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INDC INTERNATIONAL NUCLEAR DATA COMMITTEE

Table of Content Translations

of

Soviet Reports received by the

INDC Secretariat

July 1982

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Foreword

The INDC Secretariat receives a number of Soviet reports in Russian as part of the INDC document distribution system. Because of their large number and size most of them cannot be translated by the IAEA. The "Nuclear Physics Research in the USSR - Collected Abstracts" report series and occasional reports of interest to the nuclear data community are translated by the IAEA on a regular basis, and are normally given a "U" distribution.

The "Table of Content Translations" contain the translation of the table of contents (and abstracts when available) of those Soviet reports which the IAEA does not translate in full. The originals of these reports are normally available in limited quantities only and are given an INDC "G" distribution.

This issue contains the table of content translation of the following reports:

- Nuclear Constants, Volume 3(42)
  Original distributed as INDC(CCP)-173/G

- Nuclear Constants, Volume 4(43)
  Original distributed as INDC(CCP)-175/G

- Nuclear Constants, Volume 5(44)
  Original distributed as INDC(CCP)-176/G

NUCLEAR CONSTANTS, Volume 3(42)

INDC(CCP)-173/G

METHOD FOR THE ANALYSIS OF THE AVERAGE TRANSMISSION ENERGY OF RESONANCE NEUTRONS

A.V. Komarov, A.A. Lukjanov

The energy-averaged transmission of resonance neutrons through iron samples are investigated as a function of sample thickness. Parameters of our theoretical model for the transmission's analysis are found in good agreement with corresponding values evaluated with average cross-sections.

CONSIDERATION OF THE RESOLUTION OF INSTRUMENTS IN THE USE OF THE PADE APPROXIMATION FOR THE ANALYSIS OF RESONANCE CURVES

V.N. Vinogradov, E.V. Gai, N.S. Rabotnov

Fredholm's integral equation of the first type, with the difference kernel and a rational function without real poles in the right-hand side approximating a resonance curve is considered. The equation is solved analitically by Fourier transforms for three types of resolution functions: sharp exponential, smooth exponential, Lorentzian. The solution in all three cases is a rational function.

DIRECT PROCESS CONTRIBUTION TO THE In113 (n,n')-REACTION SPECTRUM HARD COMPONENT

A.G. Dovbenko, et al

The direct process contribution to ^{113}In(n,n')-spectrum is analysed in terms of the coupled-channel method. The observed positive difference between neutron spectra from (n,n')- and (p,n)-reactions agrees with results of calculations, which take into account the spectroscopic information on the lowest 2^+ and 3^- collective levels of the neighboring even-even nuclei.

PARAMETRIZATION OF NEUTRON EXPERIMENTAL SPECTRA FROM (p,n), (n,n')-REACTIONS ON THE In115 AND Ta181 NUCLEI

M.I. Svirin

Analysis of neutron emission spectra was done using the cascade evaporation model. The contribution of the nonstatistical neutron emission is taken into account. The obtained data are compared with the results of other calculations.

EVALUATION OF THE (n,2n), (n,3n) CROSS-SECTIONS ON HEAVY NUCLEI TAKING INTO ACCOUNT OF NONEQULIBRIUM PROCESSES

V.M. Bychkov, V.I. Pliaskin, E.F. Tominskaja

A method for the evaluation of the (n,2n), (n,3n) excitation functions of heavy nuclei has been performed in the initial neutron energy range up to the (n,4n)-reaction threshold. Formulae are given for the absolute cross-sections calculation, which are deduced from the statistical and excitation models. The fission channel is described by the systematics of experimental Γ_n/Γ_f values. An evaluation of the (n,2n) and (n,3n) cross-sections has been done for 20 fissionable isotopes. The results have been compared with other evaluations. (To be translated in full by IAEA).

