OECD/NEA PARTITIONING AND TRANSMUTATION ACTIVITIES

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Abstract

Partitioning and transmutation (P&T) has gained interest during the past decade and the OECD Nuclear Energy Agency (NEA), in response to the interest from member countries, has included P&T in its programme of work since 1989. The information exchange meetings are one of key components of this international project, aiming at giving experts a forum to present and discuss current developments in the field. Within the NEA, the P&T project is one example of horizontal activity, involving several Divisions and Committees. Most of the work on P&T have been and are being undertaken under the auspices of the Nuclear Development Committee (NDC) and the Nuclear Science Committee (NSC). The work of the NDC mainly comprises strategic and assessment reports by expert groups on the broad field of P&T and its impact on the nuclear fuel cycle, while the NSC work includes specific projects and specialist meetings on particular scientific aspects of P&T. The Radioactive Waste Management Committee (RWMC) is also kept informed of the outcome of the NDC and NSC activities, as the potential application of P&T would impact waste management systems. P&T would not eliminate the need for geological disposal of high level waste, but potentially reduce the radiotoxic inventory to be disposed of. This paper gives an overview of past and on-going P&T activities of the OECD/NEA.

Introduction

In nuclear power generation, the efficient and safe management of spent fuel produced during the operation of commercial power plants is one of the most important issues not only to the nuclear community but also to the general public. Partitioning and transmutation of nuclear waste, i.e. to separate minor actinides (MA) and long-lived fission products from the spent fuel and transmute them into short-lived or into stable radio-nuclides in appropriate reactor systems for the reduction of the volume and toxic potential into the nuclear waste stream, is complementary to the option of long-term geological disposal of spent fuel together with other nuclear waste.

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Whenever relevant, the NEA closely co-operates with the European Commission (EC) and the International Atomic Energy Agency (IAEA) on specific topics of interest to both agencies.

This paper summarises past activities, and overviews on-going activities on P&T within the NEA programme of work.

NEA information exchange meetings on P&T

The OECD/NEA activities in the field of P&T were initiated in 1989 by the proposal form the Japanese Government to establish an international Information Exchange Programme on Actinide and Fission Product Partitioning and Transmutation. The first information exchange meeting was held in Mito, Japan in 1990, and a wide range of topics from basic research to P&T scenarios and advanced transmutation systems were discussed at the meeting. [1] At the meeting, the need to discuss more specific areas was expressed and two specialists meetings were later organised: one on partitioning technology at Mito, Japan in 1991, [2] and the other on accelerator-based transmutation at Paul Scherrer Institute, Switzerland in 1992. [3] It was also decided to organise information exchange meetings on P&T every two years.

Seven information exchange meetings have so far been organised (Mito, Japan in 1990; ANL, USA in 1992; Cadarache, France in 1994; Mito, Japan in 1996; Mol, Belgium in 1998; Madrid, Spain in 2000 and now Jeju, Korea in 2002). [4-8] While the NDC was responsible for organising the information exchange meetings up to the 5th meeting at Mol, the 6th and 7th meetings in Madrid and Jeju have been organised jointly by the NDC and NSC.

Activities of the Nuclear Development Committee (NDC)

First systems study

The Nuclear Development Committee (NDC) has conducted two P&T systems studies. The first P&T systems study (1996-1998), entitled "Status and Assessment Report of Actinide and Fission Product Partitioning and Transmutation", reviewed the advances in the separation of long-lived isotopes, the transmutation options and the impact of P&T on waste management and disposal. [9] Minor actinides and long-lived fission products contributing mostly to the long-term radiotoxicity and risk were also discussed. A comprehensive analysis was made for three specific fuel cycle options: Once-Through Cycle with direct disposal, Reprocessing Fuel Cycle, and Advanced Fuel Cycle with P&T. However, the more effective transmutation strategies with fully closed fuel cycles and the specific role of accelerator-driven systems (ADS) in these fuel cycles were not addressed in the study.

