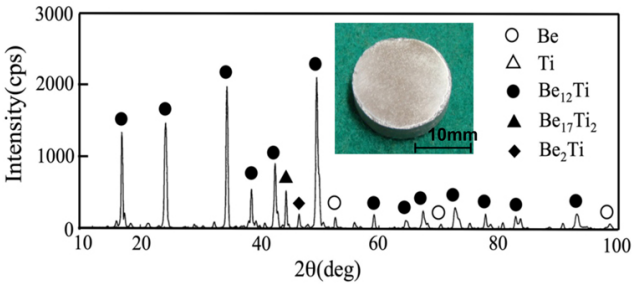
IFERC Newsletter

IFERC-N-2012-7~12 (*No. 5, 30 April, 2012*)
International Fusion Energy Research Centre, Rokkasho, Aomori 039-3212, Japan

DEMO R&D Activity

R&D activities in JA Task-4 (Advanced Neutron Multiplier)



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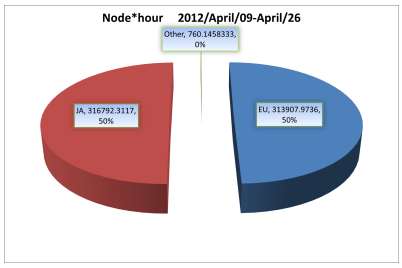
CSC Activity

1st Cycle of IFERC-CSC (Apr. 9 to Nov. 14) started



DEMO Design Activity

Joint Japan-EU work on fusion safety started

Meetings

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IFERC-N-2012-7 *(No. 5, 30 April, 2012)*

International Fusion Energy Research Centre, Rokkasho, Aomori 039-3212, Japan

DEMO R&D Activity

R&D activities in JA Task-4 (Advanced Neutron Multiplier)

Beryllium intermetallic compounds (beryllides) have become promising materials for advanced neutron multipliers. Establishing the fabrication technique for beryllide is a key issue. Trial fabrications were carried out through plasma sintering, a non-conventional consolidation process.

I. Beryllium Handling Room

Beryllium and its alloys (>3wt% Be) are defined as controlled chemical substances in Japan. Therefore, equipment for safely handling beryllium is required. The maximum concentration of beryllium is limited to <0.002 mg/m^3. The partitions of the beryllium handling room and the local ventilations are shown in Figs. 1 and 2, respectively. The room consists of a beryllium handling area, an exhaust system room and an entrance area. The devices for handling beryllium in the beryllium handling area are connected to the exhaust blower of the local ventilation system through pre-filters and HEPA filters. Figure 3 shows a plasma sintering device and a worker with personal protective wear for beryllium. The protective wear includes a Tyvek suit, impervious gloves, protective mask and shoes to prevent exposure to beryllium.

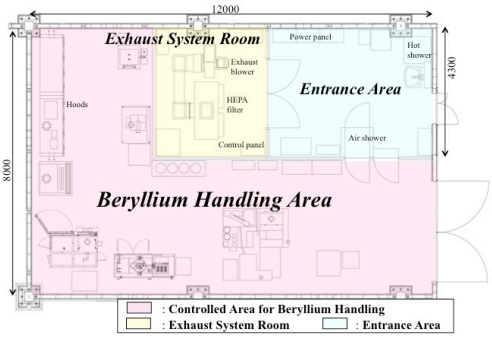


Fig.1 Partitions in the beryllium handling room

II. Beryllide synthesis experiment

The flow diagram of the plasma sintering method is shown in Fig.4. The plasma sintering process consists of plasma generation, resistance heating and pressure application. Although hot isostatic pressing (HIP) and arc-melting methods have been proposed for beryllide synthesis, the plasma sintering method has an advantage of being a simple process with a lower impurity level in the products, compared with other existing methods.

A result of X-ray diffraction (XRD) analysis and a photo of the plasma-sintered $Be_{12}Ti$ beryllide at a sintering temperature of 1273K are shown in Fig. 5. The plasma-sintered $Be_{12}Ti$ specimen was dense and had a metallic luster. The trial fabrication of Beryllide showed that $Be_{12}Ti$ beryllide was synthesized successfully using the plasma sintering method from mixed elemental powders at a temperature lower than the melting point.

