International Atomic Energy Agency

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INTERNATIONAL NUCLEAR DATA COMMITTEE

Table of Content Translations

of

Soviet Reports received by the

INDC Secretariat

October 1979

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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. 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, Number 3(30)
  Original distributed as INDC(CCP)-134/G

- Nuclear Constants, Number 4(31)
  Original distributed as INDC(CCP)-136/G

- Nuclear Constants, Number 1(32)
  Original distributed as INDC(CCP)-137/G

YIELD AND CROSS-SECTIONS OF PHOTOFISSION FOR ISOTOPES Th, U, Np, Pu, Am IN ENERGY RANGE FROM 4,5 MeV TO 7,0 MeV

Yu.B. Ostapenko, G.N. Smirenkin, A.S. Soldatov, V.E. Zhuchko, Yu.M. Tsipeniuk

The numerical data for yields and cross-sections of photofission for 9 nuclei (^{232}Th, ^{233}U, ^{235}U, ^{236}U, ^{238}U, ^{237}Np, ^{239}Pu, ^{241}Po, ^{241}Am) obtained by bremsstrahlung radiation experiments in the energy range from 4,4 MeV to 7,0 MeV on a microtron are listed. The results of these studied nuclei are compared with data of other authors.

EVALUATION OF THRESHOLD REACTION CROSS-SECTIONS WITH EMISSION OF CHARGED PARTICLES FOR CHROMIUM ISOTOPES

L.P. Abagyan, V.M. Bychkov, S.M. Zakharova, A.B. Pashchenko, V.I. Pliaskin

Evaluation of threshold reaction cross-sections with emission of charged particles for chromium isotopes in the energy range from threshold up to 20 MeV was made. Data of experimental works published up to 1977 and theoretical model calculations are taken into account in the evaluation.

TOTAL GAMMA-PRODUCTION CROSS-SECTION FROM THE INELASTIC INTERACTION OF 14 MeV NEUTRON WITH DIFFERENT NUCLEI

V.M. Bezotosnij, V.M. Gorbatchev, L.M. Surov, M.S. Shvetsov

The results of measurements of total γ-production cross-sections from inelastic interaction of 14 MeV neutrons with Mg, Si, P, S, Ti, Zn, Zr, Mo, Cd, In, Hg and Bi nuclei in the energy range of $0,5 \leqslant E_\gamma \leqslant 12$ MeV are presented. These measurements were carried out with a pulsed source of 14 MeV. Thin spherical samples (4π-geometrics), time of flight method, and γ-scintillation spectrometer with the NaI(Tl) crystal of 200 x 100 mm diameter have been used.

SPECTRA OF SECONDARY NEUTRONS, EMITTED AS A RESULT OF INTERACTION OF NEUTRONS WITH ^{238}U

V.M. Bychkov, A.B. Pashchenko, V.I. Pliaskin

The emission spectra, the fission spectra and summarized spectra of secondary neutrons, emitted as a result of bombarding ^{238}U with neutrons with 5-14 MeV energy are given. All data are calculated on the foundation of theoretical models and semiempirical formula.

THE PENETRABILITY THROUGH THE DOUBLE-HUMPED FISSION BARRIER APPROXIMATED BY THREE PARABOLAS

U.S. Masterov, A.A. Seregin

The penetrability is calculated in quasiclassical approximation for the double-humped barrier defined by two parabolic peaks connected smoothly by a third parabola forming the intermediate well. The results are compared with the numerical solution of Schrödinger's equation. The specific results for ^{236}U are reported.

OPTICAL MODEL OF ELASTIC SCATTERING OF COMPOSITE PARTICLES

V.E. Kolessov, N.N. Titarenko

The calculation of the elastic scattering of composite particles by nuclei are given in the framework of the optical model in a broad region of energies and masses of the scattering particles and targets. The systematic comparison of the calculations with the available experimental data is carried out.