Among the general conclusions of the report could be mentioned:

- Fundamental R&D for the implementation of P&T needs long lead times and requires large investments in dedicated fast neutron spectrum devices, extension of reprocessing plants and construction of remotely manipulated fuel and target fabrication plants.
- The short-term impact of partitioning would be to reduce long-term radiotoxic inventory of the resulting HLW at the expense of an increase of the operational requirements for the nuclear facilities concerned.
- Recycling of Pu and minor actinides could stabilise the transuranic element inventory of a reactor park. Multiple recycling of transuranic elements is a long-term venture, which may take decades to reach equilibrium in transuranic element inventories.
- Conditioning of separated long-lived nuclides in appropriate matrices, which are much less soluble than glass in geological media, or which could serve as irradiation matrix in a delayed transmutation option, is a possible outcome for the next decades.
- P&T will not replace the need for appropriate geological disposal of high-level waste, irradiated transuranic element concentrates, and residual spent fuel loads from a composite reactor park.

Second systems study

The second P&T systems study (1999-2000), entitled "A Comparative Study of Accelerator-driven Systems and Fast Reactors in Advanced Nuclear Fuel Cycles", aimed at comparing the role and relative merits of both systems in closed fuel cycles. [10] To quantitatively assess the advantages and drawbacks of different fuel cycle strategies, seven representative fuel cycle schemes were selected and compared with the current once-through cycle: Pu burning, Heterogeneous minor actinide recycling, transuranic (TRU) burning in fast reactors, TRU burning in accelerator driven systems (ADS), MOX recycling combined with TRU burning, Double strata fuel cycle and Fast reactor strategy.

The study confirmed that all transmutation strategies with fully closed fuel cycles can in principle achieve similar reductions in the TRU inventory and in the long-term radiotoxicity of high-level waste.

The study also provided some general conclusions, which could influence policy decisions. These conclusions are:

- While P&T will not replace the need for appropriate geological disposal of high-level waste, the study has confirmed that different transmutation strategies could significantly reduce, i.e. a hundred-fold, the long-term radiotoxicity of the waste and thus improve the environmental friendliness of the nuclear energy option. In that respect, P&T could contribute to a sustainable nuclear energy system.
- Very effective fuel cycle strategies, including both fast spectrum transmutation systems (FR and/or ADS) and multiple recycling with very low losses, would be required to achieve this objective.
- Multiple recycle technologies that manage Pu and MA either together or separately could achieve equivalent reduction factors in the radiotoxicity of wastes to be disposed. The study shows that pyrochemical reprocessing techniques are essential for those cycles employing ADS and FRs where very high MA-content fuels are used.
- In strategies where Pu and MA are managed separately, ADS can provide additional flexibility by enabling Pu-consumption in conventional reactors and minimising the fraction of dedicated fast reactors in the nuclear system.
- In strategies where Pu and MAs are managed together, the waste radiotoxicity reduction potential by use of FRs and ADS is similar and the system selection would need to be made based on economic, safety and other considerations.
- Further R&D on fuels, recycle, reactor and accelerator technologies would be needed to deploy P&T. The incorporation of transmutation systems would probably occur incrementally and differently according to national situations and policies.
- Fully closed fuel cycles may be achieved with a relatively limited increase in electricity cost of about 10 to 20%, compared with the LWR once-through fuel cycle.
- The deployment of these transmutation schemes need long lead-times for the development of the necessary technology as well as making these technologies more cost-effective.

In addition, the study concluded that in order to keep the P&T option open, focused R&D should be continued on

- critical and sub-critical fast reactors;
- demonstration of reprocessing technologies and associated advanced fuels at appropriate scale;
- structural and coolant materials;
- irradiation experiments;
- improvement of modelling tools to simulate materials behaviour under irradiation and high temperature;
- safety analysis of ADS, and
- performance assessment of geological repositories using a P&T source term.