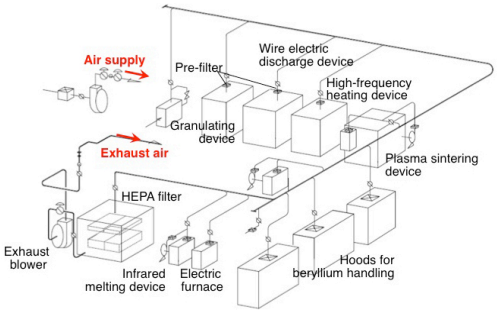


Fig.2 Schematics of the local exhaust ventilation system

Fig.3 Plasma sintering device and workers handling beryllium with personal protective

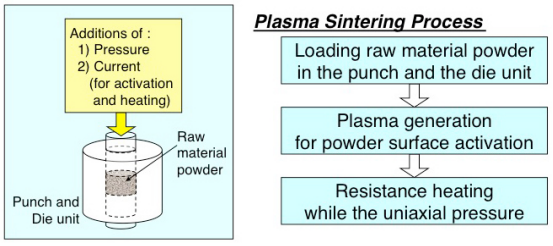


Fig.4 Flow diagram of the plasma sintering method

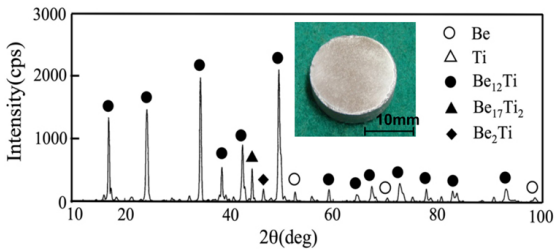


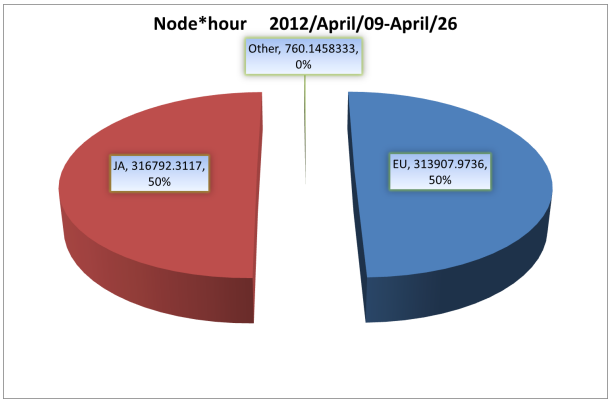
Fig.5 XRD profile of $Be_{12}Ti$ beryllide after plasma sintering at 1273K

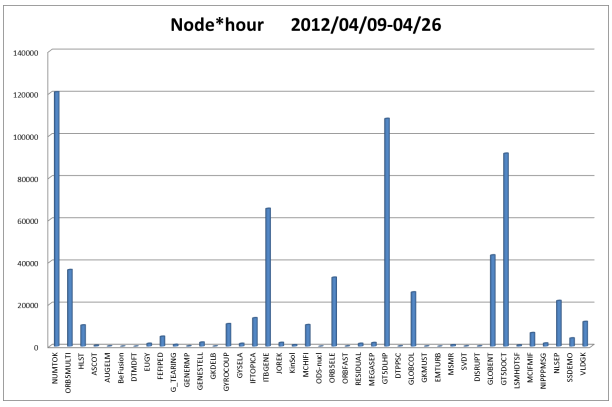
IFERC-N-2012-8 *(No. 5, 30 April, 2012)*

CSC Activity

1st Cycle of IFERC-CSC (Apr. 9 to Nov. 14) started

The first cycle of IFERC-CSC started from 9th April, and 5501 jobs have been submitted by 26th April. Of these jobs, EU users used 313,900 node*hours and JA users 316,800 node*hours (see the figure on the right). The ratio of EU to JA is about 50% to 50%. The node*hours for each project are shown below. As you can see, among 68 projects, 41 projects have submitted jobs by 26th April. Also, it shows that the projects on plasma turbulence (GENE, ORB5 and GT5D) were main users so far, but the other projects utilized Helios as well.





