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IFMIF/EVEDAプロジェクトの進展と今後の展開；ターゲット系開発の進展
Progress and Scheme of IFMIF/EVEDA Project; Lithium Target Facility

若井栄一[1]，渡辺一慶[1]，井田瑞穂[1]，近藤浩夫[1]，金村卓治[1]，古川智弘[1]，平川康[1]，新妻重人[1]，藤城興司[1]，中庭浩一[1]，伊藤譲[1]，杉本昌義[1]，帆足英二[2]，吉橋幸子[2]，芹澤久[2]，川人洋介[2]，深田智[3]，鈴木晶大[4]，八木重郎[5]，辻義之[6]，古谷一幸[7]，Fridrich Groeschel[8]，Juan Knaster[8]，Micciche Gioacchino[9]，Angel Ibarra[10]，Roland Heidinger[10]，Nitti Francesco[10]

Eiichi Wakai[1], Kazuyuki Watanabe[1], Mizuho Ida[1], Hiroo Kondo[1], Takuji Kanemura[1] , Tomohiro Furukawa[1], Yasushi Hirakawa[1], Shigeto Niitisuma[1], Kouji Fujishiro[1], Kouichi Nakaniwa[1], Yuzuru Ito[1], Masayoshi Sugimoto[1], Eiji Hoashi[2], Sachiko Yoshihashi-Suzuki[2], Hisashi Serizawa[2], Yosuke Kawahito[2], Satoshi Fukada[3], Akihiro Suzuki[4], Juro Yagi[5], Yoshiyuki Tsuji[6], Kazuyuki Furuya[7], Fridrich Groeschel[8], Juan Knaster[8], Micciche Gioacchino[9], Angel Ibarra[10], Roland Heidinger[11], Nitti Francesco[11]

[1]日本原子力研究開発機構，[2]大阪大学，[3]九州大学，[4]東京大学，[5]核融合科学研究所，[6]名古屋大学，[7]八戸工業高等専門学校，[8] Project Team of IFMIF/EVEDA Project, [9]ENEA,Brasimone, [10] Fusion for Energy, [11] Siemat

[1] Jappan Atomic Energy Agency, [2] Osaka University, [3] Kyushu University, [4] Tokyo University, [5] NIFS, [6] Nagoya University, [7] Hachinohe National College of Technology, [8] Project Team of IFMIF/EVEDA Project, [9]ENEA, [10] Siemat [11] Fusion for Energy,

1. Introduction and objective

Fusion reactor materials development needs a high energy and high-density neutron source to simulate the neutrons generated by fusion reactions. Therefore, the construction of the International Fusion Materials Irradiation Facility (IFMIF) is being studied. The objective of IFMIF is to generate the neutrons by injecting the deuteron beams accelerated to high energy onto the 260 mm wide and 25 mm thick free-surface lithium flow. Guiding the liquid lithium along the concave back plate at a speed of 15 m/s is required to increase the pressure in the lithium flow by centrifugal force, to avoid boiling by the heat input of the deuteron beams, and to remove heat by the lithium flow circulation. It enables the target geometry to be maintained at the time of heat input, which is unexpected for solid target, and realizes the steady-state neutron source. Basic experiments of lithium flow in a test facility with small amounts of lithium had been conducted in the past, but the flow was suspected to be less stable in the conditions of the faster lithium flow and under high flow rate of lithium, and so the validation of high–speed free-surface flow at full scale has been a challenging subject. To develop the IFMIF design, IFMIF/EVEDA (Engineering validation and engineering design activity) has been started from 2007.

2. Progress and Scheme of IFMIF/EVEDA project

As shown in Fig. 1, EVEDA Lithium test loop (ELTL) has now constructed and operated a liquid lithium flow test facility with the world's highest flow rate, and succeeded in generating a 100 mm wide and 25 mm thick free-surface lithium flow along a concave back plate steadily at a high-speed of 20 m/s at 300°C for the first time in the world as shown in Fig. 2. This result will greatly advance the development of an accelerator-based neutron source to high energy and high-density, one of the key objectives of the fusion reactor materials development under the BA Activities. The source generates neutrons by injecting deuteron beams onto the free-surface of the lithium jet.

Fig.1 EVEDA Lithium Test Loop

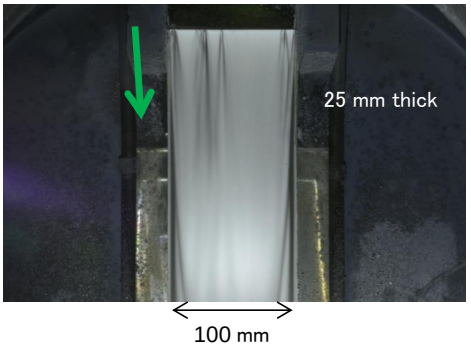

Fig.2 Li flow with free surface (20 m/s)

The recent related engineering validation and engineering design of lithium facility is also developed and summarized.

3. Summary

(1) This project is being performed from the middle of 2007.
(2) ELTL was constructed in Oarai-JAEA, and the validation of ELTL is shown in this conference and it is under a great progress.
(3) Engineering Design of Lithium target facility was summarized on June 2013. The intermediate IFMIF engineering design was produced by all EVEDA team.