NEUTRON INTERACTION CROSS-SECTIONS AVERAGED OVER THE PROMPT NEUTRON FISSION SPECTRA OF U235, Pu239 and Cf252

V.I. Starostov, L.N. Kudrjashov

The possibility of a ± 2% agreement between calculated and experimental values of the $^{235}U(n,f)$, $^{239}Pu(n,f)$, $^{238}U(n,f)$, $^{237}Np(n,f)$, $^{27}Al(n,\alpha)$, $^{27}Al(n,p)$, $^{115}In(n,n')$, $^{56}Fe(n,p)$, $^{46}Ti(n,p)$, $^{197}Au(n,\gamma)$ reaction cross-sections averaged over prompt neutron spectra from ^{235}U, ^{239}Pu thermal fission and ^{252}Cf spontaneous fission, is shown.

THE THERMAL NEUTRON-INDUCED FISSION NEUTRON SPECTRA OF U233, U235, Pu239 AND SPONTANEOUS FISSION OF Cf252

V.I. Bol'shov, et al

The results of measurements of the ^{233}U, ^{235}U, ^{239}Pu fission neutron spectra by thermal neutron flux of the reactor BR-10 and spontaneous fission of ^{252}Cf by the scintillation method using crystals of stilbene and anthracene are presented. The values of the parameter for the Maxwellian distribution used for the approximation of experimental results are determined. The agreement with the results of the earlier measurements of the same experimental group and the latest evaluated data is demonstrated.

THE DETERMINATION OF ABSOLUTE INTENSITIES OF SHORT-LIVED FISSION PRODUCT GAMMA-RAYS BY GAMMA-RAY SPECTROSCOPY IN A PULSED IRRADIATION MODE

A.N. Gudkov, et al

A modified γ-spectroscopic analysis method was used to measure the absolute yields of the more intense gamma-rays from 13 fission products. The experiment was conducted with a sample consisting of un-separated fission products. Measurements were made at regular intervals in a pulsed irradiation mode. The results are compared with compiled gamma radiation data. Previously unknown absolute intensities of gamma-rays from the decay of ^{101}Nb, ^{102}Nb and ^{144}Ba were obtained.

MEASUREMENTS OF SHORT-LIVED FISSION PRODUCT YIELDS FROM NEUTRON INDUCED FISSION OF U233 BY GAMMA-RAY SPECTROSCOPY OF BULK FISSION PRODUCTS IN A PULSED IRRADIATION MODE

A.N. Gudkov, et al

The modified method to analyze time-dependent gamma-ray spectra from bulk fission products in a pulsed irradiation mode is described. The results obtained in the determination of cumulative yields for thermal neutron induced fission of ^{233}U are presented.

DERIVATION OF THE GENERALIZED FREQUENCY DISTRIBUTION OF MODERATOR ATOMS FROM EXPERIMENTAL DOUBLE DIFFERENTIAL SCATTERING CROSS-SECTION FOR THERMAL NEUTRONS

Yu.V. Lissitchkin, et al

The procedure for the derivation of the generalized frequency distribution function for incoherently scattered atoms is described. The problem of the derivation is solved by taking into account elastic (quasielastic), multiphonon and multiple scattering effects. The results of calculations using the program SPECTR are given both for "paper" (simulated) and real experiment.

COMPUTERIZED DATA LIBRARY OF EVALUATED THRESHOLD REACTION CROSS-SECTIONS BOSPOR-80

V.M. Bychkov, et al

The Library contains 142 recommended excitation functions of (n,p), (n,α), (n,t) and (n,2n) reactions in the energy range from threshold up to 20 MeV. The evaluation based on the critical analysis of experimental data and nuclear reaction model calculations. A comparison of the recommended cross-sections averaged over the fission neutron spectrum with experimental data is made. BOSPOR-80 evaluated cross-sections are recorded on magnetic tape of the Nuclear Data Centre ES-1033 computer and can be obtained by request from CJD (Obninsk). (Article to be translated in full by IAEA).

