NI-60	(N,P),(N,α)			24	
29-CU-63	(N,P),(N,α)			24	
29-CU-63	MANY		31		
29-CU-65	(N,P),(N,α)			24	
29-CU-65	MANY		31		
30-ZN-65	(N,γ)		25		
34-SE-75	(N,γ)				25
39-Y -	MANY		31		
41-NB-	MANY		31		
41-NB-93	MANY	1MeV-20MeV		23	
41-NB-93	(N,N)	FAST		11	
42-MO-	RES.PAR.		16		
43-TC-	RES.PAR.		16		
44-RU-102	MANY			20	
46-PD-107	MANY			20	
52-TE-	RES.PAR.		16		
55-CS-133	(N,γ)		25		
56-BA-	RES.PAR.		16		
57-LA-	RES.PAR.		16		
58-CE-	RES.PAR.		16		
59-PR-	RES.PAR.		16		
60-ND-	RES.PAR.		16		
61-PM-	RES.PAR.		16		
62-SM-	RES.PAR.		16		
63-EU-	RES.PAR.		16		
63-EU-151	MANY			32	
63-EU-153	MANY			32	

NUCLIDE	DATA TYPE	ENERGY RANGE	PAGE A	PAGE B	PAGE C
64-GD-155	MANY			32	
64-GD-157	MANY			32	
67-HO-165	MANY			31	
79-AU-197	(N,γ)			32	
79-AU-197	MANY	10KeV-20MeV	31		
79-AU-198	(N,γ)		25		
82-PB-	RES.PAR.,(N,γ)		11		
82-PB-	(N,N)			38	
90-TH-232	FISSION YIELD	FAST,14MeV	25		
92-U -233	FISSION YIELD	THERMAL	25		
92-U -233	FISSION YIELD	FAST,14MeV	25		
92-U -235	(N,F)			32	
92-U -235	(N,F)			22	
92-U -235	FISSION YIELD	FAST,14MeV	25		
92-U -235	FISSION YIELD	THERMAL	25		
92-U -235	MANY		37		
92-U -238	(N,F),(N,γ)		22		
92-U -238	FISSION YIELD	FAST,14MeV	25		
92-U -238	MANY			11	
92-U -238	(N,N)	FAST		11	
92-U -238	(N,γ),(N,F)			32	
92-U -238	(N,N')	680KeV-1530KeV	29		
92-U -238	RES.PAR.	RESONANCE REGION		32	
93-NP-237	(N,2N)			25	
94-PU-239	MANY		37		
94-PU-239	RES.PAR.	RESONANCE REGION		32	
94-PU-239	MANY	30KeV-20MeV			7
94-PU-239	FISSION YIELD	FAST	25		
94-PU-239	(N,F)			32	
94-PU-239	FISSION YIELD	THERMAL	25		
94-PU-240	MANY		37		
94-PU-240	MANY			32	
94-PU-241	MANY	UP TO 100 KeV			7
94-PU-241	MANY		37		
94-PU-241	FISSION YIELD	THERMAL	25		
94-PU-241	FISSION YIELD	FAST	25		
94-PU-242	MANY		37		
95-AM-241	MANY	FAST		7	
97-BK-249	MANY	10^{-5}eV-20MeV	15		
98-CF-249	MANY	10^{-5}eV-20MeV	15		
98-CF-250	MANY	10^{-5}eV-20MeV	17		
98-CF-251	MANY	10^{-5}eV-20MeV	17		

CONTRIBUTION TO NNDEN 38

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Laboratory of Physics Studies
CEN Cadarache
13278 SAINT PAUL LEZ DURANCE CEDEX - FRANCE

WORK IN PROGRESS

- Continuing activity on JEF1 Benchmarking.
  (E. FORT, P. LONG).
- Reevaluation of ^{241}Am in the fast range.
  (E. FORT, P. LONG).
- Analysis of the recent experimental transmission and fission data obtained at OAK RIDGE on ^{239}Pu (thermal and resonance range).
  (H. DERRIEN, G. de SAUSSURE, R. PEREZ, R.L. MACKLIN).
- Analysis of the recent experimental transmission and fission data obtained at OAK RIDGE on ^{241}Pu (thermal and resonance range).
  (H. DERRIEN, G. de SAUSSURE).

WORK PLANNED FOR THE NEAR FUTURE

- Complete reevaluation of ^{239}Pu in the range 30 KeV - 20 MeV. (E. FORT, P. LONG).
- Translation in ENDF B format of the recent ^{239}Pu evaluation in the thermal and resonance range. (H. DERRIEN).
- Evaluation of ^{241}Pu in the thermal and resonance range. (H. DERRIEN).

PUBLICATIONS

R.Matrix analysis of the ^{239}Pu cross section up to 1 KeV.
H. DERRIEN, G de SAUSSURE, P.B. PEREZ, N.M. LARSON and R.L. MACKLIN.
ORNL Report to be published.

R.Matrix analysis of the ^{241}Pu cross section up to 100 eV.
H. DERRIEN, G. de SAUSSURE.
ORNL Report to be published.

CONTRIBUTION A NNDEN

CEN, Bruyères-le-Châtel, France

- Work recently completed and publications :

  - Nucleon-induced excitation of collective bands in ^{12}C
    Ali S. MEIGOONI[1] et al.,
    Nucl. Phys. A445 (1985) 304.

  - Cross sections and analyzing powers for fast neutron scattering to the ground and first excited states of ^{58}Ni and ^{60}Ni
    P.P. GUSS[2] et al.,
    Nucl. Phys. A438 (1985) 187.

  - Giant resonance coupling and ℓ-dependent potentials for ^{16}O
    J.P. DELAROCHE et al.,
    Phys. Rev. C 33 n° 5 (1986) 1826.

  - Collective excitations of ^{194}Pt in low energy neutron scattering
    M.C. MIRZAA[3] et al.,
    Phys. Rev. C 32 n° 5 (1985) 1488.

  - Coupled-channel description of inelastic scattering from soft nuclei
    J.P. DELAROCHE, F.S. DIETRICH[4]
    Submitted to Physical Review C

  - Coupled-channel analysis of nucleon scattering from ^{40}Ca up to 80 MeV
    G.M. HONORE[5] et al.
    Phys. Rev. C 33 n° 4 (1986) 1129.

  - Fast neutron scattering from soft nuclei : coupled-channel formalism and illustrations
    J.P. DELAROCHE
    Specialists' meeting on the use of the optical model for the calculation of neutron cross sections below 20 MeV - NEANDC - 222 "U" p. 249 (1986).

- The spin-orbit interaction for neutron-nucleus scattering
  R.L. WALTER[6], J.P. DELAROCHE
  Specialists' meeting on the use of the optical model for the calculation of neutron cross sections below 20 MeV - NEANDC - 222 'U' p. 271 (1986).

- Semi-microscopic calculations of elastic, inelastic and total neutron scattering by ^{239}Pu
  Ch. LAGRANGE, D.G. MADLAND[7], M. GIROD
  Phys. Rev. C 33, 1616 (1986)

- Use of results from microscopic methods in optical model calculations
  Ch. LAGRANGE
  Specialists' meeting on the use of the optical model for the calculation of neutron cross sections below 20 MeV - NEANDC - 222 'U' p 209 (1986).