Planned activities

Advanced fuel cycles, including fast or thermal reactors or accelerator-driven systems, linked to a variety of P&T schemes have the potential to greatly alter specifications of nuclear waste. In consequence, an expert group will be created to carry out a study on "Impact of Advanced Nuclear Fuel Cycle Options on Waste Management Policies". The study will focus on advanced nuclear fuel cycle options and associated waste forms, repository performance assessment studies using source terms for waste arising from such advanced nuclear fuel cycles, and identification of new options for waste management and disposal. A close collaboration with the NEA Radioactive Waste Management Committee and with the NSC will be sought.

Past activities of the Nuclear Science Committee (NSC)

Nuclear data and computer codes (1991-1997)

In the early 1990s, the NSC launched an international code comparison exercise on the calculation of intermediate energy nuclear data for accelerator-based transmutation applications to assess the predictive ability of computer codes used. [11-15] The data calculated comprised double-differential cross-sections, neutron yields, and mass distributions of spallation products. The results were collected, analysed and compared against experimental data. A specialists' meeting on intermediate energy nuclear data, held in 1994, recommended a systematic compilation of experimental intermediate energy data and the NEA Data Bank started to compile these data into the EXFOR database.

Physics benchmarks (1992-2000)

In 1992, under the guidance of the NSC, a Task Force on Physics Aspects of Different Transmutation Concepts was created to assess the fundamental scientific issues of transmutation concepts at that time. The group examined more than 20 different transmutation concepts. However, a consistent comparison analysis of different concepts could not be made due to inconsistencies in analysis methods used for each system. [16]

An international benchmark exercise was therefore launched to better understand the basic physical phenomena and to provide a basis for a more systematic system analysis methodology. The benchmark examined different transmutation concepts based on pressurised water reactors (PWRs), fast reactors, and an accelerator-driven system. The physics of complex fuel cycles, involving reprocessing of spent PWR reactor fuel and its subsequent reuse in different reactor types, was investigated. For the PWR benchmark, the results showed consistency well within the limits associated with multiple plutonium recycling, as established by the NEA Working Party on Plutonium Fuels and Innovative Fuel Cycles (WPPR). For the Fast Reactor benchmark, calculation code systems used by the participants showed a good general agreement in the predictions of the nuclear characteristics of the minor actinides loaded fast reactor core. For the ADS benchmark, large discrepancies were observed in main neutronic characteristics such as initial k_{eff} and burn-up behaviour. [17]

The unsatisfactory outcome of the ADS benchmark indicated a need for refining the benchmark specification, especially addressing the neutronics of minor actinide dominated sub-critical cores. The NSC therefore launched a new benchmark in 1999. A model of a lead-bismuth cooled sub-critical

system driven by a beam of 1 GeV protons was chosen for the exercise. The design of the sub-critical core was similar to that of the Advanced Liquid Metal Reactor (ALMR). The benchmark reactor was assumed to operate as a minor actinide burner in a "double strata" fuel cycle scheme, featuring a fully closed fuel cycle with a top-up of pure minor actinides. Two fuel compositions for a start-up and an equilibrium core were considered, both differing considerably from normal U-Pu mixed-oxide fuel compositions.

Although significant differences in normal integral reactor physics and safety parameters, as well as neutron flux distributions, were again observed, the main outcome of the benchmark indicated that the overall status of the nuclear data and computational tools for the analysis of ADS minor actinide burners is satisfactory for scooping calculations, but not for detailed design calculations. [18]

Accelerators

R&D activities and construction plans related to high power proton accelerators (HPPAs) are being considered in various countries to promote basic and applied sciences, including accelerator-driven nuclear energy systems (ADS). The performance of such hybrid nuclear systems depends to a large extent on the specification and reliability of the particle accelerator, as well as the integration of the accelerator with spallation targets and in some cases, sub-critical assemblies. However, for practical applications, there are improvements to be accomplished in terms of beam losses and frequency of the beam trips.

