

Status Report of JAEA Nuclear Data Center

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1. General

Japan Atomic Energy Agency (JAEA) was established as an independent administrative agency on October 1, 2005 after the merger of Japan Atomic Energy Research Institute (JAERI) and Japan Nuclear Cycle Development Institute (JNC). Nuclear Data Center in JAEA has taken over the activities of Nuclear Data Center in JAERI. JAEA, however, is an administrative agency and a mid-term plan has to be submitted to and approved by the Minister of Education, Culture, Sports, Science and Technology. The mid-term plan is the work plan to be performed during from October 1, 2005 through March 31, 2010. In the mid-term plan it is officially declared to compile the next Japanese Evaluated Nuclear Data Library JENDL-4. The main effort to compile the JENDL-4 library is to improve the quality of nuclear data of fission products (FP) and minor actinides (MA) because the importance of those nuclear data is increasing in the fields relating to ADS, FBR, MOX fuel utilization, R & D on innovative reactors and so on. Covariance data are also considered to be important and the emphasis is placed on their evaluation too.

2. Status of Evaluation works

1) JENDL-4

(1) Evaluation of minor actinides

After the establishment of JAEA, resonance parameters have been updated for ^{229}Th , $^{231,233}\text{Pa}$, $^{234,236}\text{U}$, $^{236,242}\text{Pu}$, $^{242,242\text{m}}\text{Am}$, $^{242-248}\text{Cm}$ and $^{250,251}\text{Cf}$. Fission cross sections have been also updated for $^{230,232}\text{Th}$, ^{237}Np , ^{237}U , $^{236,238}\text{Pu}$, $^{241-243}\text{Am}$ and ^{244}Cm . In these evaluation works, a least-squares fitting code GMA was used.

The project to measure the cross section data of ^{237}Np and $^{241,243}\text{Am}$ nuclides has been performed in Japan. The measured data is scheduled to be obtained in this year. The data will be used for the new evaluation.

(2) Evaluation of fission products

Resolved resonance parameters of JENDL-3.3 FP nuclides were examined for JENDL-4 by taking into account of recently measured data. As a result, the parameters of 89 FP nuclides were update. In addition to those updated data the parameters of 13 nuclides were newly evaluated.

In the non-resonance energy region, nuclear model calculations are performed to evaluate cross sections. Optical model parameters used for the model calculations were searched for by using a coupled-channel optical code OPTMAN. The systematics of optical model parameters has been obtained by comparing with experimental data.

(3) Covariance data

The need of covariance data are increasing to estimate the accuracy of reactor calculations. The least-squares fitting code GMA is used to estimate covariance data. In the case of nuclear model calculations, covariance data of cross sections are calculated by taking into consideration of the propagation of the covariances of model parameters. At present no covariance data are fixed for JENDL-4, but the preparation of covariance data for some nuclides are being performed.

2) JENDL High Energy File

JENDL High Energy File (JENDL/HE) contains the evaluated data for neutron and proton reactions up to 3 GeV. A part of the JENDL/HE file was released as JENDL/HE-2004 in March 2004. The file contains the data of 66 nuclides which are selected as having the first priority in the discussion of Japanese high energy nuclear data evaluation group. The full JENDL/HE file is planed to include the data of total 132 nuclides and to be released in early 2007.

3) JENDL Photo nuclear Data File

JENDL Photonuclear Data File (JENDL/PD) contains the gamma-ray induced reaction up to 140 MeV. The data is used for the fields of electron accelerator shieldings, radiation therapy and actinides detection. The data of 68 nuclides was released as JENDL/PD-2004 in 2004. The evaluated data of 107 nuclides by KAERI group are going to be included in the JENDL/PD file. The extended JENDL/PD file will be released in early 2007.

4) JENDL PKA/KERMA File

The JENDL PKA/KERMA File is being developed for the purpose of the estimation of radiation damage in solid material. The incident particle is assumed to be neutrons with energy up to 50 MeV. The file contains the spectra of primary knock-on atoms (PKA), damage energy spectra, DPA cross sections and KERMA factors.

3. Other Activities

1) CINDA Compilation

Papers on neutron induced reaction data published in Japanese journals and reports are surveyed. Total of 66 entries were sent to NEA Data Bank from April 2005 through March 2006.

2) Code development

We are developing theoretical calculation codes for the evaluation of cross section and particle emission spectrum which are not able to be estimated from only experimental data. The codes are based on the spherical and coupled-channel optical models, the distorted-wave Born approximation (DWBA), the pre-equilibrium exciton model and the Hauser-Feshbach statistical model width fluctuation corrections.

The two kinds of codes are now developed: one is FORTRAN program and other one is C++ program. Both of them are being checked by comparison with experimental data.