- Calculation of fission spectrum integrals for the energy region 15-20 MeV of fission neutron spectra
  R.L. WALSH[8]

- Transformations cinématiques et intégration des sections efficaces doublement différentielles
  O. BERSILLON

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Sektion Physik
Mommsenstr. 13
DDR - 8027 Dresden

Work recently completed:

1. Second revised version of evaluated data file for Silicon /1/ (new resonance parameters, improved capture cross sections; now MAT 1402 of BROND)
   (D. Hermsdorf, A.V. Blokhin, A.V. Ignatyuk)

2. First revised version of evaluated data file for Lead /2/ now with resonances parameters, γ-ray-production cross sections and corrected neutron emission spectra in MF 6 MT 10 representation according to /3/; new MAT 8201 of BROND)
   (D. Hermsdorf, A.V. Blokhin, A.V. Ignatyuk)

3. Test of evaluated microscopic data for Si and Pb by integral measurements
   (D. Hermsdorf, M. Toepfer)

4. Phenomenology of angular distributions of neutron emission spectra (DDX) by systematics of experiments and theoretical interpretation
   (D. Hermsdorf, H. Kalka, U. Steininger, J.M. Briseño-Galvez)

Computer codes:

1. Revised version of AMAPRE /4/ improved by an exact treatment of pairing effect according to Fu /5/
   (H. Kalka)

2. Code SIXFIL for processing of MF 6 data structures to produce inelastic scattering matrices for transport calculations
   (M. Toepfer)

Recent publications:

1. D. Hermsdorf,
   Proc. 14th Int. Symp. on Interaction of Fast Neutrons with Nuclei, Gaussig 1984, Report ZfK-562, p. 113, 1985

2. H. Kalka, D. Hermsdorf, D. Seeliger,
   Proc. 3rd Conf. on Neutron Induced Reactions, Smolenice, 1985, in press

3. D. Hermsdorf,
   "Description of File 1402 for Silicon for the Library BROND - Revision of MAT 2015 and Integral Data Tests", INDC(GDR)-38/L, in press

4. D. Hermsdorf,
   "Description of File 8201 for Lead for the Library BROND", INDC(GDR)-39/L, in press

5. D. Hermsdorf, H. Kalka, D. Seeliger, U. Steininger,
   Contributions to "Final Report to CRP on Techniques of Measurements, Analysis and Instrumentation for 14-MeV Neutron Nuclear Cross Sections, Dubrovnik, 1986, in press

Work in progress:

1. Calculation and evaluation of DDX for fast neutron-induced neutron emission for U-238 and Nb-93

2. Revision of MAT 9238 for U-238 for the Library BROND

3. Participation in the CRP on Nuclear Data for Structural Materials

/1/ D. Hermsdorf, Reports INDC(GDR)-20/L, INDC(GDR)-22/L, 1983

/2/ D. Hermsdorf et al., see NNDEN/36, p. 4, 1985

/3/ O. Schwerer, H.D. Lemmel, INDC(NDS)-156, 1984
R.E. Mc Farlane et al., LA-UR-84-1026, Rev. 1, 1984

/4/ H. Kalka, see NNDEN/34, p. 7, 1983

/5/ C.Y. Fu, Nucl. Sci. Engng. 86 (1984) 344

E.N.E.A.- Centro Ricerche Energia 'E. Clementel'
Laboratorio Dati Nucleari e Codici
Divisione Fisica e Calcolo Scientifico
Dipartimento Tecnologie Intersettoriali di Base
Via Mazzini, 2 - 40138 Bologna, Italy
tel. 051/498111 - telex 511578 ENEABO I

Names: F. Fabbri, G. Maino, E. Menapace, A. Mengoni, G.C.Panini, M. Pescarini. G. Reffo, M. Rosetti, M. Vaccari.

Publications

1) A. Mengoni, F. Fabbri, G. Maino, "Evaluation of Gamma-Ray Production Cross Sections and Spectra for Neutron-Induced Reactions on Chromium", RT/TIB/85/38.

2) M.G. Borgia, G.C. Panini, M. Pescarini, "Comparison between EURLIB-4 and VITAMIN-C Libraries with respect to a Shielding Reference Problem", RT/TIB/86/4

3) G.C. Panini, "Highlights of the ENDF-6 Format", RT/TIB/85/32

Work in progress or recently completed

I) Evaluation

Photon production cross sections and relevant spectra have been evaluated in the incident neutron energy range from 1 KeV to 8 MeV for ^{50}Cr, ^{52}Cr, ^{53}Cr, ^{54}Cr and nat Cr.

A study on effects due to the inclusion of parity dependence in nuclear level densities is in progress, within the framework of the Hauser-Feshbach statistical model.

II) Activity in Nuclear Data Management and Processing

a) The THEMIS code for nuclear data processing is being on CRAY.XMP. The code has been obtained from CEA-Saclay and final goal is to merge in it the ACER module received from AERE-Winfrith.

b) Some parts of the VITAMIN-J library has been processed by THEMIS in the framework of the GEFF-1 project for fusion group libraries.
The processing will deal with the neutron data of 12 materials, the photon production data for most part of the materials and the photon data of all the nuclides of interest in the fusion field.

c) Reaction rates and kerma factors in the same VITAMIN-J structure for all EFF-1 materials have been ottained too.

Contribution to Neutron Nuclear Data Evaluation Newsletter-38

Japanese Nuclear Data Committee
(Nuclear Data Center, JAERI)

Work Recently Completed and Publications:

(1) Systematic Analysis of Fission Cross Sections of Actinides by means of Double-Humped Barrier Model
Takaaki OHSAWA, Yuji SHIGEMITSU, Masao OHTA and Kazuhiko KUDO: J. Nucl. Sci. Technol., 21, 880 (1984)

Neutron-induced fission cross sections of 24 actinide nuclei were analyzed in terms of the double-humped fission barrier model to deduce the barrier heights. Good fits were obtained by assuming that the first barrier is mass-symmetric and axially asymmetric, while the second barrier is mass-asymmetric and axially symmetric. Systematic trends were observed in the barrier heights of the actinide nuclei; the first barrier height as a function of neutron number tends to be peaked at N≈147, whereas the second barrier height increases linearly as a function of $(1-x)^3A^{2/3}$, where x is the fissility. By decomposing the barrier heights into liquid-drop and shell correction parts, the surface energy coefficient was deduced to be 17.55 MeV. This value is consistent with existing values obtained from nuclear mass systematics. This fact corroborates the theoretical conjecture that the shell correction is damped at larger deformation corresponding to the second barrier. Near constancy of the fission barrier heights for actinides (fission barrier anomaly) was interpreted in terms of the three-component analysis.

(2) Evaluation of Neutron Nuclear Data for ^{249}Bk and ^{249}Cf
Yasuyuki KIKUCHI and Tsuneo NAKAGAWA: JAERI-M 85-138 (1985)

Neutron nuclear data of ^{249}Bk and ^{249}Cf have been evaluated in the energy range from 10^{-5} eV to 20 MeV. Evaluated quantities are the total, elastic and inelastic scattering, fission, capture, (n,2n), (n,3n) and (n,4n) reaction cross sections, the resolved and unresolved resonance parameters, the angular and energy distributions of the emitted neutrons, and the average number of neutrons emitted per fission. The fission cross sections were evaluated mainly on the basis of measured data. The other cross sections were calculated with the optical and statistical models because of scarce measured data.

(3) Evaluation of Neutron Nuclear Data of Natural Nickel and Its Isotopes
Yasuyuki KIKUCHI and Nobuo SEKINE: J. Nucl. Sci. Technol., 22, 337 (1985)

Neutron nuclear data of natural nickel and its isotopes have been evaluated. Evaluated are the total, elastic and inelastic scattering, capture, (n,2n), (n,3n), (n,p), (n,α), (n,n'p) and (n,n'α) reaction cross sections, the resonance parameters, the angular and energy distributions of secondary neutrons in the energy range of 10^{-5} eV∿20 MeV. The evaluation has been made on the basis of recently measured data with the aid of the spherical optical model and

statistical model. The results of the benchmark tests of JENDL-1 have been also taken into consideration. Special care has been taken on the background cross sections in the resonance region, the remaining resonance structure in the unresolved resonance region up to a few MeV, and grouping of the inelastic scattering levels in the natural nickel file. The problems left for future work are also discussed. The results of the present evaluation were adopted in JENDL-2.