The NSC therefore decided to organise workshops on "Utilisation and Reliability of High Power Proton Accelerators" to discuss actual problems and possible solutions. The scope of the first workshop, held in Mito, Japan in 1998, comprised the experience and prospects of HPPAs and the required accelerator reliability in various applications, especially focused on beam trips and power fluctuations. [19] More thorough discussions on issues and concepts was held in the following workshops in Aix-en-Provence, France in 1999 [20] and in Santa Fe, USA in 2002. [21] The 4th Workshop will be organised in Korea in spring 2004.

Chemistry

Recognising that the feasibility of P&T directly depends on the capability to separate actinides and fission products with a very high recovery efficiency, the NSC has organised various activities in fuel cycle chemistry. In 1993, a Task Force on Actinide Separation Chemistry reviewed the existing, and the need for additional, basic actinide chemistry data, the types of actinide waste streams, hydrometallurgical and pyrochemical separation processes, including new processes developed for the minor actinide separation in P&T systems. [22]

Following the report from the Task Force, the NSC organised a workshop at Villeneuve-les-Avignon, France in 1997 to review separation strategies of long-lived nuclides from nuclear waste. [23] The workshop proposed follow-up meetings devoted to the application of X-rays to radioisotope chemistry and to the evaluation of speciation technology. Consequently, the NSC held a workshop on "Speciation, Techniques and Facilities for Radioactive materials at Synchrotron Light Sources" in Grenoble, France in 1998, [24] and a workshop on "Evaluation of Speciation Technology" in Japan in 1999. [25]

Regarding pyrochemical processes, the NSC organised a workshop on "Pyrochemical Separations" at Villeneuve-les-Avignon, France in March 2000, dealing with the national and

international R&D programmes, pyrochemical reprocessing requirements in future fuel cycles, and process simulation and design. [26] Following one of the recommendations from the workshop, to promote efficient international collaboration and to provide a common scientific base on pyrochemistry, the NSC created an Expert Group on Pyrochemistry in 2000. The work scope of this group was not restricted to P&T applications. The Expert Group will produce a state-of-the-art report summarising its findings on the technology status and the necessary R&D by end of 2002. This group was later integrated in the chemical partitioning subgroup of the new Working Party on Scientific Issues in P&T. The subgroup covers both aqueous and dry processes.

On-going activities of the Nuclear Science Committee

The Nuclear Science Committee decided to establish a Working Party on Scientific Issues in Partitioning and Transmutation (WPPT) in 2000, to better co-ordinate different its on-going activities related to P&T. The scope of the WPPT is to deal with the status and trends of scientific issues in Partitioning and Transmutation (P&T), comprising different disciplines such as accelerators, chemistry, material science, nuclear data and reactor physics. The objectives of the WPPT are to provide the member countries with up-to-date information on the development of P&T technologies, to liaise closely with other NEA working groups such as the Working Party of Plutonium fuels and Innovative Fuel Cycles (WPPR) and to provide advice and support to the nuclear community on the developments needed to meet the requirements (data and methods, experiment validations, scenario studies) for implementing different P&T scenarios.

To cover a wide range of the P&T fields, the WPPT comprises four subgroups: accelerator utilisation and reliability for ADS applications, chemical partitioning, fuels and materials, and physics and safety for transmutation systems. All the subgroups will publish a state-of-the-art report on their specialised field by 2004.

Accelerator utilisation and reliability for ADS applications

The scope of the subgroup is to

1. Evaluate the potential utilisation of accelerator-driven spallation targets as part of transmutation systems.
2. Organise one or more workshop(s) of experts on accelerators, spallation targets, and beam entrance windows in order to consider, evaluate, and rank potential issues related to system performance and reliability.
3. Evaluate expected performance of accelerators, spallation targets, and beam entrance windows for applications associated with accelerator-driven transmutation systems, and
4. propose a prioritised list of issues that need to be resolved relating to the interaction of an accelerator and target system.