SENSITIVITY OF GROUP CROSS-SECTION VARIATIONS ON BIOLOGICAL SHIELDING CALCULATIONS BY THE DEDUCTION-DIFFUSION METHOD

K. Mikhai

This paper treats the influence of group cross-section uncertainties on the accuracy of calculating experimental radiation levels determined by the activation detectors located at different sites of a biological shielding. The detectors were mounted in the irradiation tunnel of the Budapest Technical University training reactor. A comparative analysis of the accuracy of the calculation method and the accuracy of the data input was performed.

ENERGY-DEPENDENT CROSS-SECTION CALCULATION CODE FOR FISSILE NUCLEI IN THE NON-RESOLVED RESONANCE REGION

N. Kuyumdzhieva, N. Yaneva

The programme was designed to calculate the energy dependence of simulated cross-sections on the basis of the R-matrix formalism taking into account the interference between nearby lying levels. The calculated values of energy-averaged ^{239}Pu total cross-section in the interval 100 -2000 eV are compared with experimental data.

NEUTRON RESONANCE DESCRIPTION USING AN EXCITON MODEL APPROACH

M. Katchmarchuk, M. Pshitula

An exciton model method to calculate reduced neutron resonance widths is presented. Results of the calculations are compared with experimental data.

A STREAMER SPECTROMETER FOR THE STUDY OF RARE REACTIONS WITH NEUTRONS

M.N. Mikhailov, et al

A streamer spectrometer for detecting and photographing electron positron pairs from internal conversion during capture of thermal neutrons by nuclei of argon and hydrogen are described.

NUCLEAR CONSTANTS, Volume 4(43)

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THE STUDY OF NEUTRON ENERGY SPECTRA OF BFS CRITICAL ASSEMBLIES

Yu.A. Kazanskij, et al

A comparison of the experimental and calculational data is made with regard to the neutron energy spectra in media for different reactor compositions. The measurements were carried out in the central uranium and plutonium fuelled test zones on the BFS critical assemblies. The detailed spectrum calculations were based on the numerical solution of the slowing down equation with a rigorous kernel elastic scattering energy loss. The neutron cross-section library of the Nuclear Data Center were used with 14000 energy points irregularly spaced describing in a best way the resonance structure of neutron cross-sections for the main reactor materials. The reasons for differences between experiment and calculation are discussed. The recommendations for future neutron energy spectra measurements are given.

DETERMINATION OF k_{eff} FOR THE BFS-40 CRITICAL ASSEMBLY USING DIFFERENT PROGRAMS AND SYSTEMS OF CONSTANTS

V.A. Tarassov, et al

The paper deals with the calculations of the criticality of a fast critical assembly with an iron reflector. Monte-Carlo programs (MK-26, MMK-22, MMK-22P, ARMONT), two-dimentional diffusional programs (DD-26, DD-18, RADAR) and one-dimentional programs (9M, M26, 26D, SN) were used. The 18-group and 26-group (BNAB-70 and BNAB-78) libraries of constants are used. Best agreement with the experiment ($\sim$1 % k_{eff})was obtained from calculations by the Monte-Carlo method in the sub-group approximation using the BNAB-78 constants. The other programs give discrepancy with the experiment from 4 to 12 per cent of k_{eff}.

KERMA-FACTOR FOR NEUTRON INTERACTIONS IN Li7

I.M. Bondarenko

Heat generation by neutron interactions in ^{7}Li is calculated. Kerma-factors (kerma-kinetic energy released in materials) are calculated for neutron energies between 0.1 and 20 MeV. The ENDF/B-IV data and recent experimental information are used for the calculation of the kerma-factors. The kerma-factors are presented graphically in units of eV·b/atom as a function of neutron energy.

EFFECTIVE METHOD FOR THE CALCULATION OF THERMAL CONSTANTS FOR URANIUM-WATER LATTICES

V.N. Gurin

This article describes a one-group thermal constant calculation for uranium-water lattices. According to this method, neutron thermalization is taken into account without regard for cell multigroup fluxes. Numerical calculations of absorption and fission cross-sections are made for typical uranium-water lattices with various enrichment; these show that the method is suitable for use in many calculations.