Detailed figures and tables were published as JAERI-M 85-101 (1985), by the same authors.

(4) Evaluation of Neutron Nuclear Data of Chromium, Iron and Nickel for Fusion Neutronics Application

Yasuyuki KIKUCHI, Keiichi SHIBATA, Tetsuo ASAMI, Teruo SUGI, Hisao YAMAKOSHI and Naoyuki KITAJIMA: J. Nucl. Sci. Technol., 22, 499 (1985)

Evaluated nuclear data of Cr, Fe and Ni in JENDL-2 were modified for fusion neutronics application. The modification was made on the inelastic scattering and (n,2n) reactions. The coupled channel optical model was applied to the inelastic scattering to the low-lying collective levels. The pre-equilibrium model was used for the inelastic scattering to the other levels and (n,2n) reaction. The obtained results were checked by comparing with the double differential cross section measured at Osaka University.

(5) Proceedings of Specialists' Meeting on Nuclear Data for Fusion Neutronics

Sin-iti IGARASI and Tetsuo ASAMI(Ed.): JAERI-M 86-029 (1986)

This report is the Proceedings of the Specialists' Meeting on the Nuclear Data for Fusion Neutronics. The meeting was held in July 23-25 1985 at Tokai Research Establishment of Japan Atomic Energy Research Institute, under the participation of twenty-odd specialists who were the members of Working Group on Nuclear Data for Fusion in Japanese Nuclear Data Committee and a part of the members of Subcommittee on Fusion Reactor in Japanese Committee on Reactor Physics. Review papers were presented for the evaluated data in JENDL-3PR1 and -3PR2, the data needs in the fusion reactor blanket design, the status of experimental and evaluated data for fusion neutronics, and the analyses of integral experiments. In a final stage of this meeting, the discussions were made in three working groups and the recommendations were reported from these three groups. The outlines of the discussions and the recommendations are also included in the Proceedings.

(6) Evaluation of Resonance Parameters of Mo, Tc, Te, Ba, La, Ce, Pr, Nd, Pm, Sm and Eu Isotopes for JENDL-2 Fission Product File

Yasuyuki KIKUCHI, Orihiko TOGAWA and Tsuneo NAKAGAWA: JAERI-M 86-030 (1986)

The resonance parameters of 39 fission product nuclides have been evaluated. The present work is a part of the evaluation of 100 fission product nuclei for JENDL-2 by Japanese Nuclear Data Committee. All the available experimental data were collected, stored in REPSTOR system and compared with one another. The evaluation was made on the basis of the experimental data. The precise description of the evaluation is given in this report. The presently

evaluated resonance parameters are tabulated in Appendix with the experimental data.

(7) Reevaluation of Decay Energies of Fission Product Nuclides in JNDC FP Decay Data File

Jun-ichi KATAKURA and Ryuzo NAKASIMA: JAERI-M 86-041 (1986)

The decay data of all experimentally identified fission product nuclides included in the JNDC FP Decay Data File are reviewed in detail, since the missing of beta-transition to unobserved highly excited states in the daughter nucleus is considered to be probable in some cases even for nuclides with small Q-value of β decay. Thus the decay energies of 127 nuclides or metastable states except for ^{88}Rb and ^{143}La revised previously are reevaluated. The results of summation calculations based on the revised JNDC FP Decay Data File modified by the present evaluation are in much better agreement with experimentally measured decay power curves than previous ones. Especially, the discrepancy remained for cooling times from a few hundreds to about 1500 seconds is removed. And the agreement is kept within about 5 % for wide range of cooling times.

(8) Proceedings of the 1985 Seminar on Nuclear Data

Tetsuo ASAMI and Motoharu MIZUMOTO(Ed.): JAERI-M 86-080 (1986)

The 1985 Seminar on Nuclear Data was held on November 12 to 14, 1985 at Tokai Research Establishment of Japan Atomic Energy Research Institute. This is an annual meeting which have been held since 1978, with the support of Japanese Nuclear Data Committee. Four researchers from China and one from Indonesia participated in this seminar.

The seminar was divided into seven sessions including Poster session. The subjects are: (1) Nuclear data activities in each country, (2) Activities of JNDC Working Groups, (3) Topics, (4) Relation between absolute and relative measurements of nuclear data, (5) Nuclear data for fusion reactors, and (6) Problems on heavy nuclide nuclear data. Poster session was carried out with the title of "Neutron cross-section measurements and facilities in Japan". The Proceedings include the contributed papers presented in this seminar and the descriptions for Posters.

(9) Evaluation of Neutron Nuclear Data for ^{250}Cf and ^{251}Cf

Tsuneo NAKAGAWA: JAERI-M 86-086 (1986)

Nuclear data of ^{250}Cf and ^{251}Cf have been evaluated in the energy range from 10^{-5} eV to 20 MeV. There exist only a few experimental data for the cross sections of both the isotopes, that is, the cross sections at the thermal neutron energy and the resonance integrals. Therefore, the present evaluation was based on systematic trends of the data and the calculation with the optical, statistical and evaporation models. Cross sections evaluated in this work are the total, elastic and inelastic scattering, fission, radiative capture, (n,2n), (n,3n) and (n,4n) reaction cross sections. In the energy range below 150 eV, hypothetical resonance levels were generated so as to reproduce the measured thermal cross sections and resonance integrals. Other evaluated quantities are the angular distributions of elastically and inelastically scattered neutrons and those of neutrons emitted from the (n,2n), (n,3n), (n,4n) and fission

reactions, their energy distributions, and average numbers of neutrons emitted per fission. The results were compiled in the ENDF/B-V format.

(10) The following papers were presented in International Conference on Nuclear Data for Basic and Applied Science, held at Santa Fe, New Mexico, May 13-17, 1985.

1) Charge Distribution in Nuclear Fission Taking into account Inherent Error of Theoretical Expression (JA64)
   A. ZUKERAN
2) Simultaneous Evaluation of Fission and Capture Cross Sections and Their Covariances for Heavy Nuclei (IB07)
   Y. KANDA, Y. UENOHARA, T. MURATA, M. KAWAI, H. MATSUNOBU, T. NAKAGAWA, Y. KIKUCHI and Y. NAKAJIMA
3) A Calculation of Capture Gamma-Ray Spectra for Ta-181 and Au-197 (JB29)
   N. YAMAMURO
4) A Method of Analysis of Neutron Inelastic Scattering by Heavy Nuclei and Its Application to Cross Section Evaluation for Th-232 (JB31)
   T. OHSAWA, K. FUJINO, M. OHTA and K. KUDO
5) Estimation of Level Density Parameters and Energy Shifts with Bayesian Method (JB33)
   Y. UENOHARA, Y. KANDA, T. YUGAWA and Y. YOSHIOKA
6) Evaluation of Nuclear Data for Fusion Neutronics (JC26)
   Y. KIKUCHI and K. SHIBATA
7) Evaluation of FP Cross Sections for JENDL-2 (JC36)
   T. AOKI, S. IIJIMA, M. KAWAI, Y. KIKUCHI, H. MATSUNOBU, T. NAKAGAWA, Y. NAKAJIMA, T. NISHIGORI, M. SASAKI, T. WATANABE, T. YOSHIDA and A. ZUKERAN

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May 27, 1986

NEUTRON NUCLEAR DATA EVALUATION NEWSLETTER-38

ECN-PETTEN, THE NETHERLANDS

1. Names

H. Gruppelaar, H.A.J. van der Kamp, A.J. Jansen, R.J. Heijboer, J.M. Akkermans, D. Nierop and Shi Xiangjun (visiting scientist), Netherlands Energy Research Foundation (ECN), P.O. Box 1, 1755 ZG PETTEN, The Netherlands. Telephone: 02246-4083, telex: 57211 REACP NL.