Papers presented at the 4th All-Union
Conference on Neutron Physics, Kiev 18-22 April 1977

NEUTRON TOTAL CROSS-SECTION MEASUREMENTS OF ^{45}Sc AND ^{56}Fe

R.C. Block, U.N. Singh, K. Kobayashi, R.E. Chrien, H.I. Liou

NEUTRON RESONANCE PARAMETERS FOR ^{238}U

F. Poortmans, E. Cornelis, L. Mewissen, G. Rohr, R. Shelley, T. van der Veen, G. Vanpraet, H. Weigmann

NEUTRON RESONANCE PARAMETERS FOR ^{237}Np

L. Mewissen, A. Angeletti, E. Cornelis, F. Poortmans, G. Rohr, G. Vanpraet, H. Weigmann

ETUDE DES DEFORMATIONS DES ISOTOPES PAIR-PAIR DU TUNGSTENE AU MOYEN DE LA DIFFUSION DES NEUTRONS

J.P. Delaroche, G.Haouat, R. Shamu, J. Lachkar, M. Patin, J. Sigaud, J. Chardine

NEUTRON CAPTURE AND TOTAL CROSS-SECTION MEASUREMENTS ON FAST REACTOR STRUCTURAL MATERIALS

D.B. Gayther, M.S. Coates, G.D. James, M.C. Moxon, D.B. Syme, B.W. Thomas, B. Thom

THE EVALUATION OF $\alpha = \sigma_\gamma/\sigma_f$ FOR ^{239}Pu IN ENERGY REGION 0,1 - 1000 keV

V.A. Konshin, V.F. Zharkov, E. Sh. Sykhovitskij

Correlation of partial errors of different measurements is taken into account. Errors of evaluation curve are given.

NEUTRON EMITTED BY FISSION FRAGMENTS FROM SPONTANEOUS FISSION OF ^{252}Cf AND FROM THERMAL FISSION OF ^{239}Pu

Yu.S. Zamyatnin, V.G. Bassova, D.K. Riasanov, A.D. Rabinovich, V.A. Korostylev

The results are considered from measurements of an average number of neutrons emitted by individual fission fragments with a given mass and total kinetic energy in ^{252}Cf spontaneous fission and ^{239}Pu thermal fission. The fission events with maximum and minimum neutron yields are analyzed. The value for a maximum deformation of light and heavy fragments are estimated.

STUDY OF THE DENSITY OF TRANSIENT STATES OF FISSIONED NUCLEI OF ^{237}U AND ^{238}U IN PHOTONUCLEAR REACTIONS

V.E. Marshalkin, I.E. Mitrofanov, V.M. Poryshev, V.S. Russkikh

Cross-sections of fission and total yield of neutrons under the influence of γ-quanta with energies of 6-18 MeV for ^{238}U are measured. The experimental information analysis is carried out with the purpose of a study of the density of the fissioned nuclei transient states and of the determination of the photo-absorption cross-section. The values of the density parameters of transient states of fissioned nuclei of ^{238}U and ^{237}U are estimated and their strong correlation is revealed.

A CALCULATION AND ERROR ESTIMATION OF FISSION-PRODUCT INDEPENDENT YIELDS IN THERMAL-NEUTRON-INDUCED FISSION OF ^{235}U WITH PAIRING-EFFECTS CONSIDERATION

A.N. Gudkov, V.M. Zhivun, V.V. Kovalenko, A.B. Koldobskij

A method for the calculation of fission-product isobar distributions parameters and their errors, based on existing experimental information, is given. Fission-product independent yields by thermal-neutron-induced fission of ^{235}U and their errors are calculated. Both proton and neutron odd-even effects are taken into account.

ON THE STANDARD SHAPE OF THE ^{252}Cf SPONTANEOUS FISSION PROMPT NEUTRON SPECTRUM

G.M. Akhmedov, V.S. Stavinskij

The standard shape of the spectrum was obtained in constant temperature approximation. The results are compared with the experimental data on the ^{252}Cf fission prompt neutron spectrum.

It is shown that the standard shape of prompt fission neutron spectrum in the fragment center-of-mass system is realized for definite relation between the theoretical parameters.

STATISTICAL PROPERTIES OF EXCITED NUCLEI

A.V. Ignatyuk

The paper reviews the principal methods of a theoretical description of the statistical characteristics of excited nuclei. The experimental data demonstrating the shell and the collective phenomena in highly excited nuclei are discussed. A consistency of results of the thermo-dynamic description with a spectroscopic information about the character-istics of low-lying levels is shown.

