お 知 ら せ Ⅱ

N N D E N 3 1 へ の 投 稿

Contribution to Neutron Nuclear Data Evaluation Newsletter-31

Japanese Nuclear Data Committee
(Nuclear Data Center, JAERI)

Work Recently Completed and Publications:

(i) Evaluation of Resonance Parameters of ^{233}U, ^{235}U, ^{239}Pu and ^{241}Pu
Yasuyuki KIKUCHI, Akira ASAMI and Tadashi YOSHIDA
(Submitted to the IAEA Consultants Meeting on U and Pu Isotope Resonance Parameters)

The resonance parameters of ^{233}U, ^{235}U, ^{239}Pu and ^{241}Pu were evaluated for Japanese Evaluated Nuclear Data Library Version 2 (JENDL-2). The evaluation was made by two steps. At first, the parameters were evaluated on the basis of the reported measured data with suitable method which depends on the status of measured data. The most reliable parameter set could be found after some simple examinations for ^{233}U, ^{239}Pu and ^{241}Pu, since total number of measured parameter sets is limited for these nuclides. On the other hand, numerous measurements exist for ^{235}U, and the evaluation was made by taking a suitable average, considering the fission and capture areas. Secondly, the cross sections were calculated with the parameters thus obtained, and were compared with the measured cross sections. Then the parameters were so modified that the calculated cross sections well reproduced the measured data. After modifying the resonance parameters, the remaining discrepancies between the calculated and measured cross sections, which are mainly caused by the interference among levels and are inevitable with the single-level Breit-Wigner formula, were corrected by applying slight background cross sections. The resonance integrals calculated from the presently evaluated parameters agree well with the measured data.

The full paper will be published in JAERI-M report.

(ii) Evaluation of Resonance Parameters of ^{238}U, ^{240}Pu and ^{242}Pu
Tsuneo NAKAGAWA, Atsushi ZUKERAN and Masayoshi KAWAI
(Submitted to the IAEA Consultants Meeting on U and Pu Isotope Resonance Parameters)

The evaluation of the resolved resonance parameters of ^{238}U, ^{240}Pu and ^{242}Pu was performed for the second version of Japanese Evaluated Nuclear Data Library JENDL-2. In this work, all the resonance parameters measured so far were compiled and examined. The evaluation was made by mainly using recent measurements for each isotope. The presently evaluated resonances are 183 s-wave and 265 p-wave resonances up to 4.73 keV for ^{238}U, 267 s-wave resonances up to 5.69 keV for ^{240}Pu and 95 s-wave resonances up to 1.89 keV for ^{242}Pu. For ^{238}U and ^{240}Pu, negative resonances were also recommended. The multi-level Breit-Wigner formula was applied, and their resolved resonance regions were chosen from 10^{-5} eV to 4 keV for ^{238}U and ^{240}Pu and from 10^{-5} eV to 1.29 keV for ^{242}Pu. Furthermore, background cross sections were determined to correct the cross sections calculated from the evaluated resonance parameters.

The full paper will be published in JAERI-M report.

Work in Progress:

(i) Neutron nuclear data evaluation of ^{233}U is in progress from 10^{-5} eV to 20 MeV. The quantities evaluated are total, fission, capture, elastic and inelastic scattering, (n,2n) and (n,3n) reaction cross sections. The average numbers of prompt and delayed neutrons per fission are also evaluated. (from N. Asano, SAEI)

(ii) Reevaluation of neutron cross sections is in progress for about 80 FP nuclides from thermal to 15 MeV. (from M. Kawai, NAIG)

(iii) Evaluation of neutron nuclear data for ^{241}Am and ^{243}Am is in progress from thermal to 20 MeV. (from Y. Kikuchi, JAERI)

Work about codes:

(i) A computer code "HIKARI" has been developed. It calculates the angular distributions of cross sections and analyzing powers of the gamma-rays produced by the radiative capture of polarized nucleons by unpolarized nuclei. The formalism is based on the direct-semi-direct capture model and takes account of the electric dipole, quadrupole, octupole and magnetic dipole transitions. Special features include the ability to calculate transitions from the isovector (E1, E2, E3, M1) and isoscalar (E2, E3) resonances and to take the isospin-splitting of the electric giant dipole state into account. The use of complex coupling between an incident particle and the target nucleus is optional. Options are also given for the particle-vibration coupling form factor for E2 and E3 transitions and for the form of the optical potential. The program needs the approximate memory size of 130 KB. The user's manual is in preparation. (from H. Kitazawa, TIT)

(ii) A computer code PROFP-Y has been developed to prepare the input data of the DCHAIN and FPGS codes, which analyze buildup and decay of fission products. The PROFP-Y consists of various function modules such as data edition, replacement, addition, retrieval, graphical representation of decay chain diagram, coupling of data with those of JNDC FP Decay Data File, and calculation of fission yields, etc. These are conveniently selected for user's requirement. The code has been used for producing the input data library of DCHAIN, which includes nuclear decay and fission yield data of 1172 nuclides. The nuclear decay data has been taken from JNDC FP Decay Data File compiled by Working Group on Evaluation of Decay Heat in Japanese Nuclear Data Committee. Most of the fission yields of newly added nuclides and newly reported isomers were calculated with the present code. This code can be successfully applied to sensitivity analysis of decay heat for theoretically estimated values and reevaluation work with new experimental data because of the facilities of quick revision and error checking of the library.

Users' manual has been published in JAERI-M 9714.

(from Z. Matumoto, JAERI)

S. Igarasi
Nuclear Data Center
Tokai Research Establishment
Japan Atomic Energy Research Institute
Tokai-mura, Naka-gun, Ibaraki-ken 319-11
Japan
Nov. 10, 1981