2. Recent publications and reports

[1] H. Gruppelaar and J.M. Akkermans; The GRAPE Code System for the Calculation of Precompound and Compound Nuclear Reactions - GRPYPHON code description and manual, ECN-164 (1985).
[2] H. Gruppelaar and P. Nagel; Pre-Equilibrium Effect in Nuclear Models and Codes, NEA Data Bank Newsletter 32 (1985).
[3] H. Gruppelaar; Present Status of the European Fusion File, Proc. Int. Semi. on Nuclear Data, Cross Section Libraries and their Applications in Nuclear Technology, Bonn, October 1985, p. 288 (Kerntechnische Gesellschaft E.V.).
[4] H. Gruppelaar, R.J. Heijboer, A.J. Janssen, H.A.J. van der Kamp, N. Karouby-Cohen, L. Martin-Deidier, G. Rimpault and M. Salvatores, Integral Test of Fission-Product Cross Sections, Contr. Inf. Conf. on Nuclear Data for Basic and Applied Science, May 1985, Santa Fe, NM, ECN-176 (1985).
[5] H. Gruppelaar, D. Nierop and J.M. Akkermans; Processing of double-differential cross sections in the new ENDF-VI format - GROUPXS code description and users' manual -, ECN-182 (1986).
[6] P.E. Hodgson, G.M. Field, H. Gruppelaar and P. Nagel; Pre-Equilibrium Processes in Nuclear Reactions, Inv. paper Int. Conf. on Nuclear Data for Basic and Applied Science, May 1985, Santa Fe, NM, extended review paper, Rev. Nuovo Cim., in press (1986).
[7] H.A.J. van der Kamp and H. Gruppelaar; Evaluation of neutron cross sections for ^{101}Ru (RCN-4 data library), ECN-85-129, available upon request.
[8] H. Gruppelaar, J.M. Akkermans and Shi Xiangjun; Investigation of spin effects in exciton model codes, contr. paper Int. Conf. on Fast Neutron Physics, Dubrovnik, May 1986.
[9] J.M. Akkermans, Shi Xiangjun and H. Gruppelaar; Economizing Hauser-Feshbach calculations in the continuum, to be published.

3. Work recently completed

- Precompound-model studies: [1,2,6,8].
- Distribution of EFF-1 file [3] to European users.
- Revision of lead continuum cross sections [3].
- Third phase of integral-data test JEF-1 fission-product file (cooperation CEA-Cadarache) [4].
- Investigation of spin effects in excition models [8].
- Revision of a large data base for activation and transmutation reaction cross section for fusion-reactor applications.

4. Work in progress

- Unified precompound and compound-model study.
- Fourth phase of integral-data test JEF-1 fission product file (cooperation CEA-Cadarache).
- Evaluations of Ru-102, Pd-107, Ni-isotopes.
- Editing of GEFF-1 multi-group constant file.

5. Computer codes

- GRAPE system [1]: available from NDB.
- GROUPXS code [5]: to be submitted to NDB.

Chinese Nuclear Data Center

Address: Institute of Atomic Energy
P. O. Box 275 (41), Beijing
P. R. China

Work recently completed

- Zhang Jin, Zhou Delin and Cai Dunjiu
  Systematics of Excitation Function for (n,2n) and (n,3n) Reactions.
  (Intern. Conf. on Nucl. Data for Basic and Applied Science, Santa Fe, New Mexico, USA, 13-17 May, 1985)
- Zhao Zhixiang and Zhou Delin
  Systematics of Excitation Function for (n, Charged particle) Reactions. (to be published) *)
- MUP-2, a computer code for calculating the neutron nuclear data of intermediate and heavy nuclei. This is a combined code including calculations based on optical model, Hauser-Feshbach statistical theory with width fluctuation correction and evaporation model including preequilibrium statistical theory based on exciton model. Some study results of microscopic theory of the optical potential have also been used in this code. (have been submitted to NEADB)

Work in progress

- H. Q. Qi and Z. P. Chen (Department of Physics, Tsinghua University, Beijing, China)
  Complete evaluation of neutron nuclear data for Co.

*) INDC(CPR)-8 (June 1986)

NUCLEAR PHYSICS DIVISION, AERE, HARWELL

An evaluation has been started in cooperation with France and Germany of the cross-sections of U-238. In this work the high energy range and thermal region will be done in France while the unresolved resonance range will be the responsibility of Germany; the UK will do the remainder. Up to the present time most of our work has involved the resolved resonance region. It had been hoped to use the ENDF/B-VI standards in the evaluation but since these may now not be available in time, steps are being taken to evaluate the U-235 fission cross-section which is needed to obtain the U-238 fission and capture cross-sections.

In cooperation with ECN Petten work is being done to improve the cross-section library UKCTR111A(1) used for the calculation of the activation of fusion reactors. The work is in two phases; in the first ECN Petten, with some help from us, have produced an improved and extended library. In the second phase the library will be further improved by replacing some of the less accurate data with better data and the library will be extended to give more complete coverage of the periodic table if this proves necessary.

In order that the second phase of the work can be carried out 3 codes of varying sophistication are being implemented and improved. The Los Alamos preequilibrium statistical model code GNASH has been implemented(2) on the CRAY-1 computer. This code uses Hauser-Feshbach theory to calculate complicated multistep reaction chains and it will only be used for nuclei where accurate calculations are required. At the other extreme a version of the code THRESH(3) which is based on the statistical model plus cross-section systematics is being further improved by incorporating better systematics that are being developed into the code. The code CADE(4) has a more physical basis than THRESH but is not so sophisticated as GNASH. It does not consider reactions to discrete final levels in the nucleus but assumes the final nucleus can be described by a continuum of levels (Weisskopf-Ewing Theory). This code is currently being tested against experimental data and being made easy to run in cooperation with the University of Oxford.

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(1) O. N. Jarvis, UKAEA Report AERE-R 9601 (Rev.) (1980).

(2) D. W. Muir, UKAEA Report AERE-R 11877 (1985).

(3) L. Giancarli and H. Gruppelaar, UKAEA Culham Report CLM-R 261 to be issued.

(4) D. Wilmore, UKAEA Report AERE-R 11515 (1984).

Neutron Nuclear Data Evaluation Newsletter 38

Nuclear Physics Laboratory, Oxford, U.K.

Publications

1. The Interaction of Neutrons with ^{59}Co. By P.E. Hodgson. Proceedings of the 4th International Conference on Nuclear Reaction Mechanisms (Varenna 1985) Ricerca Scientifica ed Educazione Permanente. Supplemento **46**.1.1985.
2. Pre-equilibrium Processes in the Reactions of Neutrons on ^{59}Co and ^{93}Nb. By G.M. Field, R. Bonetti and P.E. Hodgson. J. Phys. **G12**.93.1986
3. Analysis of Cross-sections of Neutron-Induced Reactions from 1 to 20 MeV. By P.E. Hodgson. Specialists' Meeting on the Use of the Optical Model for the Calculation of Neutron Cross-Sections below 20 MeV. (November 1985) OECD Paris.117.1986.
4. Analysis of Neutron Inelastic Scattering from ^{59}Co and ^{93}Nb using the Multistep Compound Pre-Equilibrium Theory. By R. Bonetti and P.E. Hodgson. Specialists' Meeting on the Use of the Optical Model for the Calculation of Neutron Cross-Sections below 20 MeV (November 1985) OECD Paris.267.1986.
5. The Interactions of Neutrons with ^{59}Co. By P.E. Hodgson. Proceedings of the 2nd La Rábida Summer School on Nuclear Physics (June-July 1985) World Scientific.418.1985.
6. Pre-Equilibrium Processes in Nuclear Reactions. By P.E. Hodgson. Proceedings of the 2nd La Rábida Summer School on Nuclear Physics (June-July 1985) World Scientific.439.1985.
7. The Inelastic Scattering of Neutrons by ^{232}Th. By A.M. Street and P.E. Hodgson Nucl. Sci. Eng. **92**.459.1986.
8. Pre-Equilibrium Processes in Nuclear Reactions. By P.E. Hodgson, G.M. Field, H. Gruppelaar and P. Nagel. Invited paper to Santa Fé Conference (May 1985). This reviews both the exciton and the quantum mechanical theories.
9. Pre-Equilibrium Processes in Nuclear Reaction Theory: The State of the Art and Beyond. By H. Gruppelaar, P. Nagel and P.E. Hodgson. Rivista del Nuovo Cimento (in course of publication).