EVALUATED NEUTRON DATA FOR THERMAL REACTOR CALCULATION

L.P. Abagyan, M.S. Yudkevich

The evaluated data library for low energy neutrons is described. Cross-section information is given in the form used in thermal reactor calculations. The library is sufficiently compact for operative use in the calculations. The description of evaluation procedure used for the actinides is given. (To be translated in full by IAEA).

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THE FISSION ENERGY OF URANIUM AND TRANSURANIUM ELEMENTS

P.E. Nemirovskij, L.G. Manevich

The actual fission energy was determined from the energies of neutrons, gamma-ray quanta and beta electrons obtained from existing data on beta decay fission product chains. Calculations were performed for fission by thermal neutrons, fission spectrum neutrons and 14 MeV neutrons. The results, compared with experimental data on the kinetic energies of fission fragments, and the energies of prompt gamma-rays and neutrons. Reasonable agreement is observed between the calculated and experimental values.

ON AMBIGUOUS PARAMETRIZATION OF NEUTRON CROSS-SECTIONS IN THE LOW-ENERGY REGION

G.M. Novosselov, V.M. Kolomiets

The influence of the level-level interference and Dopler-effect on the ambiguity of the determination of the resonance parameters from the neutron cross-section energy dependence is investigated in the low-energy region. It is shown that a condition $\Gamma_n \gg D$ should be taken as a criterion of the validity of the single-level approach instead of the well-known condition $\Gamma \gg D$, where the values Γ, Γ_n are average total width and average neutron width of resonances, respectively, and $\overline{D}$ is the average level spacing. Using the ^{152}Eu isotope as an example, when $\overline{\Gamma}_\gamma \sim \overline{D}$ it is shown that the resonance structure data obtained from time-of-flight measurements are reproduced even if the level-level interference and Dopler-effect are negligible.

PHENOMENOLOGY DESCRIPTION OF ANGULAR DISTRIBUTIONS

B.V. Zhuravlev, N.V. Kornilov

The angular distributions of neutrons from (n,n'), (p,n) (α,n) reactions are analysed in the framework of a phenomenological approach. It is shown that the shapes of continium angular distributions can be described in terms of Legendre polynomials with the coefficients being a simple function of the energy of the emitted particles.

MEASUREMENT OF THE PU238 HALF-LIVE

V.D. Sevastianov, V.P. Yarina

A half-life of 86,54 years for ^{238}Pu has been measured. The evaluated experimental results of this measurement of the ^{238}Pu half-life has yielded a value of 86.96 $\pm$ 0.55 years.

COBALT ELASTIC AND INELASTIC SCATTERING OF NEUTRON IN THE ENERGY RANGE FROM 5 TO 8 MeV

S.P. Simakov, et al

Differential cross-sections of elastic and inelastic scattering of neutrons by cobalt have been measured for incident neutron energies of 4.99, 5.97, 7.00 and 8.09 MeV. The measurements were made by the time-of-flight method using a gas tritium target as the neutron source. The basic details of experiment and method used for separation of the elastic and inelastic scattering in time-of-flight spectra are given. The experimental results of this work are compared with those reported by other experimentors.

NEUTRON CAPTURE GROUP CROSS-SECTION LIBRARY FOR FISSION FRAGMENTS

A.B. Gusev, et al

The 26-group neutron capture cross-section library for fission fragments derived from ENDF/B-IV data are given. The composition of this library is briefly described. The multigroup cross-sections were averaged over standard spectra using the PROPAN-complex program. Calculated resonance integrals were compared with data given in the commentary to the ENDF/B-IV library. (To be translated in full by IAEA).

THICK TARGET YIELDS OF RADIOACTIVE NUCLIDES

P.P. Dmitriev, G.A. Molin

188 experimental thick target yields for 140 radioactive nuclides irradiated by 22 MeV protons are presented. The reactions leading to the formation of the individual radionuclides are also given. (To be translated in full by IAEA).