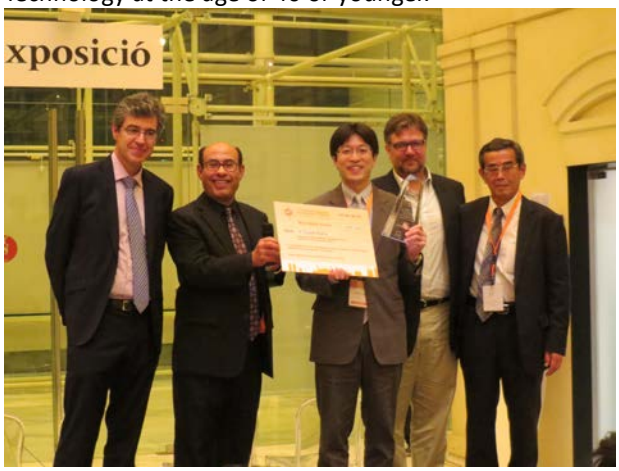
IFERC Newsletter

IFERC-N-2013-10, 4 December 2013
International Fusion Energy Research Centre, Rokkasho, Aomori 039-3212, Japan

Award

Dr. Hoshino wins Miya-Abdou Fusion Technology Award

The International Standing Committee (ISC) for the 11th International Symposium on Fusion Nuclear Technology (ISFNT-11) awarded the Miya-Abdou Fusion Technology Award to Dr. Tsuyoshi Hoshino, of Japan Atomic Energy Agency, Japan, for "- outstanding technical contribution to the fields of advanced ceramic breeding materials", this September 2013 in Barcelona, Spain. This award aims at acknowledging outstanding technical contributions to the field of Fusion Nuclear Technology at the age of 40 or younger.



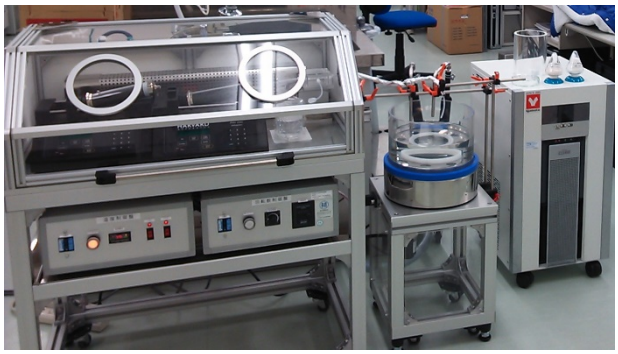
ISC awarded the Miya-Abdou Award to Dr. Hoshino.

Dr. Hoshino has mainly been engaged in the R&D on advanced tritium breeders for DEMO blanket as the Responsible Officer in the International Fusion Energy Research Centre (IFERC) project of Broader Approach (BA) activities, and he showed that the advanced tritium breeder (Li_2TiO_3 with excess Li) pebbles has contributed to an excellent DEMO blanket design and to early realization of the DEMO fusion reactor.

Lithium titanate (Li_2TiO_3) is one of the most promising candidates among tritium breeders because of its tritium release characteristics. However, the mass of Li_2TiO_3 decreases with time in a hydrogen atmosphere because of Li evaporation and Li burn-up. To control the loss of lithium at high temperatures, he created a novel material of Li_2TiO_3 with excess Li ($Li_{2+x}TiO_{3+y}$) as an advanced tritium breeder. $Li_{2+x}TiO_{3+y}$ contains an excess of Li element more than the previous breeding material Li_2TiO_3, and this advanced breeder has excellent chemical and physical stabilization at high temperatures.

At first, solution phase synthesis with the alcohol of Li and Ti was applied for the synthesis of $Li_{2+x}TiO_{3+y}$. However, these raw materials are not only extremely expensive, but also unsuitable for mass production. Therefore, he suggested a novel solid phase reaction with the powders of $LiOH \bullet H_2O$ and H_2TiO_3 as the raw material for the synthesis of $Li_{2+x}TiO_{3+y}$. For the first time in the world, he has successfully established the large-scale synthesis of $Li_{2+x}TiO_{3+y}$ raw material by this new method.

In fusion reactors, tritium breeder pebbles of about 1mm in diameter are required. An emulsion method has been developed as the new mass production technology for the $Li_{2+x}TiO_{3+y}$ pebbles.. Because this method has shown satisfactory performance in the general industry, Dr. Hoshino was sure this method would make it easier to control the particle size and the grain size than the previous wet granulation process. As the result of trial and error, he has also successfully established a mass production process of $Li_{2+x}TiO_{3+y}$ pebbles with various diameters, that have excellent grain size, high sphericity, and are suitable for the DEMO blanket.



Overview of the granulator used for the emulsion method.

He is also a key member of the Japanese Test Blanket Modules (TBM) group for the International Thermonuclear Experimental Reactor (ITER), the International Energy Agency (IEA) Fusion Nuclear Technology collaborations and the Ceramic Breeder Blanket Interactions meeting. His work has contributed to the progress of the world Fusion Nuclear Technology and fusion programs. (*Masaru Nakamichi*)