Work in Progress

1. Neutron Scattering and Reactions on ^{93}Nb from 1 to 20 MeV. By D. Wilmore and P.E. Hodgson.
2. Weisskopf-Ewing Calculations of Neutron Reactions. By S. Ait-Tahar and P.E. Hodgson. The cross-sections of (n,p) and (n,α) reactions on ^{55}Mn, ^{59}Co, ^{54}Fe, ^{56}Fe, ^{58}Ni, ^{60}Ni, ^{63}Cu and ^{65}Cu are being calculated and compared with experimental data. The aim of this work is to find a simple yet accurate way of calculating many neutron cross-sections.
3. Intercomparison of THRES-F and Weisskopf-Ewing Codes. By P.E. Hodgson. neutron cross-sections calculated with the THRES-F codes of L. Giancarli and H. Gruppelaar and the CADE (Weisskopf-Ewing) code of D. Wilmore are being compared with each other and with experimental data. The preliminary comparisons are being made for neutron reactions on ^{59}Co and ^{93}Nb from 1 to 20 MeV.

4. International Nuclear Model Code Comparison Study for Compound Nucleus Cross-Sections. Preliminary work is in progress to organise comparison of codes using the Weisskopf-Ewing, Hauser-Feshbach and Feshbach-Kerman-Koonin theories.

P.E.Hodgson
May 1986

AEE Winfrith

Compiled by R W Smith

1 Nuclear Data Evaluation and Validation

1.1 Fission Product Yields (J Banai, Birmingham University and M F James)

A revised library of independent fission yields (UKIFY1) has been produced in ENDF/B5 format. This contains yields for the thermal fission of U233, U235, Pu239 and Pu241, the fast fission of Th232, U233, U235, U238, Pu239, Pu240 and Pu241, and the 14MeV fission of Th232, U233, U235 and U238, constrained to fit physical conservation laws. It differs from the previous library C4A in that a number of corrections have been made to the data base, and the limiting yield below which fission products were ignored has been reduced. Ternery fission products are included.

A list has been compiled of mass chains for which chain yield measurements are either unavailable or discrepant, and detailed evaluations are underway of particularly important chains. A library of cumulative yields is being produced, also in ENDF/B5 format.

1.2 IAEA Co-ordinated Research Program on Transactinium Decay Data (A L Nichols)

An extensive report has been prepared in conjunction with IAEA personnel, describing all of the measurements and evaluations made under the auspices of the Coordinated Research Progammme on the Measurement and Evaluation of Transactinium Isotope Decay Data. Half-lives, branching fractions, and alpha and gamma-ray emission probabilities have been assessed for 26 heavy elements and actinides. At various times throughout the year the tabulations for this report have been reviewed in preparation for the final proofs. The intention is to include these improved data in a new version of the UKCNDC heavy element decay data library (UKHEDD-2). This IAEA document has been published as "Decay Data of the Transactinium Nuclides", Technical Report Series No 261, 1986.

1,3 Activation Products (A L Nichols)

Gamma-ray emission probability data have been evaluated for Cr-51, Zn-65 and Au-198 (and are planned for Se-75), following an IAEA consultants' meeting on Gamma-ray Standards for Detector Calibration held at Grenoble, May 1985.

1.4 Few Group Capture Cross Sections for FISPIN (R W Smith)

An in-depth review of the three group (thermal, resonance and fast) capture cross-sections of Cs133 as used in FISPIN,

has been completed for MAGNOX and PWR fuels. Estimated uncertainties based on a comparison of values calculated from JEF1 and experimental integral data were derived and the effect of resonance overlap (including Doppler broadening) from the resolved resonances of U238 on the three group data was also investigated.

An in-depth review of the Np237 (n,2n) reaction is currently in progress.

July, 1986

USA Contribution to NNDEN-38
via The National Nuclear Data Center

Recent Publications

Santa Fe, New Mexico, May 13-17, 1985, International Conference on Nuclear Data for Basic and Applied Science
"Investigation of Thick-Target Neutron Emission from BE-9(D,N) B-10 at EN=7 MeV for Angles Other Than Zero Degrees", Argonne National Laboratory
D. L. Smith, J. W. Meadows and P. T. Guenther

Santa Fe, New Mexico, May 13-17, 1985, International Conference on Nuclear Data for Basic and Applied Science
"Fast-Neutron Interaction with Niobium", Argonne National Laboratory
A. B. Smith, et al.

Santa Fe, New Mexico, May 13-17, 1985, International Conference on Nuclear Data for Basic and Applied Science
"Angular Distribution Neutron Emission Spectra of Niobium Following Bombardment by Fast Neutrons", Argonne National Laboratory
P. T. Guenther and A. B. Smith

ANL/NDM-91 1985
On the Energy Dependence of the Optical Model of Neutron Scattering from Niobium", Argonne National Laboratory.
A. B. Smith, P. T. Guenther and R. D. Lawson

Boston, Massachusetts, June 1985, American Nuclear Society Annual Meeting.
"Energy-Averaged Neutron-Nuclear Data. Measurements and Physical Interpretations", Argonne National Laboratory.
A. B. Smith

Bull. Am. Phys. Soc., Vol. 30. No. 8, p. 1252 (1985)
"Integral Neutron-Activation Cross Section Measurements in the Be-9(D,N) B-10 Thick-Target Spectrum for 7-MeV Deuterons", Argonne National Laboratory.
D. L. Smith and J. W. Meadows

Nuclear Instruments and Methods in Physics Research, A241, p. 507-510 (1985)
"Neutron Emission from the Be-9(D,N) B-10 Thick-Target Reaction for 7 MeV Deuterons", Argonne National Laboratory.
D. L. Smith, J. W. Meadows and P. T. Guenther

Nuclear Physics, A448, p. 280-300 (1986)
"Total Scattering and Gamma-Production Cross Sections for Few-MeV Neutrons on Elemental Copper", Argonne National Laboratory.
P. T. Guenther, D. L. Smith, A. B. Smith and J. F. Whalen

BNL/NCS 37575 January 1986
"Energy Dependence of the Neutron Multiplicity P_ν in Fast Neutron Induced Fission for $^{235,238}U$ and ^{239}Pu", Brookhaven National Laboratory.
M. S. Zucker and N. E. Holden

BNL/NCS-37632 January 1986
"Average Prompt Neutron Emission Multiplicuty (Nubar) Values at 2200 Meters per Second for the Fissile Nuclides", Brookhaven National Laboratory.
N. E. Holden and M. S. Zucker

BNL/NCS-37633 January 1986
"Oxygen Isotopic Abundance Variations in Nature", Brookhaven National Laboratory.
N. E. Holden

BNL/NCS-37634 January 1986
"Uncertainties in Scientific Measurements", Brookhaven National Laboratory.
N. E. Holden

BNL/NCS-37669 December 1985
"Reference Data for Nuclear Research", Brookhaven National Laboratory.
S. Pearlstein

BNL/NCS-36468 May 1985
"Spin Dependence of the Coherent Scattering Lengths of ^{27}Al and Admixture of S- and D-partial Waves", Brookhaven National Laboratory.
S. F. Mughabghab

BNL/NCS-36965 August 1985
"Reexamination of 2200 Meter/Second Cross Section Experiments for Neutron Capture and Fission Standards", Brookhaven National Laboratory.
N. E. Holden and K. A. Holden

Proc. OECD/NEANDC Specialists' Meeting on Use of the Optical Model for the Calculation of Neutron Cross Sections below 20 MeV, Paris, November 13-15, 1985, NEANDC-222'U' p. 127, (1986)
"Global and Local Optical Model Parameterizations", Los Alamos National Laboratory.
P. G. Young

Proc. Third Int. Symp. on Ceramics in Nuclear Waste Management, Chicago, Ill., April 27 - May 1, 1986,
"Calculations for Isotopically-Tailored Ceramics in Fission and Fusion Reactors", Los Alamos National Laboratory
R. J. LaBauve, R. J. Livak, and F. W. Clinard, Jr.

