

### 3. THE ACTIVITIES OF NEA ON TRANSMUTATION

The NEA has been involved since the late 1980s in various activities on Actinide and Fission Product Partitioning and Transmutation.

#### 3.1 Activities of the NSC and Data Bank

The program of work of the Nuclear Science Committee (NSC) covers several items related to transmutation. Some of these programs have been performed within the NSC's own program of work, whereas others have been carried out using the voluntary contributions from the Japanese government to the NEA.

The main emphasis has so far been on different nuclear data needs for accelerator and reactor transmutation applications. A number of projects have been or are being pursued in the field of intermediate energy nuclear data. Three studies were recently completed: one on the availability of experimental data and nuclear model codes, one on the requirements for an evaluated nuclear data file, and one on the international comparison of the performance of compute codes used in intermediate energy data calculations. A data base of available experimental data will be set up, as well as a cooperative project on an evaluated nuclear data file.

## **(1) Completed Program**

- 1) Review of Fission Product Yields and Delayed Neutron Data from the Actinides (July 1990)

A critical review of available fission product yields and delayed neutron data for the actinides of interest to transmutation, i.e., Np-237, Pu-242, Am-242m, Am-243, Cm-243 and Cm-245 was performed. The study has identified gaps and inconsistencies in the existing data base and also identified priority areas for further experimental, theoretical and evaluation efforts.

- 2) Review of High Energy Data and Model Codes for Accelerator-Based Transmutation (December 1992)

This study investigated the availability of experimental intermediate energy data. The need for a comprehensive compilation effort of these data was stressed. The most important nuclear theories and some of the associated nuclear model codes were described, and their applicability to intermediate energy nuclear data calculations was discussed.

- 3) Requirements for an Evaluated Nuclear Data File for Accelerator Based Transmutation (June 1993)

The importance of evaluated intermediate energy nuclear data files as part of a global calculation scheme for accelerator-based transmutation was discussed. The resulting report contains

a proposal for setting up the following three data libraries:

- a data library from 0 to 100 MeV (first priority),
- a reference data library from 20 to 1500 MeV,
- an activation library from 0 to about 100 MeV.

#### 4) Comparison of Codes for Calculation of Intermediate Nuclear Data (February 1994)

An international comparison study was coordinated. The aim was to assess the predictive ability of computer codes used in calculating intermediate energy charged particle data. Two cases were defined: one where thin target data of Zr-90 and Pb-208 should be calculated and one with the objective to predict the neutron yield and mass distribution of spallation products from 800 MeV proton bombardment of W. The results, to be compared to experimental data, were collected and analyzed. A specialist meeting on Intermediate Nuclear Data will be held on 30 May-1 June 1994 to discuss the result of the study.

#### **(2) On-Going Programs**

##### 1) International Evaluation Co-operation

The NSC Working Party on International Evaluation co-operation has started an activity to evaluate intermediate nuclear energy data. The project will partly build on the results from the above study on the Requirements for an Evaluated Nuclear Data File for Accelerator-Based Transmutation. The

Working Party has established a subgroup (Subgroup No.13) on this subject. The Subgroup has started to inquire data needs and held a start-up meeting on 11th May, in Gattingburg. The Group will discuss items such as the type and format of the data to be included in the library, before starting the actual evaluation effort. The first data files are expected to be ready for testing in 1994.

## 2) A Data Base for Experimental Intermediate Energy Data

According to a recommendation in the above report on Review of High Energy Data and Model Codes for Accelerator-Based Transmutation, the Data Bank has started to set up a special purpose "transmutation" data base combining relevant material from existing numerical and bibliographic data bases and supplementing the information with the data of essential interest to transmutation needs. This program has been approved by the Steering Committee as the activity reinforced by the voluntary contribution of the Japanese Government. The result of the above program, Comparison of Codes for Calculation of Intermediate Nuclear Data, will provide the basis for identifying the needs in improving the computer programs used for the modeling. At the Specialist Meeting on Intermediate Energy Nuclear Data, it will be discussed on which data compilation and evaluation will be needed in order to complement the data base.

### 3.2 Activities of the NDC

The Nuclear Development Committee (NDC) performs "Actinide Information Exchange Program". Under the program, an International Information Exchange Meeting on Partitioning and Transmutation (P-T) was held in 1990 and 1992, with the guidance of Liaison Officers nominated by member countries. This program is supported by the voluntary contribution by the Japanese Government. This program was started in 1989 as a five year program. It is expected that the NDC will extend its activity on P-T at the end of 1994 for an additional, possibly 5 years, period.

#### (1) Completed Programs

- 1) The first International Information Exchange Meeting  
(Mito City, Japan, November 1990)

A number of papers were presented both on policy orientations and scientific aspects. The discussion, which concentrated on wide ranging ideas regarding future technologies, led to the conclusion that several disparate approaches had already been taken.

- 2) Specialist Meetings

Following the first Information Exchange Meeting, the NEA helped organize two specialist meetings. The first meeting was held in November 1991 on the topics of partitioning technology. A

wide range of processes for the separation of actinides and fission products, both wet and dry, were presented. The second was in March 1992, on the topics of accelerator-based transmutation. A wide variety of concepts to discuss were presented together with presentations on data acquired, data needs and applicable models.

3) The second International Information Exchange Meeting

(ANL, US, November 1992)

The presented papers indicated that there was a common concern about the need of guidance on research needs. A number of emerging important issues were identified during the meeting, including the legal background, the incentives and the implications for the whole fuel cycle in different countries.

**(2) On-Going Programs**

1) The third International Information Exchange Meeting

(Cadarache, France, 12-14 December 1994)

At the 2nd International Information Exchange Meeting, it was concluded that a comparison of systems studies, or proto-system studies, already in progress should form a significant part of the 3rd meeting in December 1994. This is regarded as a first phase in the approach to a more co-ordinated systems study that would seek to identify advantages and disadvantages of introducing the P-T to the nuclear fuel cycle. Other areas of interest will be the effects of progress made in various national P-T activities, technical advances, economic assessments, objectives of

the P-T and environmental impact considerations. It is currently interested to invite participants from the Russian Federation to this meeting.

## 2) Preliminary Systems Study on Partitioning and Transmutation of Long-lived Nuclides

In order to improve understanding of the merits and drawbacks of introducing the P-T technology into the nuclear fuel cycle, analytic and presentational tools will be developed for comparing the many different technical approaches in relation to a variety of measures of cost and benefit. This activity will be intended to run for 5 years. In 1998, a state of the art report will be submitted, which will identify advantages and disadvantages, key technologies, target capabilities of the P-T technologies.