The subgroup will publish a final report with up-to-date information on: technology status of the proposed accelerators and targets, data available to support an accelerator application, on-going R&D, the gaps to be overcome, R&D required to fill these gaps, and international collaborations, emphasising on accelerator and spallation target reliability and any associated safety issues, target performance and toxicity of any spallation products, and beam entrance window performance, including thermal stress and radiation damage.

The third workshop on utilisation and reliability of high power proton accelerator was hosted by LANL and held in Santa Fe, USA on 12-16 May 2002. Main topics discussed were:

1. reliability of the accelerator and impact of beam interrupts on the design and performance of the ADS;
2. spallation target design characteristics and impact on the multiplier design, including materials, radiation damage and embrittlement, enhanced corrosion, cooling issues with high-power density, and windowless design concepts;
3. safety and operational characteristics of a multiplying system driven by a spallation source, and
4. test facilities.

The main findings of the workshop will be summarised in a report by October 2002. According to the normal rotation, it was suggested that the next workshop take place in Asia, most probably in Korea. The approximate date would be spring 2004.

Under the accelerator subgroup, two working groups (WG) will be formed for working on the Accelerator reliability database and the LBE technology handbook. A more detailed plan of work of the two WGs is being prepared.

The WG on Accelerator reliability database will:

- collect the beam interrupt data from various HPPAs and develop a database for the raw data;
- analyse the data for improvements based on already existing technology and recommend number of beam-trip vs. duration database in today's technology;
- the raison for the improved reliability in the extrapolated database will be documented for reference.

The WG on LBE technology will:

- co-ordinate and guide the LBE research in participating organisations, while enhancing closer and broader-based collaboration;
- develop a set of requirements and standards and a consistent methodology for experimentation, data collection and data analyses;
- publish the results in a consistent format within a single document in the form of a handbook to guide the subsequent development efforts.

The WG on LBE will publish a joint 5-year test plan in October 2003 and the final handbook will be issued by October 2007. The handbook will contain corrosion, liquid metal embrittlement data mapping as a function of thermal-hydraulic parameters, structural alloys, various proton and neutron spectral fluxes and fluences.

Chemical partitioning

The chemical partitioning subgroup incorporates members of the NSC Expert Group on Pyrochemistry, together with a set of world experts in aqueous separations processes. Its work is focused on separations processes relevant to different partitioning and transmutation systems, covering a wide range of fuel types; oxide fuel (uranium oxide, mixed uranium plutonium oxide, inert matrix fuels), fertile and non-fertile nitride fuel, composites (cermet, cercer), fertiel and non-fertile metal alloy, TRISO-coated graphite particulate fuel, and uranium and/or thorium based molten-salt fuel.

The group will perform a thorough technical assessment of separations processes in application to a broad set of P&T operating scenarios, including technical feasibility assessments, mass balance flow sheet development, technological maturity assessment, and decision analyses on technical issues. Important research, development and demonstration necessary to bring preferred technologies to a deployable stage will be identified and collaborative international efforts to further technology development will be recommended.

A state-of-the-art report on pyrochemistry will be issued by the Expert Group on Pyrochemistry by June 2003. The report will comprise four main chapters on national programmes, research needs, international collaboration, and future applications

The first publication of the chemical partitioning subgroup will be a report on national programmes in partitioning. The report will contain activities in USA, UK, Russia, Japan, Korea, Spain, France, Czech Republic and EC JRC and it will be published by June 2003. Further activities of the subgroup will be discussed at its next meeting.

Since a close co-ordination between P&T fuels developers and separations chemists is essential for assurance of success in the P&T enterprise, the subgroup will organise a joint workshop with the subgroup on fuels and materials (see below) in USA in May-June 2003.