Phys. Rev. C 32, 1157 (1985)
"Surface Effects in the Exciton Model of Preequilibrium Nuclear Reactions", Los Alamos National Laboratory.
C. Kalbach (LANL Consultant)

LA-10699-MS April 1986
"Bibliographic Survey of Medium Energy Inclusive Reaction Data", Los Alamos National Laboratory.
E. D. Arthur, D. G. Madland and D. M. McClellan

Nucl. Sci. Eng. 92, p. 350 (1986)
"Fast Neutron Inelastic Scattering Cross Sections of ^{238}U for States Between 680 and 1530 keV", Los Alamos National Laboratory.
J. Q. Shao, G. P. Couchell, J. J. Egan, G. H. R. Kegel, S. Q. Li, A. Mittler, D. J. Pullen, W. A. Schier and E. D. Arthur

Phys. Rev. C 33, p. 818 March 1986
"Two-Component Exciton Model: Basic Formalism Away from Shell Closures", Los Alamos National Laboratory.
C. Kalbach (LANL Consultant)

Journal of Radioanalytical and Nuclear Chemistry, Letters 103, 5, p. 273-280 1986
"Half Life of ^{57}Ni", Oak Ridge National Laboratory
J. K. Dickens

Phys. Rev. C31, 2041 1985
"The Test of Fermi Gas Model Predictions of Level Density in Xe-137", Oak Ridge National Laboratory.
B. Fogelberg, J. A. Harvey, M. Mizumoto, and S. Raman

Radiation Effects 92, p. 71 1986
"High Resolution Structural Material $(n,x\gamma)$ Production Cross Sections for E_n from 0.2 to 40 MeV", Oak Ridge National Laboratory.
D. C. Larson

Nucl. Sci. Eng.
"A Self-Calibrated Neutron-Capture Measurement of the 1.15 keV Resonance of Iron", Oak Ridge National Laboratory.
R. L. Macklin

Nucl. Sci. Eng. 92, p. 525 1986
"Neutron Transmission Measurement and Resonance Analysis of Zr-93 from 60 to 6000 eV", Oak Ridge National Laboratory.
R. L. Macklin, J. A. Harvey, and N. W. Hill

ORNL-6266 April 1986
"Fission-Product Yield Data from the US/UK Joint Experiment in the Dounreay Prototype Fast Reactor", Oak Ridge National Laboratory.
J. K. Dickens and S. Raman

Santa Fe, New Mexico, May 13-17, 1985, International Conference on Nuclear Data for Basic and Applied Science
"Neutron Total Cross Section of Pu-240 Below 6 eV and the Parameters of the 1.0 eV Resonance", Oak Ridge National Laboratory.
R. R. Spencer, J. A. Harvey, N. W. Hill and L. W. Weston

Submitted to Nucl. Sci. Eng.
"Resolved Resonance Parameters for 238-U from 1 to 10 keV", Oak Ridge National Laboratory.
D. K. Olsen

Nucl. Sci. Eng. 92, p. 440 1986
"Simplified Spin Cutoff Factors for Particle-Hole Level Densities in Precompound Nuclear Reaction Theory", Oak Ridge National Laboratory.
C. Y. Fu

Physics Letters 161B(4,5,6) 1985
"ℓJ-Dependence of the Real Optical Potential Near Neutron Threshold", Oak Ridge National Laboratory.
D. J. Horen, C. H. Johnson and A. D. MacKellar

Phys. Review C32, 359 1985
"Energy Average of the Scattering Matrix in Picket-Fence Model", Oak Ridge National Laboratory.
C. H. Johnson, C. Mahaux and R. R. Winters

Paris, November 1985, Proc. of Specialists Meeting on the Use of the Optical Model for the Calculation of Cross Sections Below 20 MeV, p. 159 1985
"Optical Models in the Resolved Resonance Region", Oak Ridge National Laboratory.
C. H. Johnson

Phys. Rev. C32, p. 384 1985
"Optical Model for Low-Energy Neutrons on ^{60}Ni", Oak Ridge National Laboratory.
C. H. Johnson and A. D. MacKellar

Reno, Nevada, June 15, 1986, American Nuclear Society Meeting
"R-Matrix Analysis of the Pu-239 Cross Sections up to 600 eV", Oak Ridge National Laboratory.
H. Derrien, G. de Saussure, R. B. Perez, N. M. Larson, and R. L. Macklin

Trans. Am. Nucl. Soc. 50, 470 1985
"Impact of 57-Fe on Neutron Penetration in Thick Sodium-Iron Shields", Oak Ridge National Laboratory.
C. Y. Fu and D. T. Ingersoll

Nucl. Sci. Eng. 93, 31 1986
"Multilevel Analysis of the Low Energy ^{239}Pu Cross Sections", Oak Ridge National Laboratory.
R. B. Perez, G. de Saussure, N. M. Larson, and R. L. Macklin

Evaluations Recently Completed or in Progress

Material	Laboratory	Status
^{1}H	LANL	Analysis complete for ENDF/B-VI.
^{3}H	LANL	R-matrix analysis complete to 20 MeV.
^{3}He	LANL	R-matrix analysis complete to 10 MeV.
^{6}Li	LANL	Analysis complete to 4 MeV for ENDF/B-VI.
^{6}Li	ANL	Simultaneous evaluation-(n,t),(n,n) reactions, nearly completed.
^{9}Be	LLNL	Complete.
^{10}B	LANL	Analysis complete for ENDF/B-VI.
^{10}B	ANL	Simultaneous evaluation-(n,α_0), $(n,\alpha_1\gamma)$ (n,n) reactions, nearly completed.
^{11}B	LANL	New evaluation in progress.
^{15}N	LANL	New evaluation in progress.
V	ANL	In progress (with the Univ. of Illinois).
$^{52,53}Cr$	ORNL	All reactions 1-20 MeV in progress.
^{56}Fe	ORNL	Nearing completion.
Co	ANL/LLNL	In progress.
$^{58,60}Ni$	ORNL	All reactions 1-20 MeV in progress. Analysis completed.
Ni	ANL/LLNL	Evaluation of high energy portion in progress.
$^{63,65}Cu$	ORNL	Complete.
Y	ANL	Comprehensive evaluation completed. See ANL/NDM-94
Nb	ANL	Comprehensive evaluation completed. See ANL/NDM-88
^{165}Ho	LANL	New theoretical analysis in progress.
^{197}Au	LANL	New theoretical evaluation complete. 10 keV to 20 MeV.