IFERC-N-2012-9 *(No. 5, 30 April, 2012)*

DEMO Design Activity

Joint Japan-EU work on fusion safety started

As a consequence of growing awareness of safety after the recent accident to the Fukushima Daiichi nuclear plant, an activity has been defined inside DDA to scrutinize the Safety of Fusion Plants that are planned for the future.

The first results of this activity were presented and discussed during the 1st joint collaborative Japan-EU workshop on Fusion Safety Research held at the Rokkasho IFERC site, April 19-26, 2012. Safety experts from the EU, IFERC Project Team, JAEA, University of Tokyo, and Japanese Industries met with the objective to determine the status of knowledge with regard to the most important problems of fusion safety and to identify areas where further work must be planned.

Fusion safety analysis activities conducted in the past were comprehensively revisited. Lessons learnt from the ITER licensing process and from the Power Plant Conceptual Study conducted in the EU and similar conceptual design studies in Japan were presented and intensively discussed.

Following the review of technical information from previous EU studies and the ITER licensing documents, important next step actions will be the identification of potential risks in fusion reactors, the definition of source terms, the identification of reference event sequences and the validation of safety computer codes. Analyses of beyond-design-basis accident sequences, where failure of all active safety systems and total loss of site electricity are assumed, will be performed next to demonstrate the inherent safety potential of future fusion reactors.

IFERC-N-2012-10 *(No. 5, 30 April, 2012)*

Meetings

10th Meeting of the IFERC Project Committee

The 10th Meeting of the IFERC Project Committee (PC-10) was held on 19-20 March at Rokkasho BA Site with 27 participants including remote participation from Garching, Saclay and Culham, composed of 5 PC members, the Project Leader, 8 experts from the Project Team and 14 experts from EU and JA Implementing Agencies. This was the first PC meeting under the chairmanship of Mr. David MAISONNIER.

The PC took note of the actions after the last PC-9 and recent status of sub-projects including the report by the Standing Committee of the CSC, the Safety Research of Fusion Plants, the Peer Review of DEMO R&D and the interim report of the preparatory working group of REC etc. The PC also recommended for approval by the Steering Committee the Annual Report 2011 and the update of the Project Plan.

Prior to the PC-10, the inauguration ceremony of CSC was held at the Rokkasho BA site. More than 100 guests were invited from EU and Japan in order to mark the start of the supercomputer, Helios. CSC is going to finish its test operation and provide a full-scale service for users starting on the 9th of April.

IFERC-N-2012-11 *(No. 5, 30 April, 2012)*

Meetings

The EPTM

The IFERC Extended Project Team Meetings (EPTM) started in July 2011, as a video conference between the IFERC Project Team in Rokkasho (and Naka), and the (small) F4E IFERC coordination group in Barcelona. The EPTM takes place approximately every two or three weeks, and has been from day one a very useful tool to improve the coordination of the IFERC activities, and to foster good communication and team spirit. It is used to check the status of ongoing activities, to agree on schedules, to coordinate the preparation of documents, and in general improve the efficiency of the work of the various teams. An important part of the agenda is decided by the administrative assistants, who raise the day-to-day issues regarding the document control, schedules of meetings, procedures, preparations of submissions to Committees, etc. The first task undertaken was to re-build the IFERC Document Management System (DMS) into a logic structure that would be easy and intuitive to use, as it had grown organically into a sort of wood of documents, where only the oldest inhabitants could find their way. This task was firmly taken in hand by Kanako Narumi, who had joined the IFERC Project Team in April 2011. With the help of Nuria Decker, she reorganized the whole IFERC documentation system, clarified the roles of the different actors and approval procedures, and used kind persuasion to convince the rest of the team to follow clear rules in the registration, approval and storage of documents. After a year we now enjoy a rational system, and are all grateful for her contribution. Narumi-san has now left the Project Team to improve the organsation of the life of the IFERC Project Leader, and we do not doubt that it will be a complete success!

We would like to thank and congratulate Narumi-san from this page, and extend a warm welcome to her successor, Miwako Kimura, who is already showing the dedication and initiative we have come to expect in this job!

