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Contribution to Neutron Nuclear Data Evaluation Newsletter-32

Japanese Nuclear Data Committee
(Nuclear Data Center, JAERI)

Work Recently Completed and Publications:

(i)   Analysis of Neutron Elastic Scattering from ^{6}Li between 5 and 20 MeV
Seiichi KOMODA and Tamotsu SEKIYA
Atomkernenergie/Kerntechnik, vol. 37, no. 1, (1981) pp. 134 - 138

     The ground state of the ^{6}Li nucleus is represented by the superposition of
two states in order to take into account the α-d cluster structure of the
nucleus, and the plane wave impulse approximation and the optical model are
applied for the description of neutron elastic scattering from ^{6}Li in those
states, respectively. The general shape of the angular distribution of neutrons
elastically scattered by ^{6}Li at 14 MeV is reproduced by introducing a cut-off
radius r_c of the α-d intercluster wave function and an α-d clustering probability
$P_{\alpha d}$ as fitting parameters. The best fit values of r_c and $P_{\alpha d}$ are found to be
3fm and 0.2, respectively. The angular distributions at different energies
between 5 and 20 MeV are also calculated by using these values of r_c and $P_{\alpha d}$.
In order to get a better agreement with experimental data an isotropic correction
is applied to the calculated angular distributions. The magnitude of the
correction is found to decrease smoothly with the bombarding energy.

(ii) Clustering Effects on Neutron Elastic Scattering from Lithium Isotopes
Seiichi KOMODA and Tamotsu SEKIYA
(To be published in Atomkernenergie/Kerntechnik)

     In our model we take into account the two-cluster configuration of lithium
nuclides. Its validity is tested by analyzing the differential cross section
data for neutron elastic scattering from ^{6}Li and ^{7}Li at bombarding energies
between 7 and 14 MeV. It is found that the model gives an adequate description
of neutron elastic scattering at forward scattering angles. It is concluded
that quasi-free neutron-cluster scattering contributions are significant even at
the low energies investigated.

(iii) Clustering Effects on Neutron Elastic Scattering from Boron Isotopes
Seiichi KOMODA and Tamotsu SEKIYA
(To be submitted in Atomkernenergie/Kerntechnik)

     The model developed in earlier papers is applied to boron isotopes and the
differential cross section data for neutron elastic scattering from ^{10}B and ^{11}B
are reproduced at forward scattering angles at bombarding energies between 7 and
14 MeV. The magnitude of the discrepancy between the theoretical and experimental
angular distributions at backward scattering angles decreases smoothly with the
bombarding energy as it did in the previous analyses on lithium isotopes.

(iv) Evaluation of Neutron Nuclear Data for ^{241}Am and ^{243}Am
Yasuyuki KIKUCHI
(To be submitted to JAERI-M report)

     Neutron nuclear data of ^{241}Am and ^{243}Am were evaluated for JENDL-2. The
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, and the angular distribution of the emitted
neutrons. The fission cross section was evaluated on the basis of newly measured
data, and lower values were given in the subthreshold energy region than JENDL-1.

The reliability of the calculation parameters are also much improved because experimental data became available for the total and capture cross sections of ^{241}Am in the high energy region.

   (v) Evaluation of Neutron Nuclear Data for ^{45}Sc
              Yoshiaki OKA, Tsuneo NAKAGAWA and Yasuyuki KIKUCHI
                        (JAERI-M 9981 (1982))

      Evaluation of neutron nuclear data for ^{45}Sc was performed in the energy range of thermal to 20 MeV. Evaluated quantities are the total, elastic and inelastic scattering, capture, (n,2n), (n,p) and (n,α) reaction cross sections, resonance parameters and angular distributions of emitted neutrons. Resonance parameters are recommended below 100 keV. Particular care was paid for the minimum value of the total cross section near 2 keV, since a mono-energetic neutron filter is now under design by using scandium metal at Fast Neutron Source Reactor YAYOI of The University of Tokyo. Optical and statistical model calculations are performed for the smooth cross sections above resonance region. The results were compiled in the ENDF/B format and they will be stored in the second version of Japanese Evaluated Nuclear Data Library JENDL-2.

Work in Progress:

   (i) Optical model parameters for about 80 FP nuclides were determined by taking account of local systematics for the neutron total cross sections. Level density parameters and radiation widths have been studied for nuclides of which capture cross sections in the keV energy range were measured. Resolved resonance parameters for Kr, Rb, Y, Mo, Pd, Ag, La and Nd isotopes have been evaluated, and evaluation for the other nuclides is now in progress.
                                                (from M. Kawai, NAIG)

   (ii) Evaluation of neutron nuclear data for ^{2}H is in progress in the energy region of 10^{-5} eV to 20 MeV. The angular distributions for the elastic scattering and the double differential cross sections for the (n,2n) reaction are calculated on the basis of the Faddeev equation with s-wave separable potentials.
                                                (from K. Shibata, JAERI)

Work Planned for the Near Future:

      Evaluation of neutron nuclear data for ^{246}Cm and ^{247}Cm are planned below 20 MeV.
                                                (from S. Igarasi, JAERI)

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