$^{151,153}Eu$	LANL	New theoretical analysis/evaluations in progress.
$^{155,157}Gd$	LANL	New theoretical analysis/evaluations in progress.
^{197}Au	ANL	Simultaneous evaluation-(n,γ) reaction, nearly completed.
^{235}U	ANL	Simultaneous evaluation-(n,f) reaction, nearly completed.
^{238}U	ANL/LLNL	Simultaneous evaluation-(n,γ),(n,f) reactions, nearly completed. Reactions for E>45 keV in progress.
^{238}U	ORNL	Resonance region. In progress.
^{239}Pu	ANL	Simultaneous evaluation-(n,f) reaction, nearly completed.
^{239}Pu	ORNL	Resonance region reevaluated, nearly complete.
^{240}Pu	ORNL	Nearly completed. Under review.
FP Yields	LANL	Preliminary eval. for 50 sets each of independent and cumulative yields. (ENDF/B Format)
ν_d Precursor spectra	LANL	Preliminary evaluation of 30 precursor spectra.
ν_d Precursor Pn	HEDL/LANL	~ 70 Precursor emission probabilities. reevaluated

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June 1986

Centr po yadernym dannym
Fisiko-Energeticheskij Institut, Obninsk, USSR

Essential scope of work has been carried out on nuclear data evaluation and build-up of files for Library of Recommended Evaluated Neutron Data covering 65 nuclei most urgent for fast reactors.

/B.D. Kuzminov. The work of the soviet specialists in the field of neutron nuclear data. Progress report submitted to the XV meeting of the INDC, 16-20 June 1986, to be published as INDC report./

The library of recommended estimated neutron data. A great amount of investigations have been performed to produce the methods of evaluation and ther realization for fissile nuclei, structural material nuclei and fission products. For isotopes of uranium, plutonium and neptunium a coordinated optical- statistical analysis has been made of mean neutron resonance parameters, total neutron cross-sections, fission cross-sections, neutron spectra and excitation function of (n, xn)- reactions. The level density description of this analysis took into account shell, superfluid and collective effects as well as a desplay of these effects for equilibrium and transient deformations of fissile nuclei:

On the basis of the analysis of the available estimates and experimental data a new estimate of total structural materials' files: chronium, nickel, iron was developed. The files of cross-sections for separated isotopes and their natural mixture were built-up. The new version gave essential attention to the resonance structure of cross-sections and significantly specifies the neutron

inelastic scattering cross-sections, elastic scattering cross-sections and cross-sections of lowest collective level excitation of even-even nuclei. This approach enabled the contributions of direct scattering mechanisms to be taken into account over the whole energy range, as well as the lowest-level odd isotope excitation functions whose direct experimental data are missing to be evaluated correctly.

The analysis was also run for the capture cross-sections and neutron inelastic scattering for the isotopes of zirconium, niobium and molybdenium. The results of this analysis are interest for systematics of generalized optical model parameters and the coordonated description of the total combination of neutron cross-sections.

The complex of experimental data and radiative capture cross-section evaluation was analyzed for the most important fission products making a prevalent contribution to reactor core poisoning and residual activity of waste fuel. For the isotopes ^{99}Tc, $^{101,102,104}Ru$, ^{103}Rh, $^{105,107}Pd$, ^{109}Ag, ^{129}I, $^{143,145}Nd$, $^{147,149}Sm$ the neutron and radiative strenth functions used for cross-section paramentrization in the unresolved resonance region were determined on the basis of the statistical description of capture cross-sections and mean neutron resonance parameter analysis. These data were supplemented by resonance parametrization of the cross-sections for resolved resonances and compiled in the form of complete files. The experimental data analysis has shown, that for the isotopes $^{95,97,98,100}Mo$, ^{133}Cs, ^{141}Pr and $^{151,153}Eu$ there is no nud for new evaluations, the recommendations JENDL or ENDF/B-5 being optical for them. For the isotopes ^{131}Xe, ^{147}Pm and ^{151}Sm these are no direct experimental data on fast neutron capture cross-section but information on mean resonance parameters is available. The isotopes ^{106}Ru, ^{135}Cs, ^{144}Ce and series of other less important fission products are lacking the data on both capture cross-sections and resonance parameters. The capture cross-section evaluations for all these isptopes were based on experimental systematics of radiative strenth functions.

Reevaluation was performed for the total cross-section and capture cross-section in the unresolved resonance region for the files of natural silcon and lead earlier developed in the Dresden Technical University. As a result the new versions of the files

for silicon and lead were formed.

Resently the Soviet specialists have analysed and examined the evaluated data files for the Library of Recommended Evaluated Neutron Data (LREND). The nuclear data center (FEI) carried out scientific and technical studies on the preparation of the materials for the examination and organized meetings on the discussion of evaluation analysis results.

65 files recommended are listed in the Table.

Table

Files of the Library of recommended evaluated neutron data (LREND)

Isotope	Source of evaluation	Isotope	Source of evaluation	Isotope	Source of evaluation
H	IAEA	Fe	FEI		
D	FEI	^{54}Fe	FEI	^{235}U	INE AS BSSR
^{3}He	IAEA	^{56}Fe	FEI	^{238}U	FEI
^{6}Li	FEI	^{57}Fe	FEI	^{239}Pu	INE AS BSSR
^{7}Li	FEI	^{58}Fe	FEI	^{240}Pu	- " -
^{10}B	IAEA	Ni	FEI	^{241}Pu	- " -
^{12}C	IAEA	^{58}Ni	FEI	^{242}Pu	- " -
N	ENDF/B-4	^{60}Ni	FEI	^{237}Np	INDL/A
O	FEI	^{61}Ni	FEI	^{241}Am	UKNDL
Na	FEI	^{62}Ni	FEI	^{243}Am	UKNDL
Si	DTU-FEI	^{64}Ni	FEI		
Cr	FEI	^{93}Nb	DTU-FEI		
^{50}Cr	FEI	Pb	DTU-FEI		
^{52}Cr	FEI				
^{53}Cr	FEI				
^{54}Cr	FEI				

Continution

Isotope	Source of evaluation	Isotope	Source of evaluation	Isotope	Source of evaluation
^{95}Mo	JENDL-2	^{103}Rh	FEI	^{141}Pr	ENDF/B-5
^{97}Mo	JENDL-2	^{105}Pd	FEI	^{143}Nd	FEI
^{98}Mo	JENDL-2	^{107}Pd	FEI	^{145}Nd	FEI
^{100}Mo	JENDL-2	^{109}Ag	FEI	^{147}Pm	FEI
^{99}Te	FEI	^{129}I	FEI	^{147}Sm	FEI
^{101}Ru	FEI	^{131}Xe	FEI	^{149}Sm	FEI
^{102}Ru	FEI	^{133}Cs	JENDL-1	^{151}Sm	FEI
^{104}Ru	FEI	^{135}Cs	FEI	^{151}Eu	ENDF/B-5
^{106}Ru	JENDL-1	^{144}Ce	FEI	^{153}Eu	ENDF/B-5

IAEA Nuclear Data Section
P.O. Box 100, A-1400 Vienna, Austria
Tel: 2360-1710 Telex: 1-12645

Names: D.E. Cullen, V. Goulo, H.D. Lemmel, A. Lorenz
P.K. McLaughlin, K. Okamoto, O. Schwerer

New evaluated data files:

INDL/A Supplement. New evaluations by V.A. Konshin et al. (Minsk, USSR) for U-235, Pu-239, Pu-240, Pu-241, Pu-242 have been received and added to the IAEA Nuclear Data Library INDL/A. These new evaluations supersede all earlier files by the same authors. The data are available on tape ("INDL/A Suppl. 86/5"). The tape will be accompanied by the document IAEA-NDS-12 Suppl. 86/5 containing documentation and graphical plots. Full details of the evaluations are described in Russian in two books of which microfiche copies are available as INDC(CCP)-256 [Pu isotopes] and INDC(CCP)-257 [U-235]. (We regret that, due to the large number of pages we cannot provide English translations of these books.)