IFERC-N-2012-12 *(No. 5, 30 April, 2012)*

Staff Corner

Kimio Hayashi looks forward to the DEMO R&D activities

I am a member of Japan Atomic Energy Agency (JAEA) being seconded to the IFERC Project Team from April 2008. I am in charge of the DEMO R&D activities as well as general coordination of the Project, including technical and managerial interactions between the IFERC Project and the JA Implementing Agency.

At present, the DEMO R&D activities are proceeding successfully as planned. This is deeply indebted to the intensive preparation work that EU and JA experts carried out by holding preparatory meetings at Rokkasho twice in July and November 2006. This work led us to the Joint EU/JA Proposal on the BA DEMO R&D activities summarized before the formal start of BA activities in June 2007. The DEMO R&D activities will be further upgraded by undergoing the Peer Review being currently implemented.

I am the first member of the IFERC Project to have transferred to Rokkasho in April 2009. Before that time, I worked at the Naka site of JAEA from April 2008 to March 2009 as the first professional staff of the IFERC Project, following Mr. Masanori Araki, the former IFERC Project Leader. I moved to Rokkasho just after the completion of the Administration & Research Building. Since then, many people including researchers in the DEMO R&D field have moved to, or are visiting the Rokkasho site.

How is Your Background ?

In 1980, I was employed by the Japan Atomic Energy Research Institute (JAERI, the former JAEA). In my doctor course of the University of Tokyo, I was given a PhD through my research in the fusion material field: namely, blistering of vanadium in the plasma-wall interaction field by using a small ion accelerator located near the JAEA Tokai site.

In JAEA, however, I was involved in the development of the fuel for high-temperature gas-cooled reactors (HTGRs). I studied the migration behavior of fission products (cesium etc.) in coated fuel particles with SiC coating and in graphite materials. My research also includes radiation damage of nuclear fuel (UO2) by high-energy (several tens MeV) fission fragments, as a basic study of high burn-up fuel behavior ("Rim Effect"). There is an interesting similarity between my research background and the present work such as tritium behavior and SiC/SiC composite development to be used in radiation environment.

After my 2-year work in the Planning Office of JAEA in Tokyo, I was very lucky to come back to a fusion field in April 2003; namely, R&D at the Oarai site of JAEA on tritium breeder/neuron multiplier materials for fusion blanket.

How Do You Think of the Future ?

In my university days more than 30 years ago, fusion research was very challenging and attractive for young researchers including myself. Now I can still believe in it.

On the other hand, the world society including Japanese people is going to expect that nuclear fusion should become a really available energy source in a couple of decades, because we have already invested a huge amount of money both in domestic and international fusion research. Surely, the future society will depend on the ambitions young generation including a group of people in the fusion R&D field. Of course, I hope to get involved in this group as a "mentally" young researcher.

The fusion field has a wide range ("envelope", "skirt" and "tail") in the technology. We should make a full use of nuclear engineering in close relation with fusion technology, e.g. in relevant to tritium and engineering safety, blanket/nuclear materials development considering the radiation damage effects, treatment of radioactive material etc.

My current dream is to stay healthy until the day when

the feasibility of fusion reactors is confirmed as hydrogen generators as well as electricity generators on the basis of HTGR development results and a world COE (center of excellence) role of the Rokkasho fusion research activities.

How is Your Life in Aomori ?

As you know, Aomori prefecture is very rich in nature. Recently, I have been really enjoying hiking (and mountaineering? in the future). The sharply peaked Mt. “Fukkoshi-Eboshi” (508m) in Rokkasho village is one of my favorite places to see the whole beautiful scenery of the Gulf of “Mutsu” and Mt. “Kamabusé-yama”. Two years ago, I encountered a black BEAR !! at Mt. “Eboshi-daké” in Noheji town; fortunately I was safe driving in the car.

The attached photos were taken recently with my wife at a place near the top of Mt. “Iwaki-san” (1625m). It was a really fine and pleasant day, while (because?) I used a driving way (“Tsugaru-Iwaki skyline”) and a climbing lift. I would challenge to climb up this mountain on foot and by hand someday in the future.