Fuels and materials

The work of the subgroup on fuels and materials puts emphasis on the evaluation of expected performance of fuels and materials for transmutation systems. Fundamental properties of fuels, fuel selection criteria, fabrication and behaviour prediction, cladding and coolant compatibility issues, and long-lived fission products will be revisited and summarised by the subgroup. The main objective of the subgroup is to provide member countries with up to date information on the state-of-the-art technology on fuels and materials for transmutation, the availability of pertinent data and the necessary R&D to supplement the existing database.

The outcome of the work will be published as a report including information on:

- Fundamental thermophysical and thermochemical properties of relevant actinide compounds and alloys.
- Fuel selection criteria specific to representative transmutation scenario: single (LWR/FBR) stratum and double (LWR/Dedicated system) strata.
- Fuel fabrication (effects of radiation, heat, thermochemical issues. Compatibility with reprocessing).
- Fuel behaviour prediction (differences between (U,Pu)-based power reactor fuels and transmutation fuels. recognised technological problems of transmutation fuels, and uncertainties in their performance).
- Materials issues (existing database of cladding and fuel assembly materials, compatibility with lead/lead-bismuth, and high energy environment in ADS systems).
- Long-lived fission products.
- Ongoing R&D and international collaboration.

The first draft of the final report will be issued by September 2003 and a peer reviewed final report will be published by mid 2004.

The subgroup will organise a joint workshop with the subgroup on chemical partitioning in USA in May-June 2003.

Physics and safety for transmutation systems

The main tasks of the subgroup are to organise theoretical and experiment-based benchmarks for transmutation systems, evaluate beam-trip consequences in accelerator-driven systems, perform sensitivity studies on the main physics parameters, and propose a safety approach for new P&T systems.

The performance of both critical and sub-critical systems will be analysed and homogeneous as well as heterogeneous concepts for the transmutation of transuranics, minor actinides, and long-lived fission products will be considered. An evaluation of safety approaches for new transmutation systems, including the beam-trip issue in ADS, will be undertaken and reactor control options including the optimum sub-criticality level will be investigated.

MUSE-4 benchmark

To study the neutronic of ADS, some international experiments have been proposed, in particular the experiment MUSE-4 (using the MASURCA reactor) at Cadarache, France. A benchmark was launched, based on the "liquid" metal fast sub-critical MUSE-4 experiment configurations, to compare simulation predictions based on available codes and nuclear data libraries with experimental data related to: TRU transmutation, criticality constants and time evolution of the neutronic flux following source variation. [27]

The benchmark has been divided into three steps. The first step allows an understanding of the simulation methods of the different groups and tuning of the simulation programmes with the experimental data of one already measured configuration (COSMO). In the second step, the MUSE-4 reference configuration (1 112 cells) is proposed to simulate different reactor parameters (criticality constant, flux distribution, etc.) in a nearly critical configuration. Finally, the third step is oriented to the simulation of reactor response to the external source in the sub-critical reference configuration (976 cells). Static parameters are also considered in this sub-critical reference configuration.

More than 25 solutions for the steps 1 and 2 were contributed from 14 institutions world-wide and the submitted results are being analysed. Calculations for the step 3 have recently been started and the complete MUSE-4 benchmark results will be analysed and compared with experimental results. *Beam-trip benchmark*

Taking into account the fact that beams from existing accelerators are not entirely stable (beam trips), it is crucial to understand the effects of such beam trips on different sub-critical systems (thermal shocks). Therefore, the subgroup plans to organise an ADS beam trip transient benchmark. Up to now, two benchmark specifications have been proposed:

- a "Na-cooled" ADS "overpower" and beam-trip benchmark and
- a transient induced by 3 sec, 6 sec, 12 sec and a definitive beam trip in a lead-bismuth cooled 80 MWth XADS-type system.

The subgroup will examine both of proposals and perform the beam trip transient study.

Licensing study

There is a strong need to develop the technical basis for the licensing case for a future ADS. In particular, it is felt that work on a real project is needed to advance the discussions between the accelerator and reactor communities. Therefore, a specific working group within the subgroup on physics and safety for transmutation will be formed to examine the licensing case of two designs (Belgian MYRRHA and the high power reference design being developed within the US AAA project) and to obtain consensus between accelerator, reactor safety, and licensing experts, as to the safety and licensing approaches of these two projects.