Publications:

- Decay Data of the Transactinium Nuclides. Values for half-lives and emission probabilities for alpha particles and selected gamma rays, recommended by an IAEA Coordinated Research Programme on the Measurement and Evaluation of Transactinium Isotope Decay Data. IAEA Technical Report 261 (1986). This handbook has a salesprice of 400.- Austrian Schillings. A limited number of copies is available free of charge to scientists in developing countries.

- Handbook on Nuclear Activation data, K. Okamoto (ed.), IAEA Technical Report, to be published.

- Proceedings of the IAEA Advisory Group Meeting on Properties of Neutron Sources, Leningrad, USSR, 9-13 June 1986, K. Okamoto (ed.), to be published.

ENDF/B Preprocessing Codes:

Have now been updated to include ENDF/B-VI formats.
Note: For testing these codes, some sample files containing Reich-Moore-Parameters are wanted. Suitable files should be sent to D.E. Cullen at the adress given above.

EUROPEAN FUSION FILE (EFF)

(file management: ECN, Petten)

The European Fusion File (EFF) is a nuclear-data file for application in fusion-reactor blanket design calculations, in particular for neutron-transport calculations of the Next European Torus (NET). The EFF-project is part of the European Fusion Technology Programme of the European Commun-itity (EC). More specifically, it belongs to the so-called B2 task on the development of "tools" for neutronics calculations. The following laboratories are contractors in the EFF-project: CEA (Saclay), ECN (Petten), ENEA (Bologna) and KfK (Karlsruhe). Moreover, JRC (Ispra) an CBNM (Geel) are involved as EC institutes. The project is conducted by the NET-team at Garching and by EC-Brussels; the file maintenance and management is performed at ECN (Petten). Other European laboratories are also involved: SCK/CEN (mol) with an experimental programme performed at CBNM, the UK laboratories Harwell, Birmingham and Culham (JET), ENEA (Frascati), KFA (Jülich), IKE Stuttgart and EIR (Würenlingen). Furthermore, technical support is received from the NEA Data Bank at Gif-sur-Yvette.

Early this year the EFF-1 data file [1,2] has been distributed among European users. It consists of a file with 25 important fusion materials. The format of EFF-1 is that of ENDF/B-V, with the addition of file MF6 of ENDF-VI for the reaction types MT 10, 16, 17 and 91. Furthermore, gas-production cross sections (MT 203-207) and the neutron-disappearance cross sections (MT 101) have been added. The file contains 16 evaluations that are different from ENDF/B-IV, which is still frequently used for neutronics calculations. In addition to the evaluations that were taken from the Joint Evaluated File (JEF-1) the following replacements were made:

(1) for Be and Li-7 two recent US Los Alamos evaluations have been adopted.
(2) a revision of the evaluations for Al and Si by ENEA, Bologna;
(3) a revision of the double-differential continuum neutron-emission cross sections for lead by ECN, Petten.

At present the EFF-1 file is used for the production of group constants and transfer matrices for application in neutron-transport calculations [3] of NET fusion reactor concepts. The multigroup GEFF-1 library will be distributed this year. The format will be that of the VITAMIN-J library produced at the NEA Data Bank. The next step is the revision of evaluations for EFF-2, mainly for the structural materials and some light elements.

References

[1] H. Gruppelaar; Europe works to set up its own fusion data file, Nuclear Europe 2 (1986), p. 40.
[2] H. Gruppelaar; Present Status of the European Fusion File, Int. Sem. on Nuclear Data Cross Section Libraries and their Applications in Nuclear Technology, Bonn, October 1985, p. 288 (Kerntechnische Gesellschaft E.V.).
[3] H. Gruppelaar, D. Nierop and J.M. Akkermans; Processing of double-differential cross sections in the new ENDF-VI format - GROUPXS code description and users' manual -, ECN-182 (1986).

Joint Evaluated File (JEF)

NEA Data Bank

Address: F-91191 GIF-SUR-YVETTE
France

Introduction

Following the successful completion of the JEF-1 general purpose library in April 1985 and the distribution of the first version of the JEF-1 Special Purpose Tapes in September 1985, the Steering Committee for Nuclear Energy reviewed the project at its meeting in October 1985, and approved a three-year continuation for the creation of a JEF reference file at the end of 1988.

Recent work on the JEF Project at the NEA Data Bank

Since the last meeting of the Scientific Coordination Group, the NEA Data Bank's work on the JEF file has mainly been devoted to the following tasks:

- general maintenance and updating of the JEF-1 library; addition of two new elements requested by users, and studies of thermal cross section values and resonance integrals;

- the creation of a group cross section library called VITAMIN J (175 groups) for shielding and fusion blanket calculations. This file contains data for 17 nuclides for infinite diluted and pure isotopes at 300 and 800 degrees Kelvin. The library will also contain covariance information for the most important reactions.

- benchmark testing of JEF-1 with one dimensional diffusion calculations. The results are in good agreement with experimental values.

- the radioactive decay and fission yield data files were compiled in September 1985. Some updating and modification had still to be done in the participating countries and at the NEA Data Bank, and the first version would be frozen at the end of July 1986.

JEF Meetings

A JEF working group meeting was held at the NEA Data Bank on 5th and 6th May 1986. The first day was devoted to JEF benchmark testing results on reactor core, shielding and the fuel cycle studies. On the second day the evaluation group discussed the list of isotopes to be reevaluated for JEF-2, and the question of formats and processing codes, and a second group investigated problems and improvements to be made to the fission yield and radioactive decay data files.

The JEF Scientific Coordination Group met on 7th May. The two main topics discussed were the distribution policy of JEF data and documents and the possible collaboration with other organisations in the field of neutron data evaluation.

Following requests for a more general release of certain JEF reports concerned with the benchmark testing of the JEF-1 library, a discussion of the distribution policy of these documents was held. It was concluded that either the JEF Working Group on Benchmark Testing or the JEF Scientific Coordination Group would review such requests and if the report was approved for wider distribution it would normally be issued as a laboratory report with a JEF number attached to it. Reports on work performed at the NEA Data Bank, at IKE Stuttgart, and at EIR Würenlingen were approved at the meeting for wider distribution.

Concerning collaboration between different laboratories in the field of neutron evaluations, the letter of invitation for observers to CSEWG from the incoming chairman of NEANDC and the agreements reached during the Sante Fé meeting in the field of fusion data were mentioned as examples.

Different possibilities for cooperation between JEF and other evaluation projects were discussed and it was agreed that, considering the different timescales, the best solution would be to encourage bilateral cooperation on a laboratory level.

Recent publications related to JEF

Summary Record of the Seventh Meeting of the Scientific Coordination Group of the Joint Evaluated File Project, NEACRP-A-758, NEANDC-A-223.

JEF Report 4 Fast Reactor Benchmark Tests on the JEF-1 Evaluated Nuclear Data File;
H. Takano and E. Sartori. NEA Data Bank, October 1985.

JEF Report 5 Integral Data Test of JEF-1. Fission Product Cross Sections;
A.J. Janssen, H. Gruppelaar, R.J. Heijboer, N. Karouby-Cohen, L. Martin-Deidier, G. Rimpault and M. Salvatores. November 1985.

JEF Report 6 Benchmark Test of JEF-1 Evaluation by Calculating Fast Criticalities;
S. Pelloni. EIR, June 1986

Recent publications received at the NEA Data Bank

Compilation of actinide neutron nuclear data, P. Andersson, H. Condé, C. Nordborg, B. Trostell, NEANDC(OR)159A/U, INDC(SWD)21/6, 2 volumes.

The Swedish Nuclear Data Committee has completed a compilation of a selected set of neutron cross section data for the most important actinide isotopes. The aim of the report is to present available neutron cross section data in order to compare different evaluated libraries.

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