THE DEPENDENCE OF THE (n,2n) CROSS-SECTION REACTION ON THE (N-Z)/A PARAMETER

V.M. Bychkov, A.B. Pashchenko, V.I. Pliaskin

The simple dependence of the (n,2n) reaction cross-section on the neutron and proton number in nuclei at 14,5 MeV incident neutron energy was obtained on basis of neutron cascade emission taking into account preequilibrium neutron emission in the first stage of the reaction and Weizsäcker's formula for nuclear binding energy.

INVESTIGATION OF ^{235}U AND STAINLESS STEEL MULTIPLYING MEDIA

S.P. Belov, V.A. Dulin, V.F. Efimenko, Yu.A. Kazanskij, E.N. Kusin,
V.M. Litaev, V.F. Mamontov, A.V. Skapar

Neutron spectrum and central reactivity coefficients of such elements
as ^{235}U, ^{10}B, ^{12}C are measured. Experimental results are compared with
results of 26-group calculations using BNAB-70 and ENDF/B-III constant
systems.

CALCULATION OF THE BREMSSTRAHLUNG YIELD FROM THICK TARGETS

V.I. Issaev, V.P. Kovalev

An analytical expression for the total yield of bremsstrahlung is
obtained. Using these results and experimental data on angular distribution
of bremsstrahlung the absolute values of the directed forward yields is
calculated.

THE 21-GROUP CONSTANTS FOR FLUORINE, CHLORINE, THORIUM-232 AND ^{233}U

S.M. Zakharova, V.F. Kapustina

The 21-group neutron constants for fluorine, chlorine, thorium-232
and ^{233}U are given. The group constants are mainly based on the neutron
cross-section energy dependence evaluations for these elements available
in the literature.

KERMA-FACTORS FOR NEUTRON INTERACTIONS IN LITHIUM HYDRIDE

I.M. Bondarenko

Heat generation by neutron interaction in lithium hydride is calculated.
Theoretical and computational models are developed for calculating neutron
fluence-to-kerma factors (kerma = kinetic energy released in materials) from
basic nuclear data for all neutron reaction types in any energy range. Kerma
factors were calculated for neutron energies between 10^{-4} eV and 20 MeV. No
major simplifying assumptions are introduced, and the accuracy of the calcu-
lated kerma factors depends only on the availability and accuracy of the
basic nuclear data. The ENDF/B-IV data and recent experimental information
are used for the calculation of kerma factors. Plots of these kerma factors
are presented in units of (eV·b/atom) and (W·s/(cm·neutr.)) as a function of
neutron energy.

THE ROLE OF DIRECT PROCESSES IN THE ANALYSIS AND EVALUATION OF INELASTIC CROSS-SECTIONS OF NEUTRONS

A.V. Ignatyuk, V.P. Lunev, V.G. Pronyaev

The main features of inelastic neutron scattering excitation functions and their connections with optical model parameters are analyzed. It is shown that the direct processes are to be taken into account both for the description of excitation functions and of the hard spectra observed in neutrons inelastic scattering reactions. The methods of including such processes in the evaluation of neutron nuclear data are discussed.

NEUTRON RESONANCE PARAMETERS OF THE $^{60}Co(T_{1/2} = 5.27$ y) ISOTOPE

V.A. Anufriev, S.I. Babich, A.G. Kolessov, V.N. Nefedov, V.S. Artamanov, R.N. Ivanov, S.M. Kalebin

The total neutron cross-section of radioactive isotope ^{60}Co has been measured on the reactor SM-2 neutron spectrometer. The resonance capture integral was found to be $I_{a} = 4,0^{\pm} 0,7b$, the estimate of the total neutron cross-section for $E_{o} = 0,025^{4}eV$ was made with an accuracy of 6 b.

NEUTRON RESONANCE PARAMETERS OF OSMIUM ISOTOPES IN THE ENERGY RANGE FROM 1 TO 550 eV

T.S. Belanova, S.I. Babich, A.G. Kolessov, V. A. Poruchikov

The transmission of 1 to 550 eV neutrons through 6 samples of osmium, enriched in the 186, 187, 188, 189, 190, 192 isotopes, have been measured on the reactor SM-2 neutron spectrometer. Neutron resonance parameters were obtained from shape analysis. The potential scattering cross-sections were found. The neutron strength functions of $(2,3 \pm 0,9) \cdot 10^{-4}$ and $(1,78 \pm 0,58) \cdot 10^{-4}$ were determined for ^{187}Os and ^{189}Os respectively. The mean level spacings and the average radiation widths have been calculated for 186, 187, 188, 189 osmium isotopes. The ten resonances of even-even osmium isotopes were observed for the first time.