The subgroup will launch time dependant studies to complement the existing steady state scenarios. These studies will be started on the basis of the scenarios recommended in the previous study, and will be focused on understanding the consequences of various implementation scenarios on R&D programmes.

Other activities within the NSC related to P&T

Working Party on International Co-operation on Nuclear Data Evaluation (WPEC)

The Working Party was established to promote the exchange of information on nuclear data evaluations, measurements, nuclear model calculations, validation, and related topics, and to provide a framework for co-operative activities between the participating nuclear data evaluation projects (ENDF, JEFF, JENDL, BROND and CENDL). The Working Party assesses needs for nuclear data improvements and addresses those needs by initiating joint evaluation and/or measurement efforts. [28]

Regarding P&T, the Working Party co-ordinates activities in intermediate energy nuclear data measurements and evaluations, and also Nuclear Model Code development and validation. In addition, the Working Party produced a High Priority Request List for Nuclear Data which covers a list of data needs, especially in the energy range above 20 MeV.

Working Party on Plutonium Fuels and Innovative Fuel Cycles (WPPR)

The Working Party carries out studies on plutonium physics, together with the Task Force on weapons-grade plutonium disposition. Moreover, in responding to recent initiatives to develop new advanced reactors, the WPPR organises Workshops on “Advanced Reactors with Innovative Fuels” (ARWIRF), covering reactor core behaviour, fuel material technology of advanced reactors, and different types of innovative fuels (advanced MOX, U-free, non-oxide, molten-salts). Although the workshops are organised under the auspices of the WPPR, the scope of the workshops is wider than that of the WPPR and covers the homogeneous and heterogeneous recycling of minor actinides. The first Workshop was held at PSI, Switzerland in 1998 considering water-cooled and fast reactors, and accelerator-driven systems with fast and thermal spectra. [29] At the second Workshop held at Chester, UK in 2001, the scope was extended to include high temperature gas-cooled reactors. [30] A third Workshop will be organised in 2004.

Shielding Aspects of Accelerators, Targets and Irradiation Facilities (SATIF)

This activity consists primarily of the organisation of a series of specialists' meetings (SATIF meetings) jointly organised by the NEA, the Shielding Working Group of the Reactor Physics Committee (Japan) and the RSICC (USA). The SATIF meetings have become a suitable forum for exchanging views and sharing experiences on thin and thick target neutron yields and radiation shielding modelling (computer codes and nuclear data aspects). The SATIF group also co-ordinates benchmark exercises, exchange of data for high energy radiation dosimetry purposes, of relevance also to transmutation applications.

Radioactive Waste Management Committee (RWMC)

The interest and involvement of the RWMC in P&T activities have been rather limited so far. However, a topical session on "The potential impacts on repository safety from a P&T programme" will be organised at the meeting of Integration Group for the Safety Case (IGSC) of RWMC in November 2002 and further discussions on the subject will be held at the RWMC in early 2003. A close co-operation among NDC, NSC and RWMC is foreseen.

Summarising remarks

The OECD Nuclear Energy Agency (NEA) organises, in response to the need of its Member Countries, a well-structured programme of work in the field of partitioning and Transmutation (P&T). It will also continue to play a significant role in the co-ordination of international activities in this field of research. The involved committees within the NEA will pursue necessary activities in nuclear data, physics of P&T systems (critical and sub-critical systems), fuel cycle chemistry, material science and transmutation fuels, safety of P&T related installations, and fuel cycle impacts, etc. Due to an increasing need to evaluate the impact of advanced fuel cycles and P&T applications on radioactive waste management strategies, a closer interaction between the P&T and the waste management communities will be sought within the NEA infrastructure. Finally, the good collaboration with other international organisations, such as the EC and the IAEA, will be also pursued.

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