Recent Nuclear-Data Activities in Japan

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1. Introduction

Japanese nuclear-data activities in these several years are reviewed. Because of the limitation of the space of this article, we here mainly concentrate on the present framework of our activity, the progress of the experimental studies of minor actinides cross-sections, evaluation of covariance-matrices, and the computer-related efforts toward completion of JENDL-4.

2. Framework

The origin of our activities on the nuclear data for applications traces back in 1963, when the Japanese Nuclear Data Committee (JNDC) was founded. Since its infancy, JNDC consisted of two bodies, namely, Sigma Special Committee in AESJ (Atomic Energy Society of Japan) and Sigma Research Committee founded by the former Japan Atomic Energy Research Institute (JAERI). Two "Sigma Committees" are the domestic names of JNDC, which had been working as a single entity by very close cooperation.

At the reformation of the Japan's national research institutes in 2005, JAERI's activity was tansferred to JAEA (Japan Atomic Energy Agency) and a new committee was established. The new "Sigma Committee" was given a clear mission to support the ongoing efforts toward JENDL-4. The AESJ part of JNDC (Sigma Special Committee) deals with the more general topics related to measurement, evaluation, and benchmarking of nuclear data. Now the two committees became separated but complementary each other.

In addition to these two purpose-oriented committees, the Nuclear Data Division of AESJ was established in 2000 with an intention to stimulate the nuclear-data research activity through symposia, special sessions and international cooperation including the Japan-Korea Joint Session, and so on.

3. A New Project

A five-year-term nuclear-data project[1] started in 2002 and completed on March 2007 under the sponsorship of the Ministry of Education, Culture, Sports, Science and Technology. It consisted of the development of novel measurement technology, the acquisition of neutron cross sections and the development of computer system devoted to nuclear-data evaluation, processing and utilization[2]. The measurement in this program started with ^{237}Np[3].

4. Measurement Activities

In these several years newly measured neutron cross sections of Np isotopes became available; ^{238}Np [4] and ^{237}Np[5,6]. It is quite interesting to see that, in spite of its short-life (2.1 days), neutron absorption in ^{238}Np plays a noticeable role under a high thermal neutron field[4]. Starting from ^{243}Am[7], data-acquisition effort will extend to other minor actinides.

Measurements of fission products cross-sections[8,9] and of high-energy neutrons cross-sections[10,11] are also underway. The papers referred now are only a part of those published recently in this field.

5. Covariance Data

The latest version of our evaluated library JENDL-3.3 contains the covariance data for 20 important nuclides including the major actinides. Recently, however, the covariance matrices for minor actinides, lead, bismuth and other important nuclides are required mainly from the innovative-reactor and the ADS sides. In response to these requirements, generation of covariance data are under way[12,13]. On the other hand, a covariance-data processing code ERRORJ was developed and now it is in use in and outside of Japan [14]. Figure 1 illustrates an example of correlation matrices[12], which was reduced from the covariance data in the ENDF-6 format by use of the ERRORJ code.
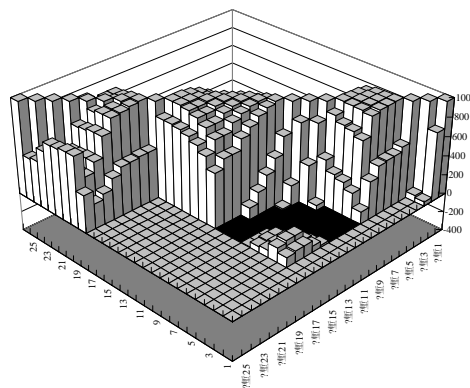

Fig. 1 Correlation matrix for ^{241}Am capture cross section (from 0.01eV to 20MeV in 26 groups)[12]

6. Efforts Toward JENDL-4

Extensive evaluation work for the next version of JENDL, JENDL-4, is now under way[15]. It is to be completed in the year 2010. In order to facilitate and qualify the evaluations, new code system CCONE was recently developed by Iwamoto[16] and is now in intensive use mainly for major[17] and minor actinide evaluations. This code includes several nuclear reaction models, such as spherical optical model, DWBA direct reaction model, preequilibrium exciton model and Hauser-Feshbach statistical model.

7. Topics

7.1 WPEC Activity

The JNDC supports the activity of WPEC (OECD/NEA Working Party on International Nuclear Data Evaluation Cooperation). We plan to propose a new Subgroup "U-235 Capture Cross Section in the Energy Region from 100 eV to 1 MeV." Our recent benchmark analyses led us to recognition that the ^{235}U capture cross section may possibly be too large in the above energy region including the resolved and the unresolved resonances. This is the reason for our proposal of new SG to the 2007 Meeting of WPEC.

7.2 High-Energy File

One of the recent topics related to JENDL is the completion of the JENDL High-Energy File[18]. This is one of the special-purpose files of JENDL and it includes the neutron and proton cross-sections up to 3 GeV.

8. Concluding Remarks

Only a part of the recent activities were reviewed in this paper. Other important contributions can be found the Proceedings of ND2004 and many will appear at the coming ND2007 Conference in Nice, which will have been finished when this article is published.

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