NEUTRON RESONANCE PARAMETERS OF ^{153}Eu, ^{154}Eu($T_{1/2} = 8.6$ y) AND

^{155}Eu($T_{1/2} = 4.7$ y)

V.A. Anufriev, A.G. Kolessov, V.N. Nefedov, V.A. Poruchikov, V.A. Safonov, V.S. Artamanov, R.N. Ibanov, S.M. Kalebin

The total neutron cross-section of the isotopes ^{155}Eu, ^{154}Eu($T_{1/2} = 8.6$ y) and ^{155}Eu($T_{1/2} = 4.7$ y) have been measured between 0.07 and 32 eV. The resonance parameters have been obtained by a single level shape analysis. The resonance capture integrals were calculated.

THE THRESHOLD REACTION CROSS-SECTIONS (n,p), (n,α), and (n,2n)

V.M. Bychkov, V.N. Manokhin, A.B. Pashchenko, V.I. Pliaskin

The (n,p), (n,α), (n,2n) threshold reactions review for nuclei with Z ≥ 20 in the neutron energy range from threshold up to 20 MeV is made. Review consists of four parts. In the first part the theoretical methods of cross-sections calculations and the empirical or semiempirical sistematics are considered. In the second, third and fourth parts the experimental data compilations on (n,p), (n,α) and (n,2n) excitation functions are given. The recommended values of cross-sections at 14.5 MeV neutron energy are given in tables. For some isotopes the recommended curves of excitation functions are also given in the form of graphs.

CROSS-SECTIONS FOR (n,p)-REACTIONS IN THE NEUTRON ENERGY RANGE FROM THRESHOLD TO 20 MeV

V.M. Bychkov, V.N. Manokhin, A.B. Pashchenko, V.I. Pliaskin

The (n,p)-reaction cross-section compilation for nuclei with Z ≥ 20 in the neutron energy range from threshold up to 20 MeV was made. The compilation results are presented on graphs. Recommended curves of excitation functions obtained as a result of analysis of experimental data and theoretical calculations are given for some nuclei.

The numerical information on measurement results in the 14-15 MeV neutron energy range and the evaluated value of the (n,p) reaction cross-section at $E_n = 14.5$ MeV are given in the table.

Experimental data published up to 1977 were taken into account.

COMPARATIVE ANALYSIS OF RECOMMENDED CROSS-SECTIONS FOR THRESHOLD REACTIONS
WITH THE USE OF INTEGRAL EXPERIMENTS

K.I. Zolotarev, V.M. Bychkov, A.B. Pashchenko, V.I. Pliaskin, V.N. Manokhin, L.A. Chernov

The recommended microscopic cross-sections for the $^{56}Fe(n,p)^{56}Mn$ and $^{58}Ni(n,p)^{58}Co$ reactions from the evaluated data libraries ENDF/B-IV, UKNDL and BOSPOR-78 were analyzed. A conclusion about the quality of these data has been made from comparison of experimental neutron spectra with the spectra restored by means of the measured nuclear reactions rates and cross-section under consideration. It is recommended to use the $^{56}Fe(n,p)$ ^{56}Mn cross-section reaction from the ENDF/B-IV or UKNDL library and the $^{58}Ni(n,p)^{58}Co$ cross-section reaction from the libraries BOSPOR-78 or ENDF/B-IV. The evaluated cross-sections of the BOSPOR-78 library are given for 8 nuclei in the energy range from threshold up to 20 MeV.

KERMA-FACTORS FOR NEUTRON INTERACTIONS IN BORON CARBIDE

I.M. Bondarenko

Heat generation by neutron interactions in boron carbide is calculated. Kerma-factors (kerma-kinetic energy released in materials) were calculated for neutron energies between 10^{-4} eV and 15 MeV. No major simplifying assumptions are introduced and the accuracy of the calculated kerma-factors depends only on availability and accuracy of the basic nuclear data. The ENDF/B-IV data and recent experimental information are used for the calculation of kerma-factors. Plots of these kerma-factors are presented in units of eV·b/atom and Watts.sec/(cm·n) as a function of neutron energy.